HEWLETT hp PACKARD

OPERATING AND SERVICE MANUAL

8505A
NETWORK ANALYZER
500 kHz to 1.3 GHz

SERIAL NUMBERS

This manual applies directly to HP Model 8505A Network Analyzers with serial number prefix 1930A. For instruments with serial number lower than 1930A, refer to the Manual Changes section of each chapter.

1400 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CALIFORNIA 95404 U.S.A.

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CERTIFICATION

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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MODEL 8505A NETWORK ANALYZER
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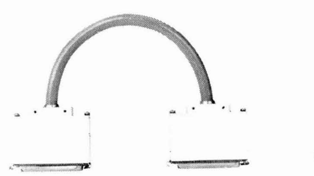
INTERCONNECT CABLE
(08505-60231)



NOTE

The following accessories supplied with the 8505A are not shown:

1. Smith and Log Chart CRT Overlays
2. AC Power Cable
3. PC Board Extenders (4) (See Accessories Supplied, Paragraph A1-40)

Figure A1-1. Model 8505A Network Analyzer

CHAPTER A
MODEL 8505A NETWORK ANALYZER

SECTION I
GENERAL INFORMATION

A1-1. INTRODUCTION

A1-2. The Model 8505A Network Analyzer comprises three functionally separate but physically integrated major assemblies: RF Source/Converter Assembly A1, Frequency Control Assembly A2, and Signal Processor Assembly A3. (A1, A2, and A3 are reference designators used to identify these assemblies throughout the manual.) The building-block approach used in construction of the 8505A is also used in the arrangement of the manual. Chapter A is divided into six sections containing information pertaining to the entire 8505A. This includes specifications, operating instructions, performance tests, adjustments, and sufficient theory and troubleshooting data to enable you to isolate a malfunction to a particular one of the three major assemblies.

A1-3. Chapters B, C, and D each cover one major assembly: Chapter B, the RF Source/Converter Assembly A1; Chapter C, the Frequency Control Assembly A2; and Chapter D, the Signal Processor Assembly A3. Each of these three chapters is divided into three sections containing general information about the assembly, a complete parts list for the assembly, the assembly theory of operation and schematic diagrams, and sufficient data for isolation of a failure within the assembly to the malfunctioning stage or component.

A1-4. DESCRIPTION

A1-5. The 8505A Network Analyzer measures network performance in the frequency range of 500 kHz to 1300 MHz. Three test input ports, A, B, and R, each provide 100 dB of dynamic range. The three test inputs are electrically identical, with R used as the reference for ratio measurements. A front-panel adjustable "line stretcher," with an associated readout in meters and centimeters, enables the electrical length of the R input to be changed to match the electrical length of the test input. This feature is used to compensate for differences in test cable lengths, and to measure the electrical length of a network under test.

A1-6. Any one of the three test inputs, or the ratio of A/R or B/R, can be selected for presentation on one or both of two identical but independent display channels: CHANNEL 1 and CHANNEL 2. These two channels each display signal magnitude, phase, deviation from linear phase, and group delay of the under-test device's transmission or reflection characteristics. A selector switch enables all of these characteristics except group delay to be displayed in either rectangular or polar coordinates. Group delay is displayed in rectangular coordinates only. Digital readouts of the displayed characteristics are also provided on the 8505A.

A1-7. The 8505A's internal signal source provides seven selectable test signal modes: logarithmic full-range sweep, linear full-range sweep, linear expanded sweep (selected start/stop end points) No. 1, linear expanded sweep No. 2, linear expanded sweeps No. 1 and No. 2 alternately displayed on display channels 1 and 2 respectively, CW $\pm\Delta F$, and CW. Logarithmic full-range and linear full-range swept signals are provided in three selectable ranges: 500 kHz to 13 MHz, 500 kHz to 130 MHz, and 500 kHz to 1300 MHz.

A1-8. The Hewlett-Packard Interface Bus (HP-IB) allows both the Frequency Control and the Signal Processor of the 8505A to either receive instructions from or send data to a remote controller. The Learn Mode of the HP-IB enables the controller to store or "learn" the state of the 8505A manually-set front-panel controls so it can recall this information as needed.

A1-9. The three major assemblies (A1, A2, and A3) of the 8505A are contained in two chassis units, stacked one on top of the other and mechanically locked together. The lower unit contains the RF Source/Converter Assembly (A1) and the Frequency Control Assembly (A2). The top unit contains the Signal Processor Assembly (A3) and its associated CRT display. Each unit has its own ac power input receptacle and dc power supplies.

A1-10. INSTRUMENTS COVERED BY THE MANUAL

A1-11. Attached to the upper and lower units of the instrument are two identical serial number plates, both inscribed with the same serial number. As shown in Figure A1-2, the serial number is in two parts. The first four digits and the letter are the serial number prefix; the last five digits are 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 to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

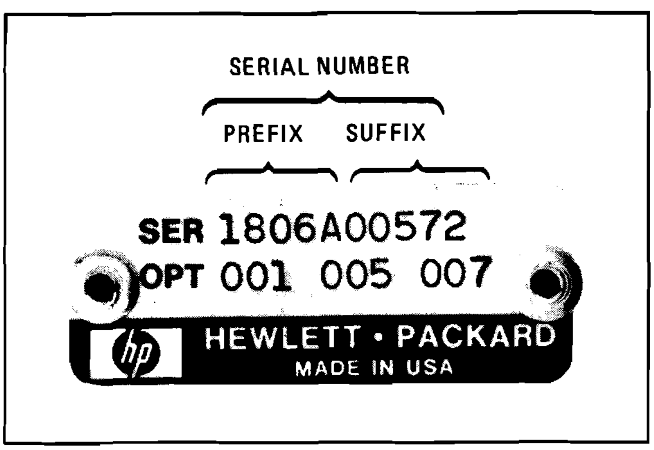


Figure A1-2. Serial Number Plate

A-12. Occasionally the manual will be accompanied by a yellow Manual Changes supplement. The Manual Changes supplement contains changes that have not yet been incorporated in the manual. A box in the upper right corner of the Manual Changes supplement identifies the affected manual by part number and print date. The supplement also identifies the serial numbers or serial number prefixes of instruments affected by it.

A1-13. The Manual Changes supplement (when there is one) is available for updating manuals already shipped from the factory. To obtain the latest Manual Changes supplement, contact your nearest Hewlett-Packard office.

A1-14. SAFETY CONSIDERATIONS

A1-15. General

A1-16. This is a Safety Class I instrument. This instrument has been designed and tested according to International Safety Requirements for Electronic Measuring Apparatus.

A1-17. Safety Symbols

⚠ Instruction manual symbol: the apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.

Indicates dangerous voltages.

⏚ Earth terminal (sometimes used in manual to indicate circuit connected to grounded chassis).

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign 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 equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

A1-18. Operation

CAUTION

BEFORE APPLYING POWER make sure the instrument's TWO ac inputs are set for the available ac line voltage, that the correct fuses are installed, and that all normal safety precautions have been taken.

A1-19. Service

A1-20. Although the instrument has been designed in accordance with international safety standards, the information, cautions, and warnings in this manual must be followed to ensure safe operation and to keep the instrument safe. SERVICE AND ADJUSTMENTS SHOULD BE PERFORMED ONLY BY QUALIFIED SERVICE PERSONNEL.

A1-21. Adjustment or repair of the opened instrument with the ac power connected should be avoided as much as possible and, when unavoidable, should be performed only by a skilled person who knows the hazard involved.

A1-22. Capacitors inside the instrument may still be charged even though the instrument has been disconnected from its source of supply.

A1-23. Make sure only fuses of the required current rating and type (normal blow, time delay, etc.) are used for replacement. Fuse requirements are indicated on the instrument's rear panels. Do not use repaired fuses or short-circuit fuse holders.

A1-24. Whenever it is likely that the protection has been impaired, make the instrument inoperative and secure it against any unintended operation.

WARNING

If this instrument is to be energized through an auto-transformer (for voltage reduction), make sure the common terminal is connected to the earthed pole of the power source.

BEFORE SWITCHING ON THE INSTRUMENT, the protective earth terminals of the instrument must be connected to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with protective earth contact. The protection action must not be negated by using an extension cord (power cable) without a protective grounding conductor. Grounding one conductor of a two-conductor outlet is not sufficient protection.

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal is likely to make this instrument dangerous. Intentional interruption of the earth ground is prohibited. Whenever it is likely that the protection has been impaired, the instrument must be secured against any unintended operation.

Servicing this instrument often requires that you work with the instrument's protective covers removed and with ac power connected. Be very careful; the energy at many points in the instrument may, if contacted, cause personal injury.

WARNING

At the top left rear of the Signal Processor Assembly A3, under the top cover, there is a two-position NORM/BY-PASS switch. When this switch is set to NORM, the front-panel LINE ON/OFF switch controls the primary power into the entire 8505A. When it is set to BY-PASS, however, only the lower unit (Source/Converter and Frequency Control Assemblies) is affected by operation of the LINE switch, the Processor Assembly will have power applied to it as long as the line cord (power cable) is connected to an ac source regardless of the position of the LINE switch. DO NOT assume there are no dangerous voltages present in the Signal Processor Assembly until you have checked the position of the NORM/BY-PASS switch.

A1-25. SPECIFICATIONS

A1-26. In order to provide the maximum amount of information about the usefulness and flexibility of the 8505A, both the performance specifications and the supplemental characteristics are listed in Tables A1-1 and A1-2. **Specifications** describe the instrument's warranted performance over the temperature range of 20° to 30°C. **Supplemental Characteristics** are intended to provide information useful in applying the instrument by giving typical but non-warranted performance parameters.

A1-27. OPTIONAL 8505A EQUIPMENT

A1-28. Option 005 Phase Lock

A1-29. Option 005 provides the capability for phase-locking the HP 8505A to an external stable signal source such as the HP 8660A/C Synthesized Signal Generator or HP 8640A/B Signal Generator. When phase-locked, the residual FM of the system approaches that of the external signal source. This system is useful in making very narrow band measurements. See Chapter E for further information.

A-30. Option 007 Labeling Interface

A1-31. Option 007 provides the capability to obtain data from the 8505A to 8501A. Data obtained from the 8505A includes front-panel control settings, frequency, and Channel 1 and 2 marker measurement information. The 8501A processes this data and displays it on the 8505A CRT as labels and graphics. See Chapter F for further information.

A1-32. Option 907 Front Handles Kit

A1-33. Option 907 consists of four front handles, two for each 8505A chassis unit, and the necessary hardware for attaching the handles. The kit part number is HP 5061-0089. See Figure A2-2.

A1-34. Option 908 Rack Flange Kit

A1-35. Option 908 contains the flanges and hardware required to mount the 8505A in an equipment rack with 482.6 mm (19 inches) horizontal spacing. The kit part number is HP 5061-0077. See Figure A2-2.

A1-36. Option 909 Rack Flange/Front Handle Kit

A1-37. Option 909 consists of one Option 907 Front Handle Kit and one Option 908 Rack Flange Kit. (See above.) The kit part number is HP 5061-0083. See Figure A2-2.

A1-38. Option 910 Additional 8505A Manual

A1-39. Option 910 provides an additional 8505A Operating and Service Manual.

A1-40. ACCESSORIES SUPPLIED

A1-41. Accessories supplied with 8505A are:

Table of Accessories

Accessory	HP Part Number
Interconnect Cable	08505-60231
HP-IB Cable (0.5 meter)	10631D
HP-IB Cable (2 meter)	10631B
*One Y-Type AC Power Cable	8120-2231 or
Two AC Power Cables	8120-1351 or
Two AC Power Cables	8120-1369 or
Two AC Power Cables	8120-1689 or
Two AC Power Cables	8120-0698
One Set Smith and Log Chart CRT Overlays	08505-60154
One 8505A Operating Instructions Sheet	08505-90074
One 12-Pin (Dual 6-Pin) Extender Board	08505-60109
Two 30-Pin (Dual 15-Pin) Extender Board	08505-60041
One 36-Pin (Dual 18-Pin) Extender Board	08505-60042
One 50-Pin (Dual 25-Pin) Extender Board	08505-60108

*Power cable supplied depends on configuration of ac power receptacle at user's location. Y-type cable connects to both top and bottom units of 8505A.

Table A1-1. 8505A Network Analyzer Performance Specifications (1 of 3)

SOURCE

FREQUENCY CHARACTERISTICS

Frequency Range: 500 kHz to 1.3 GHz in three ranges; 500 kHz to 13 MHz, 500 kHz to 130 MHz and 500 kHz to 1.3 GHz.

Swept Frequency Accuracy: ±1% of range for linear sweep.

CW Frequency Accuracy: ±2 counts ±time-base accuracy.

Frequency Stability: better than ±0.01% of reading ±0.01% of frequency range over 10 minutes after warm up.

FREQUENCY COUNTER CHARACTERISTICS

Frequency counter measurements are made at any one of five continuously variable marker positions without interrupting the swept RF signal.

Accuracy:

Counter: ±2 counts ±time-base accuracy.

Marker Frequency: ±0.002% of scan width ±counter accuracy.

Time Base Accuracy: ±5 ppm ±1 ppm/°C ±3 ppm/90 days

OUTPUT CHARACTERISTICS

Power:

Range: +10 dBm to −72 dBm.

Accuracy:

Attenuator: ±1.5 dB over 70 dB range.

Vernier: ±1 dB

Levelling: ±0.5 dB from 500 kHz to 1.3 GHz.

Impedance: 50Ω; ≥16 dB return loss at −10 dBm output level (<1.38 SWR).

Spectral Purity·

Residual FM:

Frequency Range (MHz)	0.5 to 13	0.5 to 130	0.5 to 1300
Residual FM (Hz rms)	20 Hz	200 Hz	2 kHz
Measurement Bandwidth	20 Hz – 1 kHz	20 Hz – 1 kHz	20 Hz – 10 kHz

Harmonics: >25 dB below main signal at +10 dBm output level. Typically >40 dB below main signal at −12 dB setting of vernier.

Sub-harmonics and Spurious Signals: Below −50 dBm at +10 dBm output level.

RECEIVER

FREQUENCY RANGE

500 kHz to 1.3 GHz.

INPUT CHARACTERISTICS

Input Channels: Three channels (R, A, and B) with 100 dB dynamic range.

Maximum Input Level (Selectable): −10 dBm or −30 dBm input level.

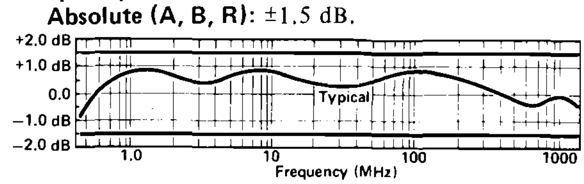
Noise (10 kHz BW): −110 dBm from 10 to 1300 MHz; −100 dBm from 2 to 10 MHz; −95 dBm from 0.5 to 2 MHz. Typically, −120 dBm using the −30 dBm input level position and 1 kHz BW.

Impedance: 50Ω: ≥20 dB return loss (<1.22 SWR). Typically >26 dB return loss (<1.11 SWR).

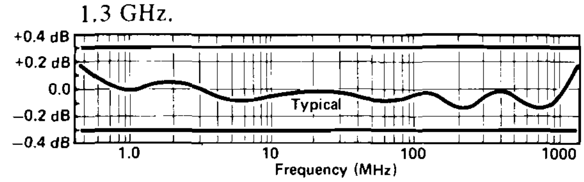
MAGNITUDE CHARACTERISTICS

Frequency Response:

Absolute (A, B, R): ±1.5 dB.



Ratio (A/R, B/R): ±0.3 dB from 0.5 MHz to 1.3 GHz.



Dynamic Accuracy:

± 0.01 dB/dB from −20 to −40 dBm.
± 0.2 dB from −10 to −50 dBm.
± 0.5 dB from −50 to −70 dBm.
± 1.0 dB from −70 to −90 dBm.
± 2.0 dB from −90 to −100 dBm.
± 4.0 dB from −100 to −110 dBm.

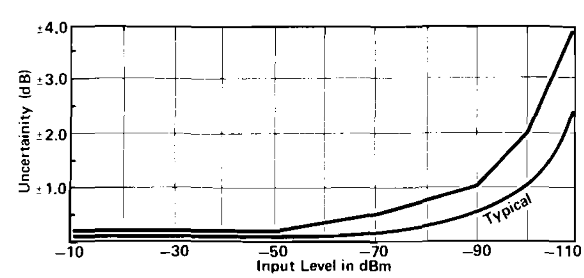
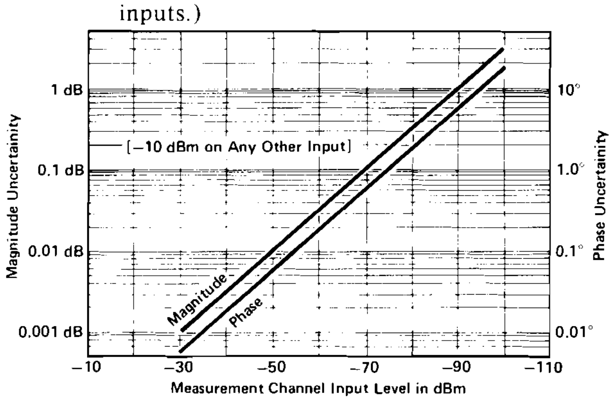


Table A1-1. 8505A Network Analyzer Performance Specifications (2 of 3)

Crosstalk Error Limits: (>100 dB isolation between inputs.)



Reference Offset:
Range: ±199.9 dB.
Accuracy: ±0.03 dB ±0.003 dB/dB of offset.

Resolution:
Marker Measurement: 0.01 dB over any <10 dB range; 0.1 dB for ⩾10 dB range.

CRT Display: 0.1 dB to 20 dB/division in 1, 2, 5 sequence.

Crosstalk: See amplitude crosstalk specifications.

Reference Offset:
Range: ±1700 degrees.

Accuracy: ±0.3° ±0.5% of offset.

Resolution:
Marker Measurement: 0.1° over <100° range and 1° for ⩾100° range.

CRT Display: 1° to 180° per division in 8 steps.

POLAR CHARACTERISTICS

Frequency Response, Dynamic Response, Reference Offset and Marker Measurement specifications are the same as magnitude and phase characteristics.

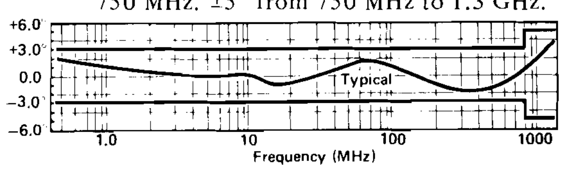
CRT Display Accuracy: Actual value is within less than a 3 mm circle of the displayed value.

Tracking Between dB Offset Controls and Polar Full switch positions: ⩽0.2 dB.

CRT Display Resolution: Magnitude graticules at 20% of full scale spacing; phase graticules at 10° increments around unit circle.

PHASE CHARACTERISTICS

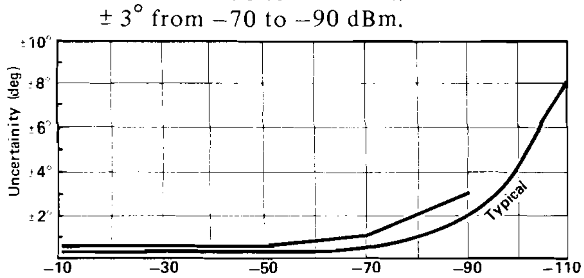
Frequency Response: ±3° from 500 kHz to 750 MHz. ±5° from 750 MHz to 1.3 GHz.



Range: ±180°.

Accuracy: ±0.01°/degree for ±170°
±0.01°/degree ±0.5° for ±180°

Dynamic Accuracy (in 10 kHz Bandwidth):
± 0.02°/dB from −20 to −40 dBm.
± 0.5° from −10 to −50 dBm.
± 1° from −50 to −70 dBm.
± 3° from −70 to −90 dBm.



DELAY CHARACTERISTICS

Frequency Response: ±1 ns from 500 kHz to 1.3 GHz

Delay Accuracy[3]: ±3% of reading ±3 units. (Units = 1 nsec for 0.5 to 1300 MHz range, 10 nsec for 0.5 to 130 MHz range, and 100 nsec for 0.5 to 13 MHz range.)

Range, Resolution and Aperture[2]

Frequency Range (MHz)	0.5 to 13	0.5 to 130	0.5 to 1300
Range	0 to 80 μs	0 to 8 μs	0 to 800 ns
Resolution CRT: Marker: Marker over limited Range:	 100 ns 100 ns 10 ns (<1 μs)	 10 ns 10 ns 1 ns (⩽ 100 ns)	 1 ns 1 ns 0.1 ns (⩽ 10 ns)
Aperture[2]	7 kHz	20 kHz	200 kHz

Reference Offset:
Range: ±1999 units.

Accuracy: ±0.3 units ±0.3% of offset.

Table A1-1. 8505A Network Analyzer Performance Specifications (3 of 3)

ELECTRICAL LENGTH/REF. PLANE EXTENSION CHARACTERISTICS

Calibrated Electrical Length:
Range and Resolution:[3]

Frequency Range (MHz)		0.5 to 13	0.5 to 130	0.5 to 1300
Range	x1	±19.9 m	±1.99 m	±19.9 cm
	x10	±100 m	±10 m	±1 m
Resolution	x1	10 cm	1 cm	0.1 cm
	x10	1 m	10 cm	1 cm

[1] ±3 Units may be calibrated out.
[2] Typical measurement Aperture using linear FM modulation technique.
[3] Vernier provides continuous adjustment of electrical length.

Accuracy: ±3% of reading ±1% of range.

Resolution: 10°

Vernier Range: Continuously variable over >10° range.

Accuracy: ±3% of reading ±10°/scan.

Phase Compensation Linearity: <±0.2% of phase slope inserted.

Dimensions: 426 mm wide, 279 mm high, 553 mm deep (16-3/4 in. x 11 in. x 21-3/4 in.).

Weight:
Net, 36 kg (86 lb)
Shipping, 48 kg (106 lb)

Table A1-2. Supplemental Characteristics (1 of 2)

SOURCE

Swept Frequency Resolution: (Verniers provide continuous frequency adjustment.)

Frequency Range (MHz)	0.5 to 13	0.5 to 130	0.5 to 1300
Start/Stop	10 kHz	100 kHz	1 MHz
CW ±ΔF	10 kHz 1 kHz	100 kHz 10 kHz	1 MHz 100 kHz
CW	100 Hz	1 kHz	10 kHz

Frequency Counter Resolution: (Least Significant digit)

Frequency Range (MHz)	0.5 to 13	0.5 to 130	0.5 to 1300
10 ms Sweep Time	10 kHz	100 kHz	1 MHz
100 ms Sweep Time	1 kHz	10 kHz	100 kHz
>1 second Sweep Time	100 Hz	1 kHz	10 kHz

Typical CW Noise (SSB in 1 Hz BW):

Frequency Range (MHz)	0.5 to 13	0.5 to 130	0.5 to 1300
dB below carrier	70	85	100
Frequency offset from carrier	1 kHz	10 kHz	150 kHz

SOURCE
General Characteristics:

Sweep Modes: Linear Full, Log Full, Start/Stop 1, Start/Stop 2, Alternate, CW ±ΔF, and CW.

Sweep Times: 10 ms to 100 seconds in decade ranges with vernier adjustment or manual sweep using vernier.

Trigger Modes: Auto, line sync., single scan or external sync. up to 50 kHz rate with ⩾2 Vpp and ⩾1 μs trigger signal.

RF Output Connector: Type N Female.

Table A1-2. Supplemental Characteristics (2 of 2)

RECEIVER

Input Damage Level: +20 dBm or ≥50 Vdc.

Full Scale Polar Magnitude Range: 1 to 0.01 in a 1, 0.5, 0.2 sequence.

Electrical Length Linearity: $\Delta\phi = 0.5\% \times 1.2f$ (MHz) x 1 (meters)

Linear Phase Substitution (degrees/scan):

Range: ±1700° per scan with 0° offset.
$$\frac{\pm 1.4\ \text{km}}{\text{scan width (MHz)}} \text{ or } \frac{\pm 4.7\ \mu\text{sec}}{\text{scan width (MHz)}}$$

Magnitude Offset

Typical Maximum Offset between −10 and −30 dBm Input Level Position: ±0.2 dB (excluding dynamic accuracy).

Typical Maximum Offset between 10 kHz and 1 kHz BW Positions: ±0.2 dB (exluding dynamic accuracy).

Phase Offset

Typical Maximum Offset between −10V and −30 dBm Input Level Position: ≤±2.0° (excluding dynamic accuracy).

Typical Maximum Offset between 10 kHz and 1 kHz BW Position: ≤± 5° (excluding dynamic accuracy).

General Characteristics:

RF Input Connectors: Type N Female.

CRT Reference Position: Reference lines for Channel 1, Channel 2, and beam center (in Polar) may be independently set to any position on the CRT Display.

General Characteristics (Cont'd)

Display Bandwidth: Selectable IF bandwidths of 10 kHz and 1 kHz. A video filter position is also provided.

CRT Background Illumination: Illumination control provided for CRT photography.

CRT Overlays: Smith Charts (3.16, 1, 0.5, 0.2, 0.1 full scale), Log Charts (10 MHz, 100 MHz and 1000 MHz). HP Part No. 08505-60154.

CRT Camera Adaptor: Hewlett-Packard 197A Option 006 camera is a direct fit. Camera bezel adaptor model 10375A is required to convert the standard 197A camera to fit the 8505A display.

Auxiliary Outputs:

Channel 1 and 2 Outputs: 0.25 V/display division with 2 kΩ source impedance.

Sweep Output: 0.25 V/display division with 2 kΩ source impedance.

Pen Lift: DC coupled, 200 mA current sink.

Power Requirements: 100, 120, 220, or 240 Vac +5% −10%, 50 to 60 Hz, approximately 275 watts. (Total for Signal Processor and Source/Converter-Frequency Control units.)

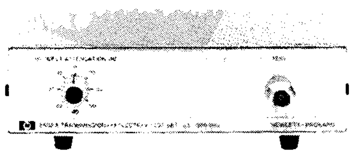
A1-42. TEST SETS AND ACCESSORIES AVAILABLE

A1-43. Test sets and accessories available for use with the 8505A are listed with their specifications in Table A1-3.

A1-44. RECOMMENDED TEST EQUIPMENT

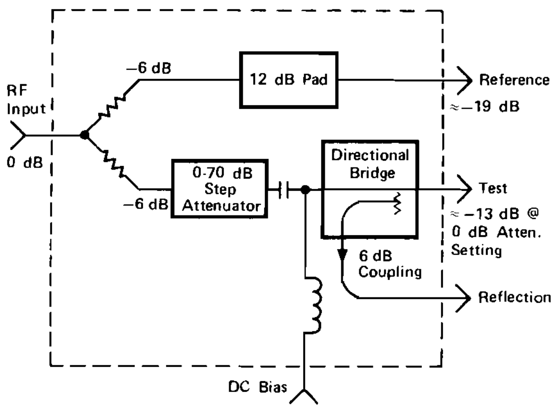
A1-45. Equipment recommended for testing and troubleshooting the 8505A Network Analyzer is listed in Table A1-4. Other equipment may be substituted for the equipment listed, providing it meets or exceeds the critical specifications indicated in the table.

Table A1-3. Test Sets and Accessories (1 of 7)



8502A
50 Ω TRANSMISSION/REFLECTION TEST SET

8502B
75 Ω TRANSMISSION/REFLECTION TEST SET[1]



8502A RF Schematic

Frequency Range: 500 kHz to 1.3 GHz.

Impedance: 8502A, 50 Ω; 8502B, 75 Ω.

Directivity: ≥ 40 dB.

Frequency Response[2]:
Transmission: ≤±0.8 dB Magnitude and ≤±8° Phase.

Reflection: ≤±1.5 dB Magnitude and ≤±15° Phase from 0.5 to 1300 MHz; ≤±10° Phase from 2 to 1300 MHz.

Port Match:
Test Port: ≥26 dB Return Loss from 2 to 1300 MHz (≤1.12 SWR) ≥20 dB Return Loss from 0.5 to 2 MHz (1.22 SWR).

Test Port Open/Short Ratio: ±0.75 dB Magnitude and ±6° Phase from 2 to 1000 MHz; ±0.9 dB Magnitude and ±7° Phase from 1000 to 1300 MHz; ±1.25 dB Magnitude and ±10° Phase from 0.5 to 2 MHz.

Reference and Reflection Port[2]: ≥25 dB Return Loss from 2 to 1000 MHz (≤1.12 SWR); ≥23 dB Return Loss 0.5 to 1300 MHz (≤1.15 SWR).

Input Port[3]: ≥23 dB Return Loss (≤1.15 SWR).

Insertion Loss:
Input to Test Port: 13 dB.

Input to Reference Port: 19 dB.

Input to Reflection Port: 19 dB.

Maximum Operating Level: ≤+20 dBm.

Damage Level: >1 watt CW.

RF Attenuator Range: 0 to 70 dB in 10-dB steps.

DC Bias Input Range: ±30 V dc, ±200 mA, some degradation of RF specification 0.5 to 100 MHz; 500 mA maximum.

RF Connectors: 8502A, 50 Ω Type N Female; 8502B Test Port 75 Ω Type N Female, all other RF connectors 50 Ω Type N Female.

DC Bias Input Connector: BNC Female.

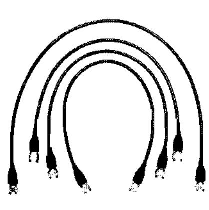
Includes: 8502B includes a 50 Ω to 75 Ω minimum loss pad (11852A).

Recommended Accessory: 11851A Cable Kit:
11853A 50 Ω N Accessory Kit for 8502A.
11855A 75 Ω N Accessory Kit for 8502B.

Dimensions: 101 mm wide, 61.5 mm high, 204 mm deep (7½ in. x 2-7/16 in. x 8 in.).

Weight:
Net, 1.7 kg (3-3/4 lb).
Shipping, 3.1 kg (7 lb).

[1] Tentative specification for 8502B.
[2] ±degrees specified as deviation from linear phase.
[3] Other ports terminated in their characteristic impedance.



11851A
RF CABLE KIT

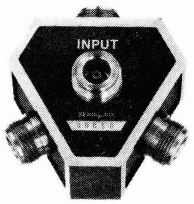
Function: Provides the necessary RF interconnections and RF shielding required for 8505A Network Analyzer measurements when using the 8502A, 8502B Transmission Reflection Test Sets or the 11850A, 11850B Power Splitters.

Kit Includes: Three 61 cm (24 in.) 50 Ω cables, phase matched to 4° at 1.3 GHz and one 86 cm (34 in.).

Connectors: 50 Ω Type N Male.

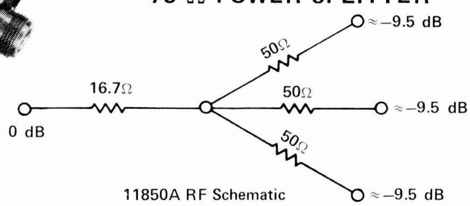
Weight: Net 0.91 kg (2 lb). Shipping, 1.36 kg (3 lb).

Table A1-3. Test Sets and Accessories (2 of 7)



11850A
50 Ω POWER SPLITTER

11850B
75 Ω POWER SPLITTER



11850A RF Schematic

Frequency Range: 500 kHz to 1.3 GHz.

Frequency Response (Absolute): Input to Output ≤±0.2 dB.

Nominal Insertion Loss: 9.54 dB for 11850A; 7.78 dB for 11850B.

Impedance: 11850A, 50 Ω; 11850B, 75 Ω.

Tracking Between Any Two Output Ports: ≤0.1 dB Magnitude and ≤1.5° Phase.

Port Match:
Output Ports: ≥32 dB Return Loss (≤1.05 SWR).

Input Port: ≥20 dB Return Loss (≤1.2 SWR).

Maximum Operating Level: ≤+20 dBm input.

Burn-out Level: ≥1 watt CW.

RF Connectors: 11850A, 50 Ω Type N Female; 11850B Test Ports (3) 75 Ω Type N Female, RF input 50 Ω Type N Female.

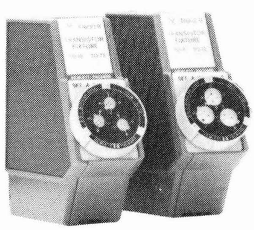
Recommended Accessory: 11851A Cable Kit.

Includes: 11850B includes three 50 Ω to 75 Ω minimum loss pads (11852A).

Dimensions: 67 mm wide, 46 mm high, 67 mm deep (2-5/8 in. x 1-7/8 in. x 2-5/8 in.).

Weight: Net, 1.8 kg (4 lb).
Shipping, 3.1 kg (7 lb)

[1] Tentative specification for 11850B.



11600B/11602B
TRANSISTOR
FIXTURES

Function: These units allow RF measurements to be made on leaded transistors. Either fixture provides common emitter, base, and collector for bipolars, and common source, gate, and drain for FET's. Other devices also fit the fixtures (tunnel diodes, diodes, etc.).

Transistor Base Patterns:
Model 11600B: Accepts TO-18/TO-72 packages. Will also accept any 3 or 4 lead packages with leads that lie on a 0.1-inch circle and whose diameters are 0.016 to 0.019 inch.

Model 11602B: Accepts TO-5/TO-12 packages. Will also accept any 3 or 4 lead package with leads that lie on a 0.2-inch circle and whose diameters are 0.016 to 0.019 inch.

Calibration References: Included for calibration of the transistor fixtures are two calibration references; a short circuit termination and a 50 Ω through-section.

Lead Lengths: Up to 1.5 inches long.

Frequency Ranges: DC to 2 GHz.

Impedance: 50 Ω nominal.

Return Loss: >26 dB, 100 MHz to 1.0 GHz; >21 dB from 1 to 2 GHz.

Connectors: Hybrid APC-7 precision connections.

Option 001: Type N Female connectors.

Recommended Accessory: The 11858A Rigid RF cable Interconnect Adapter is recommended for measurements using the 8503A S-parameter Test Set.

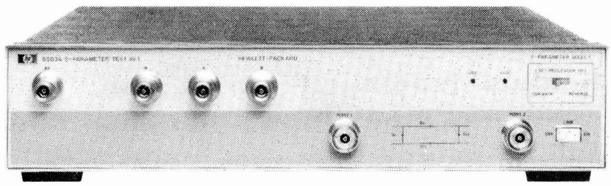
Option 003: Includes 11858A Rigid Interconnect Adapter for use with 8503A.

Maximum Power: 10W including RF signals.

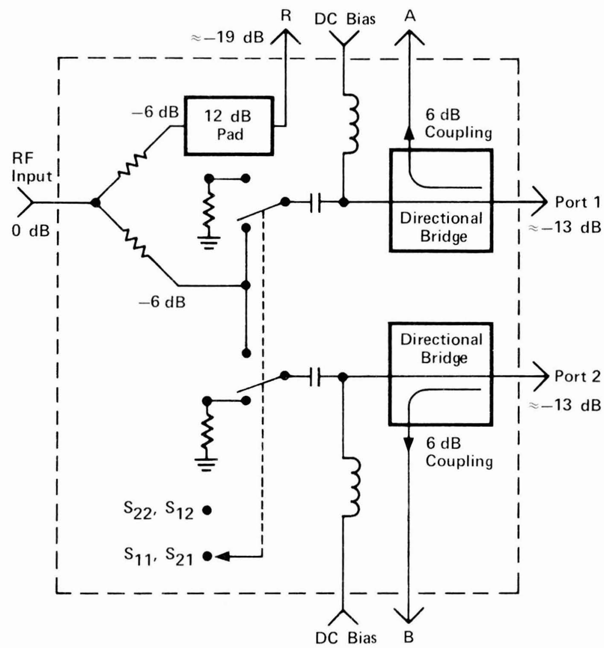
Weight:
Net, 1.1 kg (2-3/8 lb).
Shipping, 1.8 kg (4 lb).

Dimensions:
44 mm wide, 152 mm high, 229 mm deep (1-3/4 in. x 6 in. x 9 in.).

Table A1-3. Test Sets and Accessories (3 of 7)



8503A
50 Ω S-PARAMETER TEST SET
8503B
75Ω S-PARAMETER TEST SET



8503A RF Schematic

Frequency Range: 500 kHz to 1.3 GHz.

Impedance: 50 Ω.

Directivity: ⩾40 dB.

Frequency Response:
Transmission[1] **(S21, S12):** ±1 dB, ±12° from 0.5 to 1300 MHz.
Reflection[1] **(S11, S22):** ±2 dB, ±20° from 0.5 to 1300 MHz, ±15° from 2 to 1300 MHz.

Port Match[2]**:**
8503A, Test Port 1 and 2: ⩾28 dB Return Loss from 2 to 1000 MHz; ⩾26 dB Return Loss from 1000 to 1300 MHz (⩽1.11 SWR); ⩾20 dB Return Loss from 0.5 to 2 MHz (⩽1.22 SWR).
8503B, Test Port 1 and 2: ⩾24 dB Return Loss from 2 to 1300 MHz; ⩾18 dB Return Loss from 0.5 to 2 MHz.

8503A, Test Port 1 and 2 Open/Short Ratio: ⩽±0.75 dB Magnitude and ±6° from 2 to 1000 MHz: ⩽0.9 dB Magnitude and ±7.5° from 1000 MHz to 1300 MHz; ±1.25 dB Magnitude, ±10° Phase from 0.5 to 2 MHz
8503B, Test Port 1 and 2 Open/Short Ratio: ⩽±0.9 dB Magnitude and ±7.5° from 2 to 1300 MHz; ⩽±1.25 dB Magnitude and ±10° from 0.5 to 2 MHz.

Reference and Return Ports: ⩾23 dB Return Loss from 2 to 1000 MHz (⩽1.15 SWR); ⩾20 dB Return Loss from 0.5 to 2 MHz and 1000 to 1300 MHz (⩽1.22 SWR).

RF Input Port: ⩾20 dB Return Loss from 0.5 to 1300 MHz (⩽1.22 SWR).

Tracking Between Reference and Test Port 1 and 2:
Transmission[1] **(S21, S12):** ⩽±0.5 dB Magnitude and ⩽±4° Phase.

Reflection[1] **(S11, S22):** ⩽±0.75 dB Magnitude and ⩽±6° Phase.

RF Input to Test Port 1 or 2: ⩽±1.5 dB.

Insertion Loss:
Input to Port 1 and 2:
13 dB Nominal

Input to Port A, B, or R:
19 dB Nominal

Maximum Operating Level: +20 dBm

Damage Level: 1 watt CW

Connectors:
Test Ports: APC-7.

All Other RF Ports: 50 Ω Type N Female.

DC Bias Inputs: BNC Female.

DC Bias Input Range: ±30 Vdc, ±200 mA, some degradation of RF specifications 0.5 to 100 MHz; 500 mA maximum.

Includes: Four 19 cm (7½ in.) cables with Type N Male connectors for connection to 8505A.

Recommended Accessory: 11857A Test Port Extension Cables.

Power: Selection of 100, 120, 220, or 240V +5%−10%, 50 or 60 Hz., approximately 10 watts.

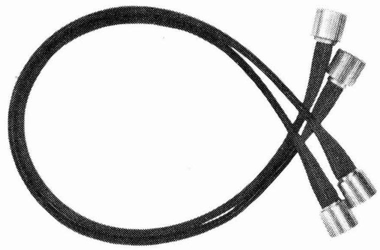
Dimensions: 432 mm wide, 90 mm high, 495 mm deep (17 in. x 3½ in. x 19½ in.).

Weight: Net, 9.1 kg (20 lb). Shipping, 11.3 kg (25 lb).

[1] ±Degrees, specified as deviation from Linear Phase.
[2] Effective Port match for ratio measurement.

Table A1-3. Test Sets and Accessories (4 of 7)

11857A/B/C[1]
TEST PORT EXTENSION CABLES



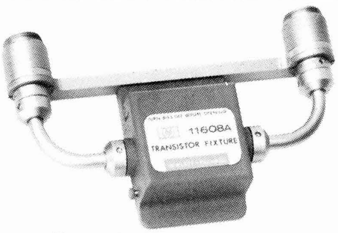
Function: Two precision cables extend the 8503A test ports for convenient measurement of devices having any two-port geometry.

Kit Includes: Two 61 cm (24 in.) cables, phase matched to 2° at 1.3 GHz

Connectors: APC-7.

Weight:
Net, 0.91 kg (2 lb).
Shipping, 1.36 kg (3 lb).

[1]11857A is 50 ohm cable with APC-7 connectors.
11857B is 75 ohm cable with Type-N 75 ohm male connectors on one end and Type-N 75 ohm female connectors on the other end.
11857C is 75 ohm cable with Type-N 75 ohm male connectors on one end and GR-900 75 ohm connectors on the other end.



11608A
TRANSISTOR FIXTURE

Function: Provides the capability of completely characterizing stripline transistors in either the TO-51 or HPAC-200 package styles. For special package styles, a through-line microstrip and bolt-in grounding structure machinable by customer is available.

Frequency Range: DC to 12.4 GHz.

Impedance: 50 Ω nominal.

Return Loss: >26 dB dc to 4 GHz; >23 dB 4.0 to 8.0 GHz; >19 dB to 12.4 GHz.

Microstrip Material: 0.031 in. polyphenylene oxide (P.P.O.); 0.080 in. wide 50 Ω stripline.

Package Styles:
Option 001: Through-line microstrip (P.P.O. plastic) and bolt-in grounding structure machinable by customer for special package styles.

Option 002: TO-51 (0.250 in. dia.).

Option 003: HPAC-200 (0.205 in. dia.).

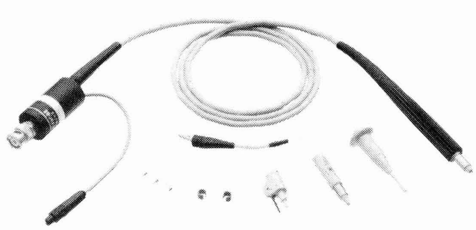
Calibration References: Options 002 and 003 are supplied with two calibration references; a short circuit termination and a 50 Ω through-section.

Connectors: APC-7 Hybrid connectors. Mates with 8503A and 8746B S-parameter Test Units. Option 100: Type N Female connectors.

Maximum Power: 10 W including RF signals.

Weight: Net, 0.9 kg (2 lb).
Shipping, 1.4 kg (3 lb).

Dimensions: 143 mm wide, 25 mm high, 89 mm deep (5-5/8 in. x 1 in. x 3½ in.).



1121A
AC PROBE

Function: For making signal measurements without disturbing circuitry and for measuring voltage transfer functions in impedance systems radically different from 50 Ω. Furnished with 10:1 and 100:1 divider and BNC adapter.

Bandwidth (3 dB): 1 kHz to >500 MHz.

Gain: 0 dB ±1 dB.

Frequency Response: 1 kHz to 100 MHz, ±0.5 dB, ±2°.

Input Impedance: 100 kΩ, shunt capacitance 3 pF at 100 MHz. With 10:1 or 100:1 divider, 1 MΩ shunt capacitance 1 pF at 100 MHz.

Output Impedance: 50 Ω nominal.

Maximum Input: 300 mV rms, ±100 V dc.
With 10:1 divider, 3 V rms, ±350 V dc.
With 100:1 divider, 30 V rms, ±350 V dc.

Power: Supplied by 8505A through PROBE PWR jacks. Warning: The output of the 1121A is direct coupled and has an output voltage of approximately −2 to −4 V. The output must not be dc coupled or the probe may be permanently damaged. If using the 1121A with instruments other than the 8505A, or if an attenuator pad is to be used at the probe output, be sure a blocking capacitor is provided. Model 10240B or equivalent can be used.

Weight: Net, 0.7 kg (1.5 lb). Shipping 1.2 kg (2.5 lb).

Table A1-3. Test Sets and Accessories (5 of 7)

11852A
50 Ω to 75 Ω Minimum Loss Pad

Function: A low SWR impedance conversion is required for accurate transmission measurements of 75 Ω devices using the 8505A Receiver (50 Ω). The Minimum Loss Pad provides a matched impedance in both directions, 50 Ω to the 8505A and 75 Ω to the device under test.

Frequency Range: DC to 1.3 GHz.
Insertion Loss: 5.7 dB
Return Loss: ⩾30 dB (⩽1.06 SWR).
Maximum Input Power: 250 mW (+24 dBm).
Connectors: 50 Ω Type N Female to 75 Ω Type N Female
Dimensions: Diameter 14 mm, length 70 mm (9/16 in. x 2-3/4 in.).
Weight: Net 0.11 kg (4 oz). Shipping, 0.26 kg (9 oz).

11853A
50 Ω Type N Accessory Kit

Function: The 11853A furnishes the RF components generally required when using the 8502A, 11850A, and 8503A (8503A requires 85032A also) when measuring devices having 50 Ω Type N connectors. The characteristics of the components in this kit insure high quality RF measurements for those devices having 50 Ω Type N connectors.

Kit Includes:

Qty.	Description
1	Type N Female short circuit
1	Type N Male short circuit
2	Type N Male Barrel
2	Type N Female Barrel
1	Storage Case

Dimensions: 254 mm wide, 64 mm high, 191 mm deep (10 in. x 2½ in. x 7½ in.).
Weight: Net 0.91 kg (2 lb). Shipping, 1.36 kg (3 lb).

11854A
50 Ω BNC Accessory Kit

Function: The 11854A furnishes the RF components generally required when using the 8502A, 11850A, and 8503A (8503A requires the 85032A also) when measuring devices having 50 Ω BNC connectors. The characteristics of the components in this kit insure high quality RF measurements for those devices having 50 Ω BNC connectors.

Kit Includes:

Qty.	Description
2	Type N Male to BNC Female adapter
2	Type N Male to BNC Male adapter
2	Type N Female to BNC Male adapter
2	Type N Female to BNC Female adapter
1	BNC Male short circuit
1	Storage Case

Dimensions: 254 mm wide, 64 mm high, 191 mm deep (10 in. x 2½ in. x 7½ in.).
Weight: Net 1.13 kg (2½ lb). Shipping, 1.59 kg (3½ lb).

11855A
75 Ω Type N Accessory Kit

Function: Provides the RF connecting hardware generally required for 75 Ω Type N component measurements using the 8502B Reflection/Transmission Test Set.

Kit Includes:

Qty.	Description
2	75 Ω Type N Male barrel.
2	75 Ω Type N Female barrel.
1	75 Ω Type N Male short circuit
1	75 Ω Type N Female short circuit
1	Storage Case

Dimensions: 254 mm wide, 64 mm high, 191 mm deep (10 in. x 2½ in. x 7½ in.).
Weight: Net 0.91 kg (2 lb). Shipping, 1.36 kg (3 lb).

11856A
75Ω BNC Accessory Kit

Function: Provides the BNC connecting hardware required for test setups using the HP 8502B Transmission/Reflection Test Set, the HP 8503B S-Parameter Test Set, or the HP 11850B Power Splitter (75-ohm) to make measurements on devices with 75Ω BNC connectors.

Kit Includes:

Qty	Description
2	75Ω Type N Male to BNC Female adapter
2	75Ω Type N Male to BNC Male adapter
2	75Ω Type N Female to BNC Male adapter
2	75Ω Type N Female to BNC Female adapter
1	75Ω BNC Male short circuit
1	BNC Male 75Ω termination
1	Storage Case

Dimensions: 168 mm wide, 114 mm deep, 51 mm high (6-5/8 in. x 4-1/2 in. x 2 in.)
Weight: Net: 0.91 kg (2 lb). Shipping: 1.36 kg (3 lb).

11858A
Rigid Interconnect Adapter

Function: Provides a rigid RF cable interconnection (horizontal to vertical test port orientation) between the 8503A S-parameter Test Set and the 11600B/11602B Transistor Fixtures and 11604A Universal Extension (11604A information provided in 8410S data sheet).

Connectors: APC-7

Dimensions: 254 mm wide, 64 mm high, 191 mm deep (10 in. x 2½ in. x 7½ in.).

Weight: Net 0.91 kg (2 lb). Shipping 1.36 kg (3 lb).

Table A1-3. Test Sets and Accessories (6 of 7)

85010A/B
8507A/B–8501A Application PAC

Function: Provides a cassette program that supplements the 85030A/B Application PAC. It provides faster data transfer and incorporates the normalization and averaging features of the 8501A.

Includes: Cassette and Operating/Programming Manual.

85030A
8507A/9830A Application PAC
85030B
8507B/9825A Application PAC

Function: Provides three cassette programs. The Accuracy Enhancement Program (AIM-30 or AIM-25) improves measurement accuracy by removing mismatch, directivity and frequency tracking errors for both one-and two-port devices. The Verification Program operationally checks calculator/network analyzer interfaces. The Basic Measurements Program makes the features of Learn Mode and data printing, plotting (with 9862A Plotter), and normalization available to the non-programmer.

Includes: Cassettes and Operating/Programmers Manual
Weight: Net 0.91 kg (2 lb). Shipping 1.36 kg (3 lb).

85031A
Verification and APC-7 Calibration Kit

Function: This kit is furnished with the 8507A Automatic Network Analyzer and is used for verification of measurement system performance. 3 dB and 50 dB Pads are included for use with the 8507A's verification program which functionally checks all parts of the 8507A system. Test data on the pads is also provided.

Kit Includes:

Qty.	Description
1	APC-7 50 Ω Termination <1.005 SWR at 2 GHz
1	APC-7 Short Circuit
1	APC-7 3 dB Pad with Test Data
1	APC-7 50 dB Pad with Test Data
1	Storage Case

Dimensions: 254 mm wide, 64.0 mm high, 19 mm deep (10 in. x 2½ in. x 7½ in.).

Weight: Net 0.91 kg (2 lb). Shipping, 1.36 kg (3 lb).

85032A
50 Ω Type N Calibration Kit

Function: This kit is recommended for use with the 8503A S-parameter Test Set or 8507A Automatic Network Analyzer for measurement of devices having Type N RF connectors.

Kit Includes:

Qty.	Description
2	APC-7 to Type N Female adapter
2	APC-7 to Type N Male adapter
1	50 Ω Type N Female termination with <1.005 SWR at 2 GHz
1	50 Ω Type N Male termination with <1.005 SWR at 2 GHz
1	Type N Female short circuit
1	Type N Male short circuit
1	Storage Case

Dimensions: 254 mm wide, 64 mm high, 191 mm deep (10 in. x 2½ in. x 7½ in.).

Weight: Net 1.13 kg (2½ lb). Shipping 1.59 kg (3½ lb).

85033A
SMA Calibration Kit

Function: This kit is recommended for use with the 8503A S-parameter Test Set or 8507A Automatic Network Analyzer for measurement of devices having SMA RF connectors.

Kit Includes:

Qty.	Description
2	APC-7 to SMA Male adapter
2	APC-7 to SMA Female adapter
1	50 Ω SMA Female termination
1	50 Ω SMA Male termination
1	SMA Female short circuit
1	SMA Male short circuit
1	Storage Case

Dimensions: 254 mm wide, 64 mm high, 191 mm deep (10 in. x 2½ in. x 7½ in.).
Weight: Net 1.13 kg (2½ lb). Shipping, 1,59 kg (3½ lb).

85036A
75Ω Type N Calibration Kit

Function: This calibration kit contains 75Ω Type N connector adapters, short circuits, and terminations. This hardware is required for making error–corrected measurements in accuracy enhancement program (AIM) test setups that use equipment with 75Ω Type N connectors.

Kit Includes:

Qty	Description
1	75Ω Type N Male to Type N Male adapter
1	75Ω Type N Female to Type N Female adapter
1	75Ω Type N Male short circuit
1	75Ω Type N Female short circuit
1	Type N Male 75Ω termination
1	Type N Female 75Ω termination
1	Storage Case

Dimensions: 168 mm wide, 114 mm deep, 51 mm high (6–5/8 in. x 4–1/2 in. x 2 in.).
Weight: Net: 0.91 kg (2 lb). Shipping: 1.36 kg (3 lb).

Table A1-3. Test Sets and Accessories (7 of 7)

8505A TEST SET AND ACCESSORY RECOMMENDATIONS

	TRANSISTOR S-PARAMETERS TO-18/TO-72 TO-5/TO-12 TO-51 HPAC-200				S-PARAMETERS APC-7 (50 Ω) Type N (50 Ω) BNC (50 Ω)			TRANSMISSION/ REFLECTION MEASUREMENTS Type N (50 Ω) BNC (50 Ω) Type N (75 Ω)			TRANSMISSION MEASUREMENTS Only Type N (50 Ω) BNC (50 Ω) Type N (75 Ω)		
8505A Network Analyzer	■	■	■	■	■	■	■	■	■	■	■	■	■
8502A 50 Ω Transmission/ Reflection Test Set									■	■			
8502B 75 Ω Transmission/ Reflection Test Set								■					
11850A 50 Ω Power Splitter												■	■
11850B 75 Ω Power Splitter											■		
8503A 50 Ω S-Parameter Test Set	■	■	■	■	■	■	■						
11600B Transistor Fixture				■									
11602B Transistor Fixture			■										
11608A Option 002 Stripline Transistor Fixture		■											
11608A Option 003 Stripline Transistor Fixture	■												
11851A RF Cable Kit								■	■	■	■	■	■
11852A 50 Ω to 75 Ω Minimum Loss Pad								◤			◤		
11853A 50 Ω Type N Accessory Kit										■			
11854A 50 Ω BNC Accessory Kit									■				
11855A 75 Ω Type N Accessory Kit								■					
11857A Test Port Extension Cables					■	■	■						
11858A Rigid Interconnect Adapter			◣										
85032A 50 Ω Type N Calibration Kit					■	■							

◣ Can be ordered as 11600B/11602B Option 003

◤ Three 50 to 75 Ω Minimum Loss Pads provided with 11852A, one Minimum Loss Pad provided with 8502B.

Table A1-4. Recommended Test Equipment (1 of 3)

Instrument	Recommended Model	Critical Specifications	Use*
Electronic Counter	HP 5340A	Freq Range: 400 kHz to 5.52 GHz Accuracy: ±1 count Sensitivity: −5 dBm	P,A,T
Power Meter and Sensor	HP 435A/8482A/ 8484A or HP 436A/8482A/ 8484A	Freq Range: 500 kHz to 1300 MHz Power Range: +20 to −60 dBm Accuracy: ±0.5 dB at 1300 MHz	P,A,T
Spectrum Analyzer	HP 141T/8552B/ 8553B/8555A	Freq Range: 500 kHz to 5.5 GHz Impedance: 50 ohms Dynamic Range: 60 dB Frequency identification capability	P,A,T
Oscilloscope	HP 180C/1801A/ 1820A/1804A	Vertical Bandwidth: 20 MHz minimum Vertical Sensitivity: 5 mV/Div Horizontal Sweep Rate: 1 µs/Div Channels: 4 (with 1804A plug-in)	A,T
Digital Voltmeter, AC/DC	HP 3490A	AC Range: 0 to 300V, 50 to 400 Hz DC Range: 0 to 200V Accuracy: ±5% Resolution: to 5 digits	A,T
Function Generator	HP 3312A	Output: +1V p-p square wave, 10 kHz and 100 kHz Adjustable DC offset.	A
Spectrum Analyzer	HP 8568A*	Freq. Range: to 1300 mHz Residual FM: < 3 Hz peak-to-peak	P
AM-FM Signal Generator	HP 8640A/B*	Frequency: 5 – 500 MHz Residual FM: < 5 Hz	P
Frequency Meter	HP 5210A*	Must have internal 12 kHz filter	P
RMS Voltmeter	HP 3400A*	True RMS Response: 1 mV-1V, 10 Hz to 10 MHz	P
Double Balanced Mixer	HP 10514A*	Frequency Range: 7 MHz to 500 MHz	P
40 dB Low Noise Amplifier	HP 08640-60506*	Input/Output Impedance: 50 ohms Low Frequency Response: 20 ±4 Hz Noise: < 3 dB	P
10 kHz Low-Pass Filter	HP 08505-60155*	Impedance: 50 ohms Type: 5-pole Butterworth	P
1 kHz Low-Pass Filter	HP 08505-60156*	Impedance: 50 ohms Type: 5-pole Butterworth	P

*If a Model HP 8568A Spectrum Analyzer is not available to make Spectral Purity tests, an alternate procedure may be used using an 8640A/B, 5210A, etc.

Table A1-4. Recommended Test Equipment (2 of 3)

Recommended Model	Instrument	Critical Specifications	Use*
3-Way Power Splitter	HP 11850A	Impedance: 50 ohms Freq Range: 500 kHz to 1.3 GHz Connectors: Type N, female Freq Response: Input to output ⩽±0.2 dB	P,A,T
50-Ohm Transmission/Reflection Test Set	HP 8502A	No substitution	P,T
Matched Type N Coaxial Cables (3 required)	HP 11851A	50-ohm double-shielded coaxial cables 61 cm (24 inches) long, phase matched to 2° at 1300 MHz	P,A,T
50-Ohm Termination (3 required)	HP 909A Option 012	Freq Range: 500 kHz to 1.3 GHz Impedance: 50 ohms Connector: Type N, male SWR: < 1.4	P,A
10 dB Attenuator	HP 8491B	Attenuation: 10 dB ±0.5 dB SWR: < 1.3	P,T
50-Ohm Feed-through Termination	HP 10100C	Connector: BNC	P
Type N Female Short	HP 11511A		P
BNC to Type N Adapter (2 required)	HP 1250-0780	Impedance: 50 ohms	P
12-Pin (Dual 6 -Pin) Extender Board	HP 08505-60109		A,T
Calibrated Step Attenuator	H89-355D	Attenuation: 0 to 120 dB in 10 dB steps Standards lab calibrated at 20 MHz Connectors: BNC	
AC Probe	HP 1121A	No substitution	A
Coaxial Step Attenuator	HP 8496A	Attenuation: 0 to 110 dB in 10 dB increments SWR: 1.5 Connectors: Type N, male	P, A

Table A1-4. Recommended Test Equipment (3 of 3)

Instrument	Recommended Model	Critical Specifications	Use*
30-Pin (Dual 15-Pin) Extender Board (2 required)	HP 08505-60041		A,T
36-Pin (Dual 18-Pin) Extender Board (3 required)	HP 08505-60042		A,T
50-Pin (Dual 25-Pin) Extender Board	HP 08505-60108		A,T
182.88 cm (72 inches) Coaxial Cable with Type N Connectors (2 required)	HP 11500A	50-ohm coaxial cable 182.88 cm long, terminated on both ends with UG-21D/U type N Male connectors	P
15.24 plus Meters (50 plus feet) of 50Ω Coaxial Cable		50-ohm type RG 223/U coaxial cable with BNC connectors on both ends	P,A
Type N Right Angle Adapter	HP 1250-0176		P
Type N Male-to-Male Adapter	HP 1250-0778	Impedance: 50 ohm	P
Type N Female-to-Female Adapter	HP 1250-0777	Impedance: 50 ohm	P
Service Interconnect Cable 61 cm (24 inches)	HP 08505-60202		T
Signature Analyzer	HP 5004A	No Substitute	T
Logic Pulser	HP 546A	No Substitute	T
Logic Probe	HP 545A	No Substitute	T
16-Pin IC Clip-on Connector (6 required)	HP 1400-0734	Any IC Clip	T

* P = Performance Test; A = Adjustment; T = Troubleshooting

CHAPTER A
MODEL 8505A NETWORK ANALYZER

SECTION II
INSTALLATION & INCOMING INSPECTION

A2-1. INTRODUCTION

A2-2. This section provides instructions for setting up the Model 8505A Network Analyzer on a bench or installing it in a standard equipment rack. Information about receiving inspection, operation verification, operating and storage environmental limitations, and packing requirements for reshipment are also included.

A2-3. RECEIVING INSPECTION

A2-4. Inspect the shipping container. If it or the cushioning material is damaged, keep it until the entire shipment has been checked for completeness, and the instrument has been checked mechanically and electrically. Check the equipment received in the shipment against the shipping manifest and equipment illustrations in Section I. Check the 8505A operation with the Incoming Inspection Tests in paragraph A2-49. If the shipment is incomplete, or if the equipment is damaged or will not pass the Incoming Inspection Tests, notify the nearest Hewlett-Packard office. If, in addition, the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for the carrier's inspection. The Hewlett-Packard office will arrange for repair or replacement of damaged equipment without waiting for a claim settlement.

A2-5. ENVIRONMENTAL LIMITATIONS

A2-6. Environmental limitations for the Model 8505A Network Analyzer are:

Temperature – 0° C to +55° C Operating; –40° C to +75° C, stored or in shipment.

Altitude (Barometric) – To 4572 metres (15 000 feet) operating. To 15240 metres (50 000 feet) stored or in shipment.

Humidity — To 95%, however, instrument must be protected from temperature extremes that could cause condensation to form in it.

A2-7. BENCH USE

A2-8. For bench use, the two chassis units of the 8505A are locked together with the lower unit sitting on the bench or on an 8503A S-Parameter Test Set. On the rear corners of each chassis unit there are feet which allow the units to be set down front-panel up as long as no cables are connected to the rear panel connectors. The bottom two feet on the Signal Processor and display unit, and the upper two feet on the Source/Converter Frequency Control unit fasten together with thumbscrews to lock the two units together at the rear (See Figure A2-1). In the front, four hook-shaped flanges on the top of the lower unit engage corresponding slots in the top unit. To fasten the two units together, proceed as follows:

a. Set the Signal Processor on top of the Source/Converter-Frequency Control, with the front edge of the Signal Processor overlapping the front edge of the bottom unit approximately 1/4-inch.

b. Slide the top unit back until its front edge is even with the front edge of the lower unit. This should lock the fronts of the two units together. Make sure they are locked by lifting up on the front of the top unit.

c. Tighten the thumb-screws on the bottom rear feet of the top unit into the top rear feet of the bottom unit.

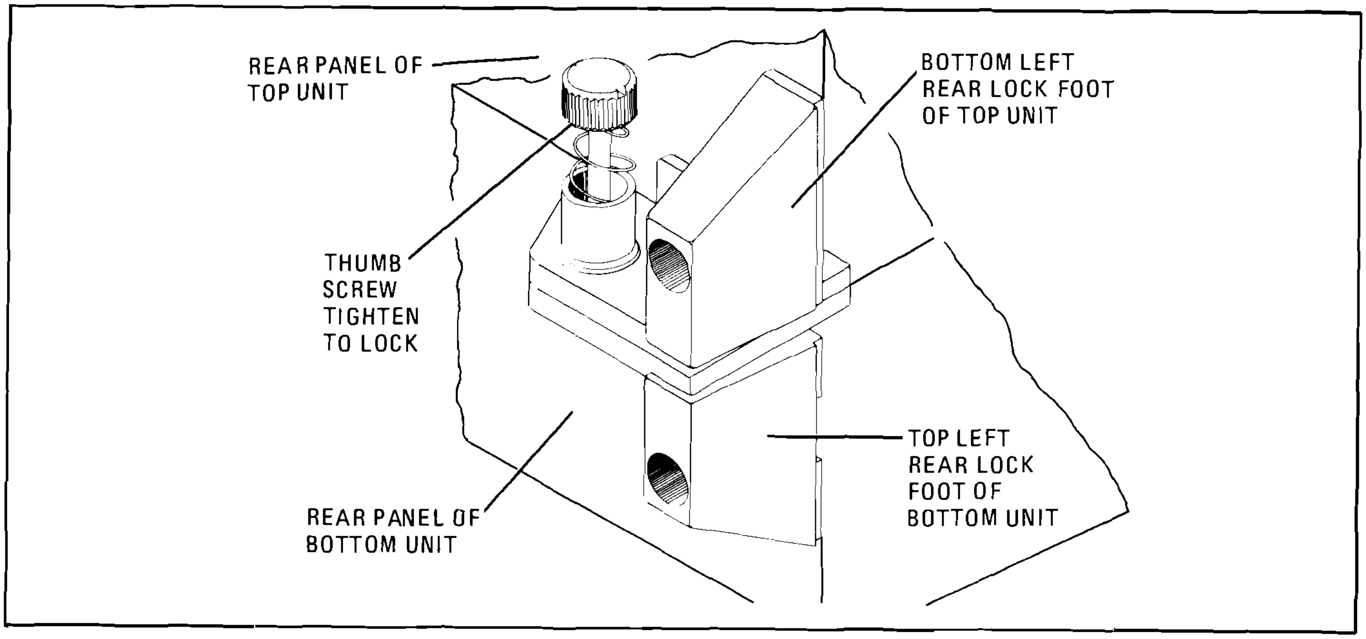


Figure A2-1. Lock Feet, Left Side

A2-9. RACK MOUNTING

A2-10. Two rack-mounting kits are available for the 8505A. One, Option 908, is for 8505A's that do not have or need front handles. The other rack mounting kit, Option 909, includes both the rack-mounting hardware and the front handles. Parts supplied with the two kits are listed in Table A2-1; the manner in which these parts attach to the 8505A is shown in Figure A2-2.

Table A2-1. Rack-Mounting Kits for 8505A

Description	HP Part Number	Quantity
OPTION 908 (HP 5061-0077) Includes:		
Rack Flange	5020-8862	4
Machine Screw, Pan Head, 8-32 x 0.375 inch	2510-0193	12
Option 909 (HP 5061-0083) Includes:		
Handle Assembly	5060-9899	4
Rack Flange	5020-8874	4
Machine Screw, Pan Head, 8-32 x 0.625 inch	2510-0194	12

NOTE

Rack-mounting kits and other options are shipped with the instrument as part of the original order only; they are not supplied separately. If you already have an 8505A and want to add the optional equipment, order the kit, assemblies, attaching hardware or other materials you need by their HP Part Numbers, rather than by option number, from your nearest HP office.

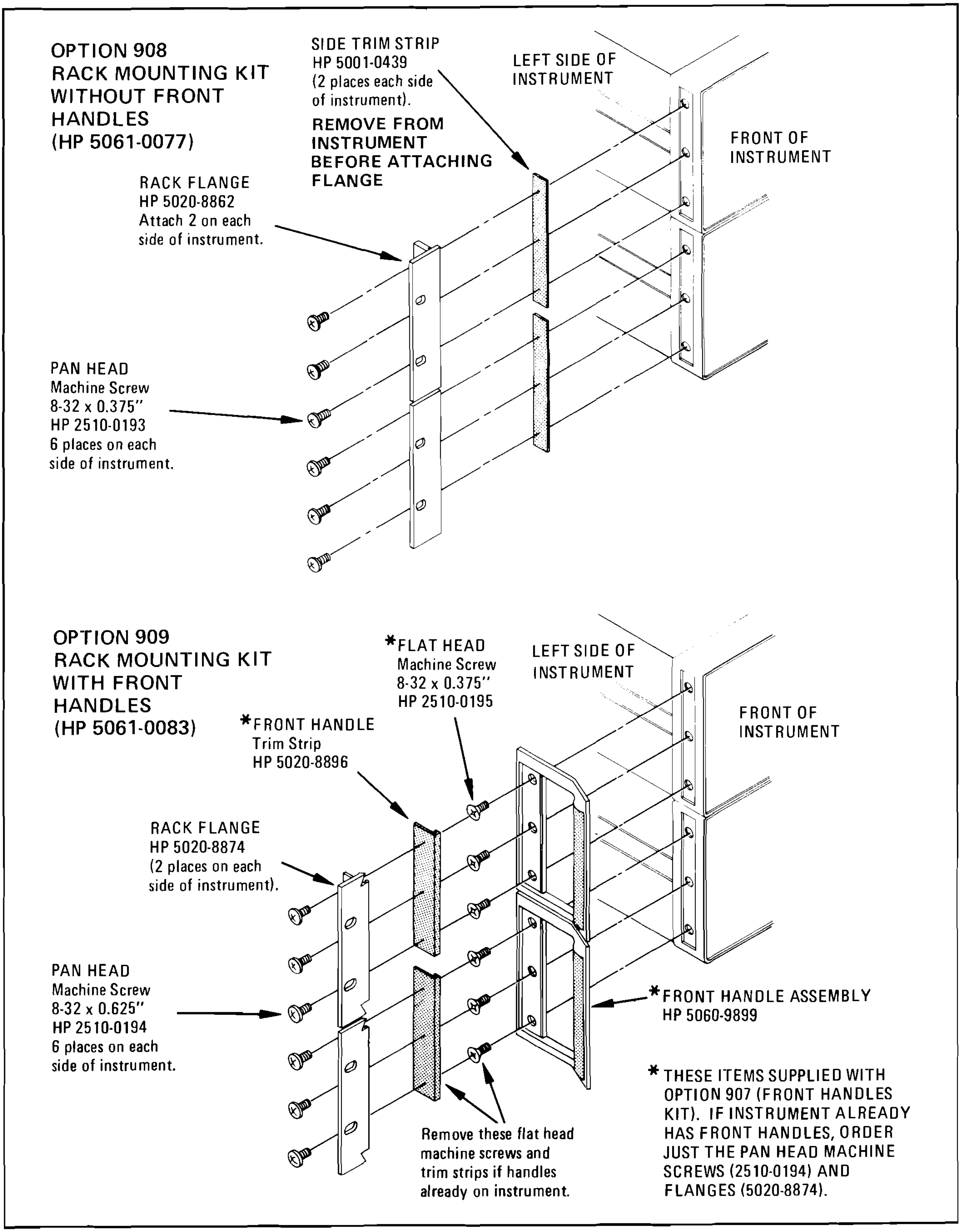


Figure A2-2. Attaching Rack Mounting Hardware and Handles

A2-11. PRE-OPERATION SET UP

A2-12. Power Requirements

A2-13. The Model 8505A requires a power source of 100, 120, 220, or 240 Vac, +5% −10%, 50 to 60 Hz, single-phase. Power Consumption is approximately 275 watts.

A2-14. Line Voltage and Fuse Selection

WARNING

BEFORE THIS INSTRUMENT IS SWITCHED ON, its protective earth terminals must be connected to the protective conductor of the mains power cable (cord). The mains power cable plug shall only be inserted in a socket outlet provided with a protective earth contact. DO NOT negate the earth-grounding protection by using an extension cable, power cable, or autotransformer without a protective ground conductor. Failure to ground the instrument properly can result in serious personal injury or death.

CAUTION

BEFORE SWITCHING ON THIS INSTRUMENT, make sure it is adapted to the voltage of the ac power source. You must set the voltage selector cards correctly in both the top and bottom units of the 8505A to adapt it to the power source. Failure to set the ac power inputs of the instrument for the correct voltage level could cause it to be severly damaged when switched on.

A2-15. Select the line voltage and fuses in both the top and bottom units of the 8505A as follows:

a. Measure the ac line voltage you will be applying to the 8505A.

b. See Figure A2-3. At each of the instrument's two rear-panel power line modules, select the line voltage (100V, 120V, 220V, or 240V) closest to the voltage you measured in step a. Note that the available line voltage must be within +5% or −10% of the line voltage selection as shown below. If it is not, you must use an autotransformer between the ac source and the 8505A.

Line Voltage	Selection
90 to 105 Vac	100V
108 to 126 Vac	120V
198 to 231 Vac	220V
216 to 252 Vac	240V

c. Make sure the fuses in the power module fuse holder are of the correct type and rating. Fuse requirements for the different line voltage selections are indicated next to the power modules.

A2-16. HP-IB Address Selection

A2-17. The talk/listen address pair for the signal processor/display is different than the talk/listen address pair for the frequency control-source/converter. The pre-set factory selected address pair for the signal processor/display is Talk Address P (Octal 120) and Listen Address Ø (Octal 060); the address pair for the frequency control-source/converter is Talk Address S (Octal 123) and Listen Address 3 (Octal 063). Before installing the HP-IB interface assemblies, other talk/listen address pairs shown in Table A2-2 may be selected. (The code selected must of course be compatible with the system.) The addresses are selected with switch S1 on the A3A21 and A2A16 HP-IB Buffer Assemblies. The numbers 1 through 5 on the two buffer assemblies correspond to b_1 through b_5 respectively in Table A2-2. The address is selected by pressing the desired switch to the open position. (See Figure A2-4.) The switches in Figure A2-4 are set to My Listen Address (MLA) in the ASCII character "3" address code (Octal 063) or to My Talk Address (MTA) in the ASCII alpha character " S" (Octal 123).

A2-18. Cable Connections

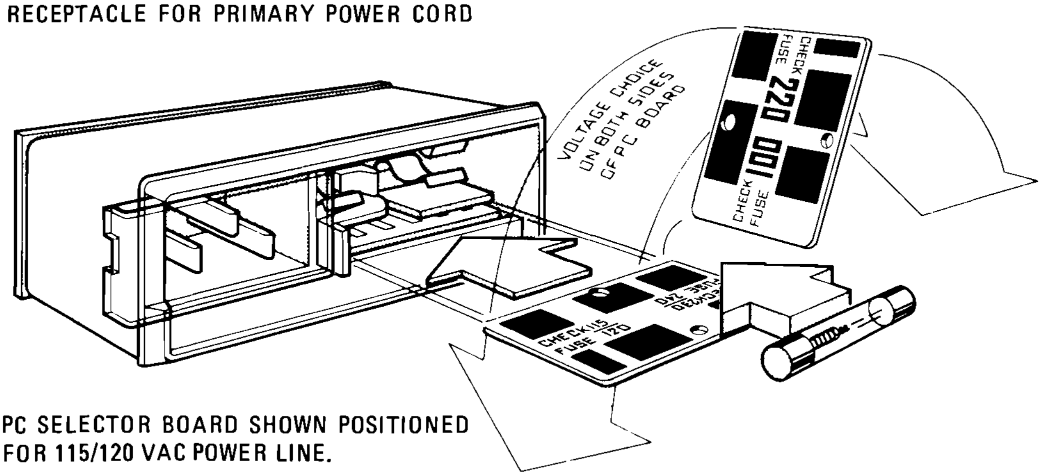
A2-19. All cable connections to the 8505A, except those to the device under test, are made at the rear panels. The rear-panel connectors and their reference designators are shown in Figure A2-5.

A2-20. Power Cable

WARNING

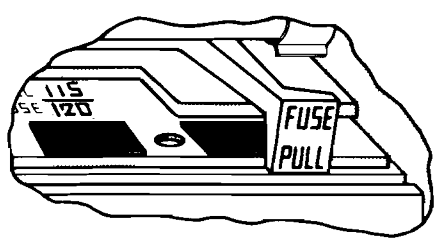
If this instrument is to be energized through an autotransformer, make sure the common terminal of the autotransformer is connected to the protective earth contact of the power source outlet socket. The protective earth terminals of the 8505A must be connected through the protective conductor of the power cable to the power source outlet socket protective earth contact. This protection must not be negated through the use of an extension cord (power cable) without a protective ground conductor. Any interruption of the protective ground, inside or outside the 8505A, can make the 8505A a dangerous electric shock hazard.

RECEPTACLE FOR PRIMARY POWER CORD



PC SELECTOR BOARD SHOWN POSITIONED FOR 115/120 VAC POWER LINE.

OPERATING VOLTAGE APPEARS IN MODULE WINDOW.



SELECTION OF OPERATING VOLTAGE

1. SLIDE OPEN POWER MODULE COVER DOOR AND PUSH FUSE-PULL LEVER TO LEFT TO REMOVE FUSE.
2. PULL OUT VOLTAGE-SELECTOR PC BOARD. POSITION PC BOARD SO THAT VOLTAGE NEAREST ACTUAL LINE VOLTAGE LEVEL WILL APPEAR IN MODULE WINDOW. PUSH BOARD BACK INTO ITS SLOT.
3. PUSH FUSE-PULL LEVER INTO ITS NORMAL RIGHT-HAND POSITION.
4. CHECK FUSE TO MAKE SURE IT IS OF CORRECT RATING AND TYPE FOR INPUT AC LINE VOLTAGE. FUSE RATINGS FOR DIFFERENT LINE VOLTAGES ARE INDICATED BELOW POWER MODULE.
5. INSERT CORRECT FUSE IN FUSEHOLDER.

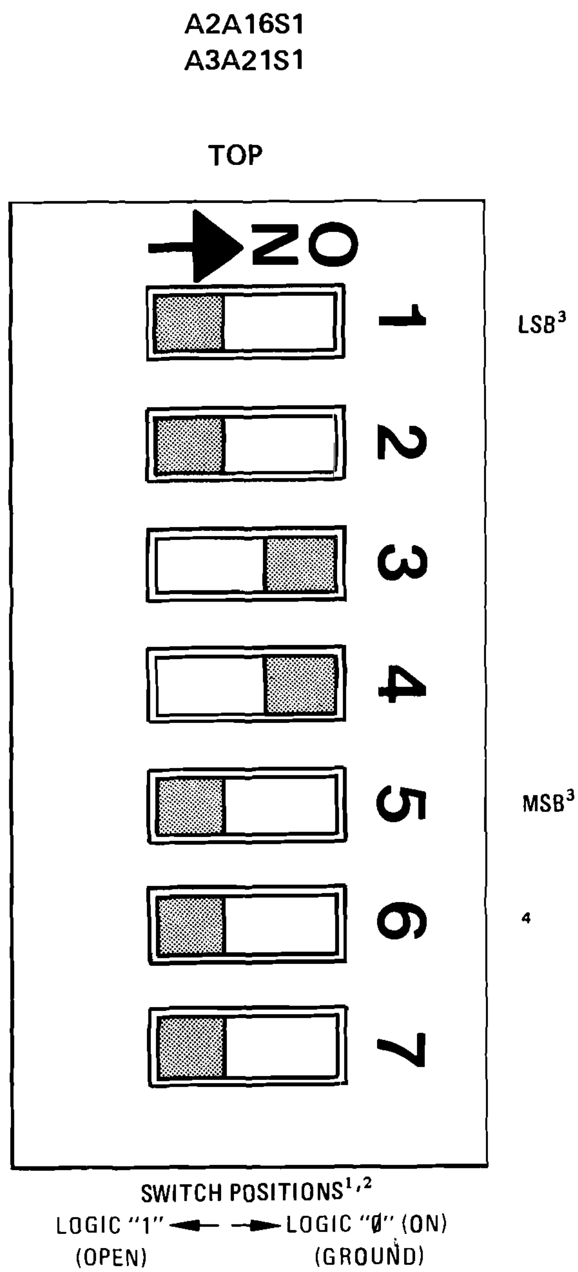
Figure A2-3. Line Voltage Selection with Power Module PC Board

Table A2-2. Talk and Listen Addresses

b_5	b_4	b_3	b_2	b_1	Talk Address Character	Listen Address Character	Decimal Value
0	0	0	0	0	@	SP	00
0	0	0	0	1	A	!	01
0	0	0	1	0	B	"	02
0	0	0	1	1	C	#	03
0	0	1	0	0	D	$	04
0	0	1	0	1	E	%	05
0	0	1	1	0	F	&	06
0	0	1	1	1	G	'	07
0	1	0	0	0	H	(	08
0	1	0	0	1	I	)	09
0	1	0	1	0	J	*	10
0	1	0	1	1	K	+	11
0	1	1	0	0	L	,	12
0	1	1	0	1	M	—	13
0	1	1	1	0	N	.	14
0	1	1	1	1	O	/	15
*1	0	0	0	0	P	Ø	16
1	0	0	0	1	Q	1	17
1	0	0	1	0	R	2	18
**1	0	0	1	1	S	3	19
1	0	1	0	0	T	4	20
1	0	1	0	1	U	5	21
1	0	1	1	0	V	6	22
1	0	1	1	1	W	7	23
1	1	0	0	0	X	8	24
1	1	0	0	1	Y	9	25
1	1	0	1	0	Z	:	26
1	1	0	1	1	[	;	27
1	1	1	0	0	\	<	28
1	1	1	0	1	]	=	29
1	1	1	1	0	⌒	>	30

*Preset Address of Signal Processor.

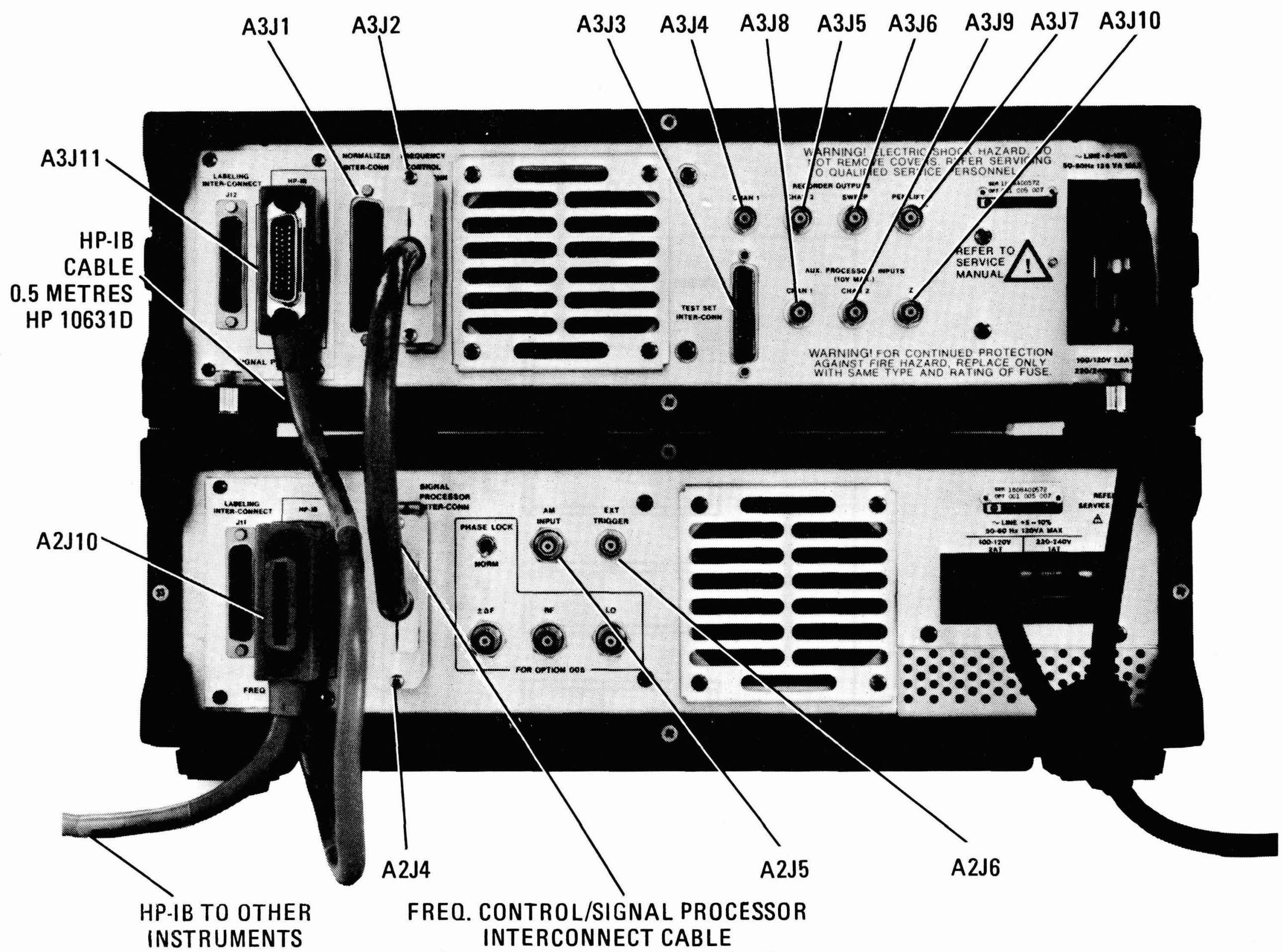
**Preset Address of Frequency Control.



NOTES

1. Darkened side of switch is pushed in.
2. Switch is shown in ASCII code "3" for Listen Address or "S" for Talk Address.
3. LSB - Least Significant Bit; MSB - Most Significant Bit.
4. Positions 6 and 7 are spares and disconnected on board.

Figure A2-4. HP-IB Address Switch



NOTE

ON 8505A NETWORK ANALYZERS HAVING SERIAL NUMBER PREFIXES 1544A AND LOWER, POSITIONS OF FREQUENCY CONTROL INTERCONNECT RECEPTACLE A3J2 AND NORMALIZER INTERCONNECT RECEPTABLE A3J1 ARE REVERSED SO THAT A3J2 IS LOCATED NEXT TO HP-IB CONNECTOR A3J11.

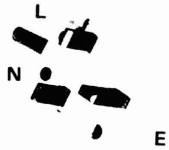
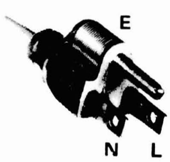
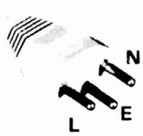
Figure A2-5. 8505A Rear Panel Connectors

A2-21. In compliance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to a properly installed power line outlet, this cable grounds the 8505A chassis. Figure A2-6 shows the different kinds of mains plugs available for the power cable supplied with the 8505A. The number shown under each plug is the HP part number for the 8505A power cable with that particular kind of mains plug.

A2-22. The power cable supplied with the 8505A is selected to be compatible with power line outlet sockets in the country of destination. If the cable you receive does not fit your power line outlet sockets, refer to Figure A2-6 to determine which cable is the correct one. Order the required cable by the HP Part Number shown from the nearest Hewlett Packard office.

A2-23. Frequency Control-Signal Processor Interconnect Cable

A-24. Connect the Frequency Control-Signal Processor cable (HP Part No. 08505-60021) between FREQUENCY CONTROL INTER-CONN receptacle A3J2 and SIGNAL PROCESSOR INTER-CONN receptacle A2J4 as shown in Figure A2-5.

Plug Type	Cable HP Part Number	Plug Description	Cable Length (inches)	Cable Color	For Use In Country
250V 	8120-1351 8120-1703	Straight*BS1363A 90°	90 90	Mint Gray Mint Gray	Great Britain, Cyprus, Nigeria, Rhodesia, Singapore, So. Africa, India
250V 	8120-1369 8120-0696	Straight*NZSS198/ASC112 90°	79 87	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	Straight*CEE7-Y11 90°	79 79	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, United Arab Republic (unpolarized in many nations)
125V 	8120-1348 8120-1398 8120-1754 8120-1378 8120-1521 8120-1676	Straight*NEMA5-15P 90° Straight*NEMA5-15P Straight*NEMA5-15P 90° Straight*NEMA5-15P	80 80 36 80 80 36	Black Black Black Jade Gray Jade Gray Jade Gray	United States, Canada, Japan (100 or 200V), Mexico, Phillippines, Taiwan
250V 	8120-2104	Straight*SEV1011 1959-24507 Type 12	79	Gray	Switzerland
250V 	8120-0698	Straight*NEMA6-15P			
250V 	8120-1860	Straight*CEE22-VI			

* Part number shown for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable including plug.

E = Earth Ground; L = Line; N = Neutral

Figure A2-6. AC Power Plug Connectors and Power Cable Part Numbers

A2-25. Hewlett-Packard Interface Bus Cables

CAUTION

Do not mate HP-IB silver and black fasteners to each other. This device is equipped with metric thread fasteners (colored black). To avoid damaging the threads, mate only with other metric threaded devices. English threaded fasteners are colored silver.

A2-26. When the 8505A is used in automatic mode, and is being controlled through the Hewlett-Packard Interface Bus (HP-IB), the HP-IB interconnect cables are connected as follows. The 0.5 metre cable (HP 10631D) is connected between A2J10 on Frequency Control and A3J11 on Signal Processor. Another HP-IB cable is connected in "piggy-back" fashion to one of the connectors and the other end connected to the desk-top-computer, test set, or other instrument in the system. Signal lines in the HP-IB cables are identified in Figure A2-7.

A2-27. As many as 15 instruments can be connected in parallel on the Hewlett-Packard Interface bus. To achieve design performance on the bus, proper voltage levels and timing relationships must be maintained. If the system cable is too long or if the accumulated cable length between instruments is too long, the data and control lines cannot be driven properly and the system may fail to perform. Therefore, the following restrictions must be observed:

a. With two instruments in a system, the cable length must not exceed three meters (9 feet).

b. When more than two instruments are connected on the bus, the cable length to each instrument cannot exceed two meters (six feet) per unit.

c. The total cable length between all units cannot exceed 20 meters (65 feet).

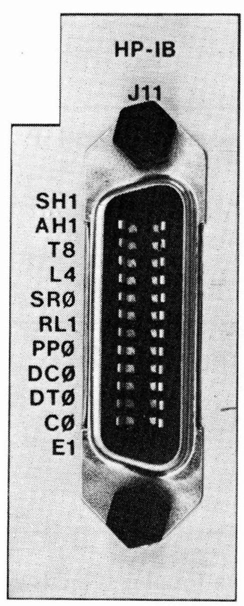
A2-28. Normalizer Interconnect Cable

A2-29. When an 8501A Normalizer is used with the 8505A Network Analyzer, the Normalizer Interconnect Cable connects to NORMALIZER INTER-CONN receptacle A3J1. Signal lines in the Normalizer Interconnect Cable are identified in Figure A2-8.

A2-30. Test Set Interconnect Cable

A2-31. When an 8503A or B S-Parameter Test Set is used with the 8505A, the Test Set Interconnect

Note	Signal	Pin	Pin	Signal	Note
	SIGNAL GROUND	24	12	SHIELD	Connected to earth ground by System Controller
Should be grounded near termination of other wire of twisted pair	P/O Twisted Pair with 11	23	11	ATN	
	P/O Twisted Pair with 10	22	10	SRQ	
	P/O Twisted Pair with 9	21	9	IFC	
	P/O Twisted Pair with 8	20	8	NDAC	
	P/O Twisted Pair with 7	19	7	NRFD	
	P/O Twisted Pair with 6	18	6	DAV	
	REN	17	5	EOI	
	DIO8	16	4	DIO4	
	DIO7	15	3	DIO3	
	DIO6	14	2	DIO2	
	DIO5	13	1	DIO1	



HP-IB Logic Levels:
True (low) State <0.8 Vdc; False (high) State >+2.4 Vdc.

Figure A2-7. HP-IB Connectors, A2J10 and A3J11, Signals and Pin Configuration

Cable connects to TEST SET INTER-CONN receptacle A3J3. Signal lines in the Test Set Interconnect Cable are identified in Figure A2-9.

A2-32. Recorder Output Connections

A2-33. BNC connector receptacles A3J4 through A3J7 furnish channel 1, channel 2, X-axis sweep, and pen-lift outputs which can be applied to an X-Y recorder. See Table A1-2, Auxiliary outputs, for output signal characteristics. See Table A2-3 for outputs with various combination of front-panel control settings.

A2-34. Display Input Connections

A2-35. BNC connector receptacles A3J8 through A3J10 can be used to apply signals from external sources to the Signal Processor CRT display.

A2-36. AM Input Connection

A2-37. BNC connector receptacle A2J5 (AM INPUT) enables an external signal to be applied to the Source/Converter ALC control circuit to amplitude-modulate the RF signal.

A2-38. External Trigger Input Connection

A2-39. BNC connector A2J6 (EXT TRIGGER) enables the Frequency Control sweep to be triggered from an external source when the Frequency Control assembly's front-panel TRIGGER switch is set to EXT.

A2-40. PREPARATION FOR RESHIPMENT

A2-41. Original Packaging

A2-42. If you must reship the 8505A and you have not retained the original packing materials, the same kinds of containers and materials used for the original shipment can be obtained through the nearest Hewlett-Packard Sales or Service office. See Figure A2-10.

A2-43. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the service required, return address, instrument model number (i.e., 8505A), and the instrument's full serial number. Mark the container or containers FRAGILE to ensure careful handling.

A3-44. In any correspondence, refer to the instrument by model number and its full serial number.

A2-45. Other Packaging Materials

A2-46. The following general instructions should be followed when repackaging with commercially available materials:

a. Wrap the instrument in heavy paper or plastic. If you are shipping the instrument to a Hewlett-Packard Service office or center, attach a tag indicating the kind of service required, return address, model number, and full serial number.

b. Place the wrapped instrument in a strong shipping container. A double-wall carton made of 350-pound test material is adequate.

c. Place enough shock-absorbing material (a three-inch to four-inch layer) around all sides of the instrument to provide a firm cushion and prevent any movement of the instrument inside the container.

d. Seal the shipping container or containers carefully and mark it or them FRAGILE to ensure careful handling.

A2-47. INCOMING INSPECTION TEST

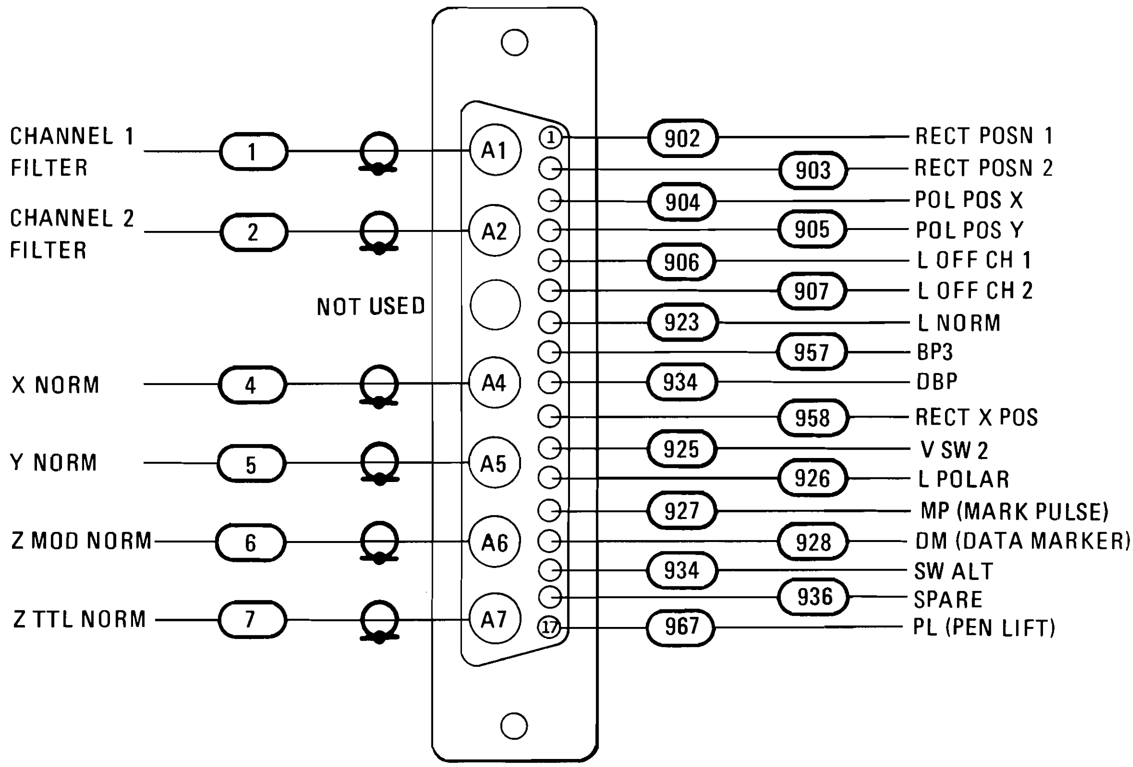
A2-48. These procedures test the salient specifications of the instrument and should be used for incoming inspection. They functionally test all major operating modes, and test the major specifications of the instrument. If certification is required, use the more lengthy procedure in Section IV, which tests all of the detailed specifications of the instrument.

A2-49. EQUIPMENT REQUIRED

A2-50. The equipment required to perform the incoming inspection is listed in Table A2-4 and shown in Figure A2-11. If substitution is necessary for any of the equipment, the alternate models must meet or exceed the critical specifications.

(Text continued on page A2-19)

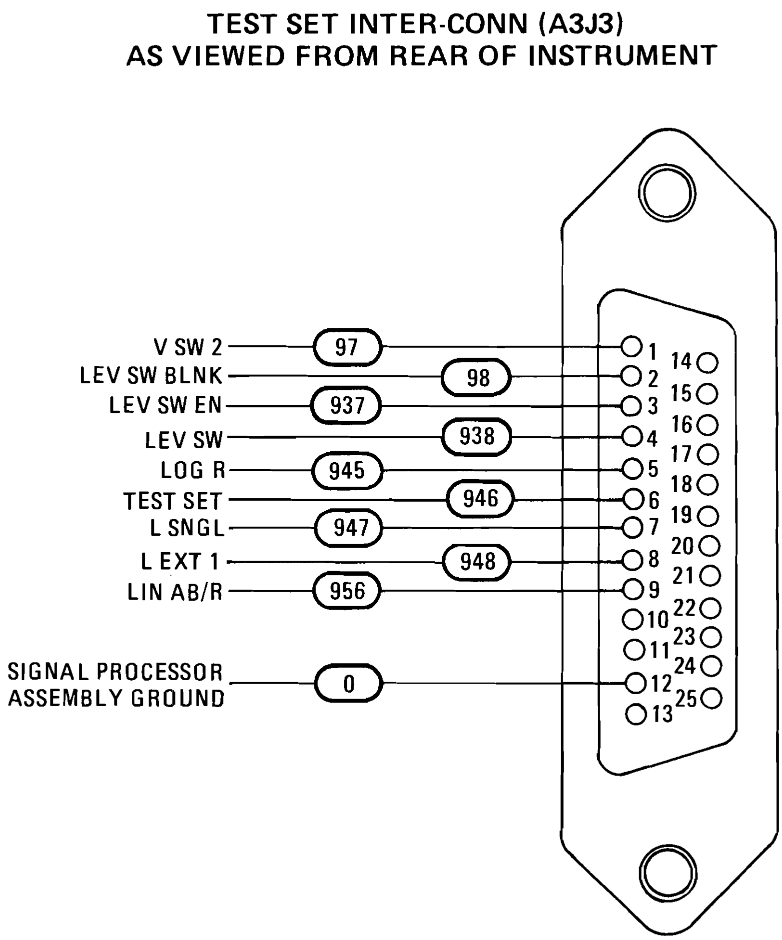
NORMALIZER INTERCONNECT RECEPTACLE A3J1
AS VIEWED FROM REAR OF INSTRUMENT



MNEMONICS TABLE

Pin	Mnemonic	Description
1	RECT POSN 1	Rectangular position, Channel 1
2	RECT POSN 2	Rectangular position, Channel 2
3	POL POS X	Display Polar Offset, X axis
4	POL POS Y	Display Polar Offset, Y axis
5	L OFF CH 1	Channel 1 on/off to Normalizer. Low = off
6	L OFF CH 2	Channel 2 on/off to Normalizer. Low = off
7	L NORM	Normalizer inputs enable. Low = inputs enable
8	BP3	Blanking Pulse 3
9	DBP	Display Blanking Pulse. High = blank
10	RECT X POS	Rectangular X Position
11	V SW 2	Sweep voltage to +13 Vdc to Signal Processor
12	L POLAR	Low polar alternate. Low = polar display
13	MARK PULSE	Marker pulse to Normalizer. High = display marker
14	DATA MARKER	Data marker. High = display marker and measure
15	SW ALT	Sweep alternate, Signal Processor to Normalizer High = Channel 1, Low = Channel 2
16	SPARE	
17	PL	Pen lift

Figure A2-8. Normalizer — 8505A Interconnecting Signal Lines and Receptacle Terminals



MNEMONICS TABLE

Pin	Mnemonic	Description
1	V SW 2	Sweep voltage independent of frequency or mode
2	LEV SW BLNK	Level sweep blanking
3	LEV SW EN	Level sweep enable
4	LEV SW	Level sweep
5	LOG R	Log magnitude of input R
6	TEST SET	Test Set (8503A) control line
7	L SNGL	Low Single sweep (Return to LOCAL)
8	L EXT 1	External signal control line
9	LIN AB/R	Linear ratio output of A or B over R

Figure A2-9. 8503A S-Parameter Test Set — 8505A Interconnecting Signal Lines and Receptacle Terminals

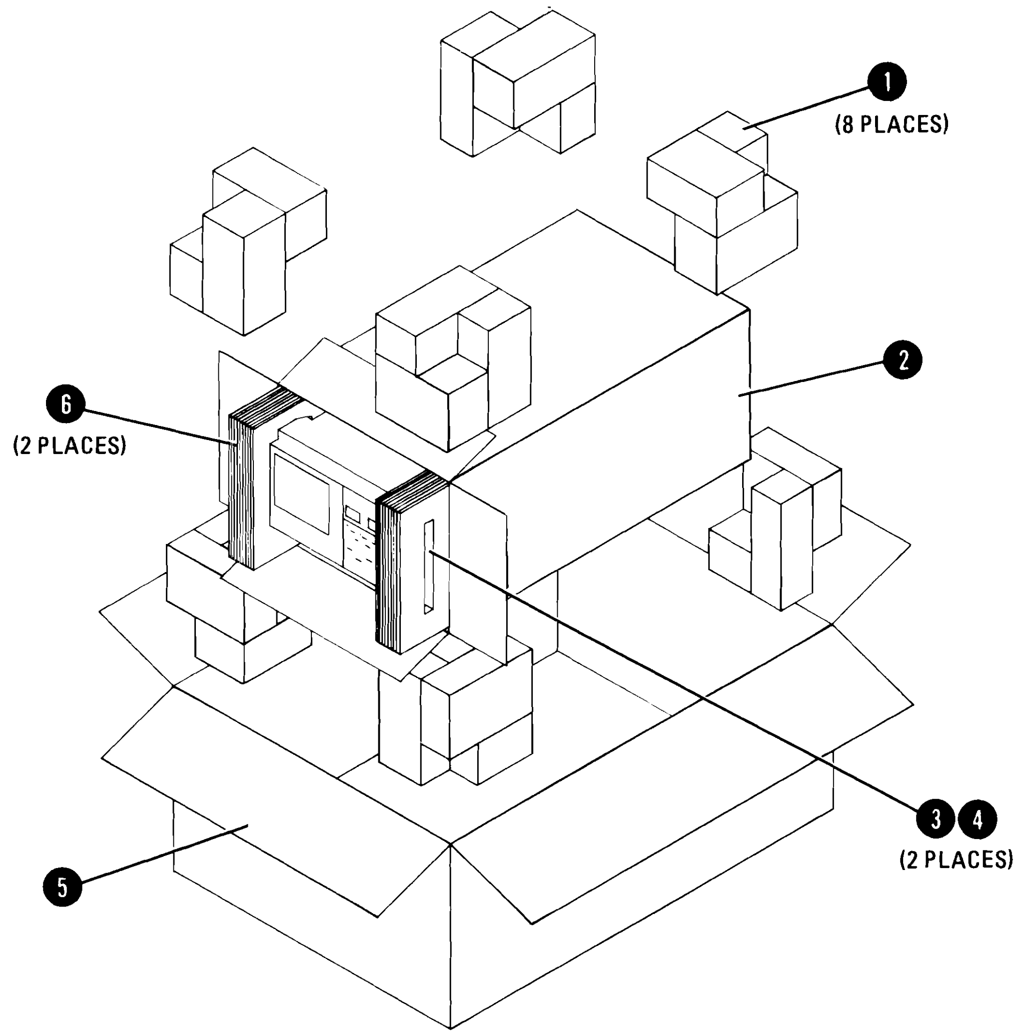
Table A2-3. Rear Panel Recorder Outputs with Combinations of Front-Panel Settings

Channel 1 MODE	OFF		MAG A or MAG A/R		MAG B or MAG B/R		MAG R		PHASE A/R or DELAY A/R		PHASE B/R or DELAY B/R		POLAR A/R or POLAR B/R	
Channel 2 MODE	**OFF**													
Consecutive Sweep Number*	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Rear Panel CH1	Ø	Ø	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1	Y1P	Y1P
RECORDER CH2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	X1P	X1P
OUTPUTS SWR	X	X	X	X	X	X	X	X	X	X	X	X	X1P	X1P
Channel 2 MODE	**MAG A or MAG A/R**													
Rear Panel CH1	Ø	Ø	Y1	Y1	Y1	Ø	Y1	Y1	Y1	Y1	Y1	Ø	Y1P	Ø
RECORDER CH2	Y2	Y2	Y2	Y2	Ø	Y1	Y2	Y2	Y2	Y2	Ø	Y2	X1P	Y2
OUTPUTS SWP	X	X	X	X	X	X	X	X	X	X	X	X	X1P	X
Channel 2 MODE	**MAG B or MAG B/R**													
Rear Panel CH1	Ø	Ø	Y1	Ø	Y1	Y1	Y1	Y1	Y1	Ø	Y1	Y1	Y1P	Ø
RECORDER CH2	Y2	Y2	Ø	Y2	Y2	Y2	Ø	Y2	Ø	Y2	Y2	Y2	X1P	Y2
OUTPUTS SWP	X	X	X	X	X	X	X	X	X	X	X	X	X1P	X
Channel 2 MODE	**MAG R**													
Rear Panel CH1	Ø	Ø	Y1	Y1	Y1	Ø	Y1	Y1	Y1	Y1	Y1	Ø	Y1P	Ø
RECORDER CH2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	Y2	X1P	Y2
OUTPUTS SWP	X	X	X	X	X	X	X	X	X	X	X	X	X1P	X
Channel 2 MODE	**PHASE A/R or DELAY A/R**													
Rear Panel CH1	Ø	Ø	Y1	Y1	Y1	Ø	Y1	Y1	Y1	Y1	Y1	Ø	Y1P	Ø
RECORDER CH2	Y2	Y2	Y2	Y2	Ø	Y2	Y2	Y2	Y2	Y2	Ø	Y2	X1P	Y2
OUTPUTS SWP	X	X	X	X	X	X	X	X	X	X	X	X	X1P	X
Channel 2 MODE	**PHASE B/R or DELAY B/R**													
Rear Panel CH1	Ø	Ø	Y1	Ø	Y1	Y1	Y1	Y1	Y1	Ø	Y1	Y1	Y1P	Ø
RECORDER CH2	Y2	Y2	Ø	Y2	Y2	Y2	Ø	Y2	Ø	Y2	Y2	Y2	X1P	Y2
OUTPUTS SWR	X	X	X	X	X	X	X	X	X	X	X	X	X1P	X
Channel 2 MODE	**POLAR A/R or POLAR B/R**													
Rear Panel CH1	Y2P	Y2P	Y1	Y2P	Y1	Y2P	Y1	Y2P	Y1	Y2P	Y1	Y2P	Y1P	Y2P
RECORDER CH2	X2P	X2P	Ø	X2P	Ø	X2P	Ø	X2P	Ø	X2P	Ø	X2P	X1P	X2P
OUTPUTS SWR	X2P	X2P	X	X2P	X	X2P	X	X2P	X	X2P	X	X2P	X1P	X2P

*Recorder outputs are multiplexed between channel 1 and channel 2 for certain combinations of mode and input settings. This causes the outputs to change on alternate sweeps from channel 1 to channel 2. If the entries in the table for 1 and 2 are the same, the outputs are the same for each sweep. However, if the entries are different for 1 and 2, the outputs are different for alternate sweeps.

Abbreviations:

X = Rectangular X, both channels
X1P = Polar X, channel 1
X2P = Polar X, channel 2
Y1 = Rectangular Y, channel 1
Y2 = Rectangular Y, channel 2
Y1P = Polar Y, channel 1
Y2P = Polar Y, channel 2
Ø = Invalid Output



Item	Qty	HP Part No.	Description
1	16	9220-2732	FOAM PADS–TOP, CORNER; BOTTOM CORNER
2	2	9211-2729	CARTON–INNER
3	4	5021-1722	BARS–SHIPPING, ALUMINUM
4	8	2510-0061	SCREW–FOR ATTACHING SHIPPING BARS
5	2	9211-2730	CARTON–OUTER
6	4	9220-2775	SIDE PADS, CORRUGATED CARDBOARD

NOTE: Quantities given are for two containers.

Figure A2-10. Packaging for Shipment Using Factory Packaging Materials

Table A2-4. List of Equipment Required for Incoming Inspection Test

Instrument	Critical Specifications	Recommended Model
Electronic Counter	Frequency Range: to 10 MHz Accuracy: ±1 count Sensitivity: –5 dBm	HP 5340A
Power Meter and Sensor	Power Range: +10 to –20 dBm Frequency Range: 0.5 to 1300 MHz Accuracy: ±0.5 dB at 1300 MHz	HP 435A/8482A
0 – 110 dB Step Attenuator	Attenuation: 0 to 110 dB in 10 dB increments Frequency: Calibrated at 30 MHz SWR: < 1.5 Connectors: Type N Male	HP 8496A
3-Way Power Splitter	Impedance: 50 Ohms Frequency Range: 0.5 to 1300 MHz Connectors: Type N Female Frequency Response: Input to output ≤±0.2 dB	HP 11850A
Matched Coaxial Cables (Set of 3)	50-ohm double-shielded coaxial cables 61 cm (24 inches) long, phase matched to 4° at 1300 MHz Connectors: Type N Male	HP 11851A
50-Ohm Termination (3 Required)	Frequency Range: 0.5 – 1300 MHz Impedance: 50 Ohms Connectors: Type N Male SWR: < 1.4	HP 909A Option 012
Type-N to BNC Adapter (2 required)		HP 1250-0780
15.24 plus Meters (50 plus feet) of Coaxial Cable	50-ohm type RG 223/U coaxial cable with BNC male connectors on both ends	
10 dB Attenuator	Attenuation: 10 dB ±0.5 dB SWR: < 1.3	HP 8491B Option 010

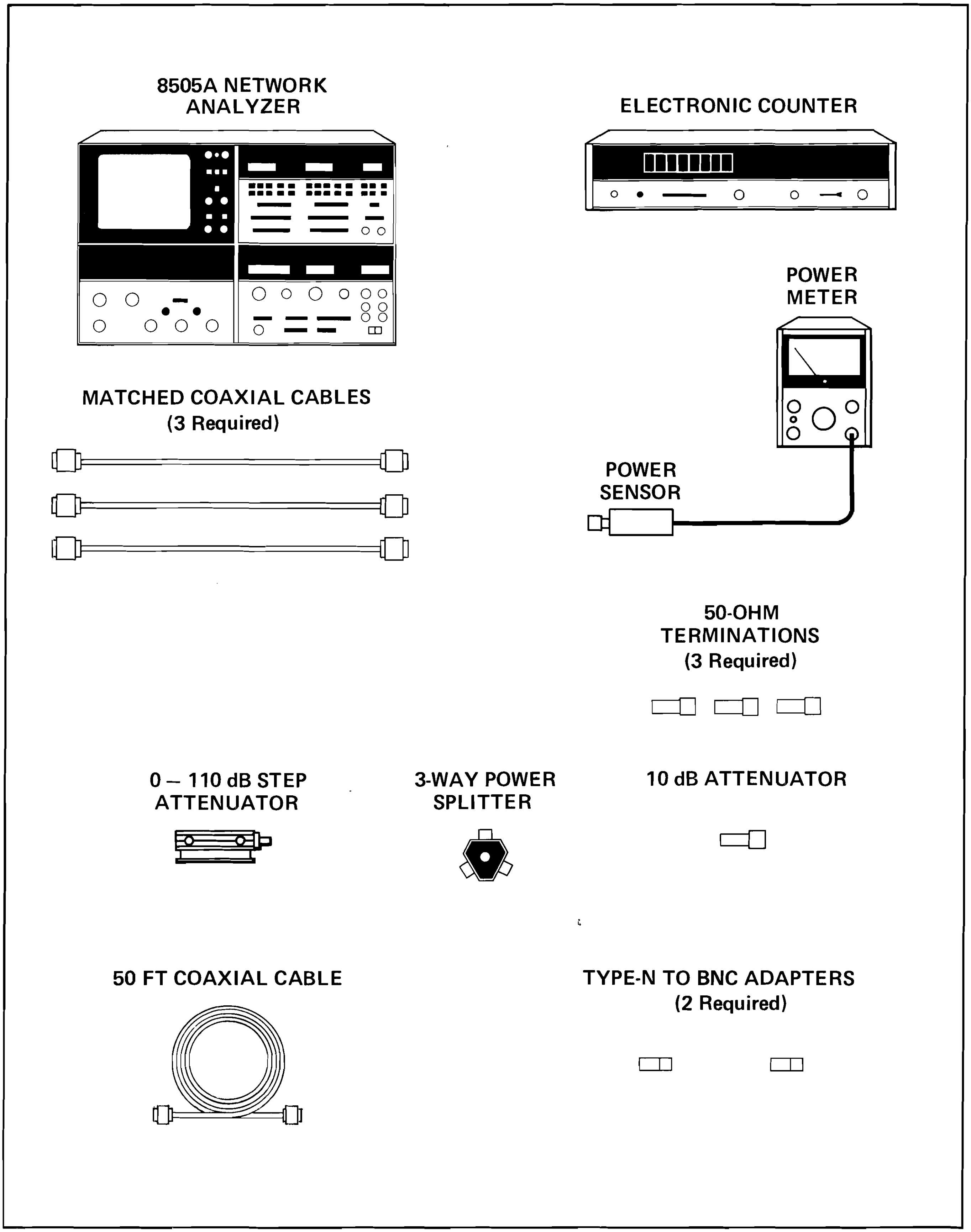


Figure A2-11. Equipment Required for Incoming Inspection Test

A2-51. FREQUENCY RANGE AND ACCURACY TEST

NOTE

Allow one hour warm-up time before making the incoming inspection.

SPECIFICATIONS:

CW Mode Accuracy ± 2 counts of LSD ± time-base accuracy*
Swept Frequency Accuracy: ±1% of range for linear sweep
Counter Accuracy: ±2 counts ± time-base accuracy*

*Time-base Accuracy = 5 ppm ±1 ppm/°C ±3 ppm/90 days.

DESCRIPTION:

The 8505A built-in frequency counter calibration is checked against a known good electronic counter by monitoring the CW RF signal. In CW ±ΔF mode, the FREQUENCY READOUT is compared to the counter readout. If necessary, the CW RF signal is adjusted to match the FREQUENCY readout. This calibrates the digital FREQUENCY readout to the actual RF OUTPUT signal being read on the built-in counter. The START/STOP sweep signal frequency is measured using an external counter to monitor the frequencies with both START and STOP frequencies the same.

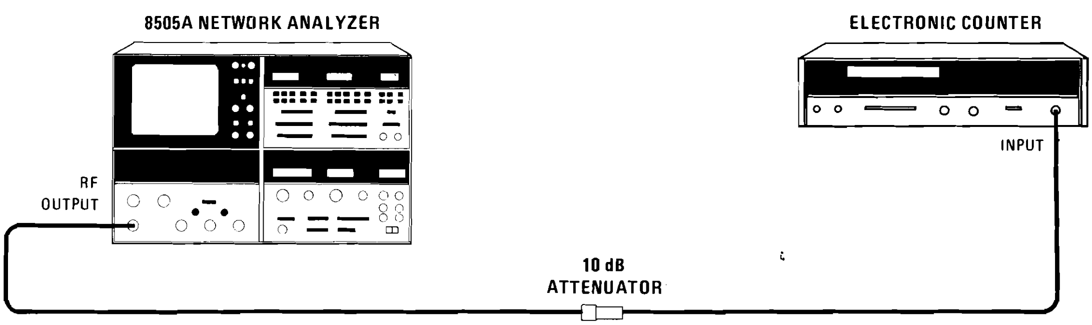


Figure A2-12. Frequency Accuracy Test Setup

EQUIPMENT:

Electronic Counter .... HP 5340A
10 dB Attenuator .... HP 8491B Option 010

A2-51. FREQUENCY RANGE AND ACCURACY TEST (Cont'd)

PROCEDURE:

COUNTER ACCURACY

a. Set 8505A Controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL VERNIER	0

On A2 Frequency Control:

RANGE MHz	.5 — 1300
MODE	LIN EXPAND
WIDTH	CW
SCAN TIME SEC	10 — 1
VERNIER SCAN TIME	Clockwise
TRIGGER	AUTO
MARKERS	1
Marker 1	Mid position

b. Connect equipment as shown in Figure A2-12 and set external counter resolution to 100 Hz.

c. Set CW FREQUENCY control and VERNIER control for 10.000 MHz indication on external Electronic Counter. The 8505A CW FREQUENCY digital display should indicate 0010.00 MHz ±0.02 MHz. (If the indication is not within tolerance, the built-in counter is malfunctioning; go to troubleshooting in Chapter C.)

FREQUENCY CALIBRATION

d. Set A2 Frequency Control WIDTH switch to CW ±ΔF.

e. Set CW FREQUENCY to 10 MHz and set CW FREQUENCY VERNIER to 0.

f. Set ±ΔF FREQUENCY to 000.0, and set ±ΔF FREQUENCY VERNIER to 0.

g. Remove the front-panel window of A2 Frequency Control (Figure A2-13).

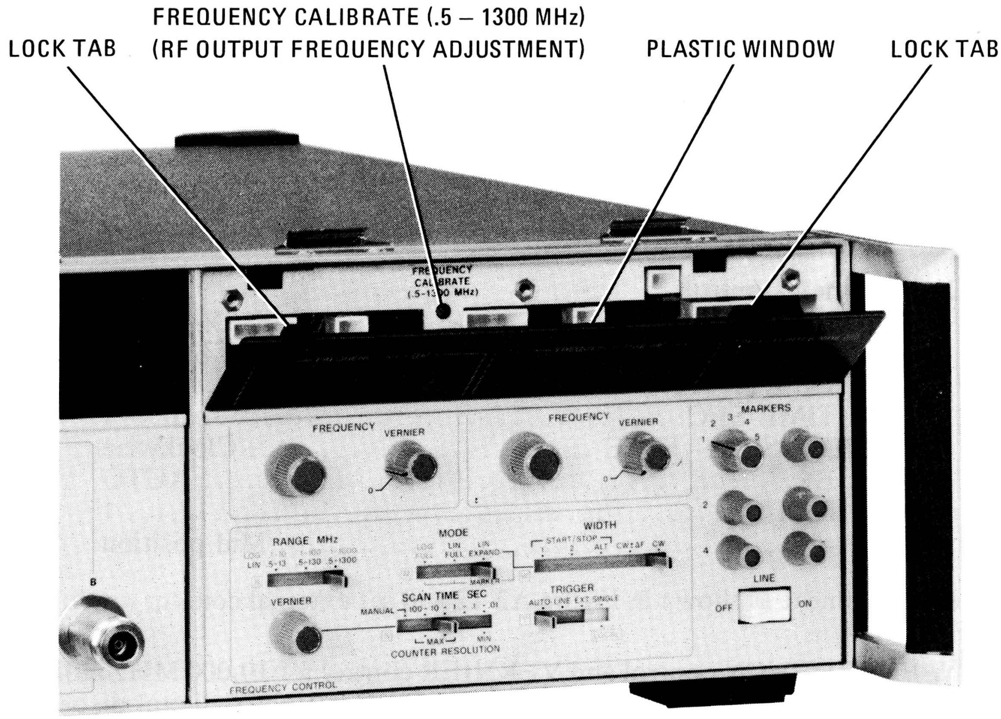
h. Adjust FREQUENCY CALIBRATE (.5 — 1300 MHz) screwdriver adjustment in the middle of exposed subpanel so the FREQ COUNTER MHz reads 10.00 MHz plus or minus 2 counts of least significant digit (LSD).

i. Reinstall the window.

SWEPT FREQUENCY ACCURACY

j. At A2 Frequency Control, set RANGE MHz switch to .5 — 1300, MODE switch to LIN EXPAND, WIDTH switch to START/STOP 1, and SCAN TIME SEC switch to .1 — .01. Set RANGE MHz switch and START and STOP frequency as listed in Table A2-5 below and read the frequency on the internal counter.

A2-51. FREQUENCY RANGE AND ACCURACY TEST (Cont'd)



1. MOVE LOCK TABS TO LEFT ABOUT 1/2 INCH UNTIL THEY UNLATCH WINDOW.
2. REMOVE WINDOW BY PULLING OUT ON LOCK TAB.

Figure A2-13. Frequency Control Front-Panel Window Removal

Table A2-5. Frequency Accuracy Table

RANGE MHz Switch Set At A2 Frequency Control	START and STOP FREQUENCY Digital Readout Set At A2 Frequency Control	Frequency Indicated On Internal Freq Counter
.5 – 1300	1300. MHz	1300 MHz ± 13 MHz
.5 – 130	130.0 MHz	130.0 MHz ± 1.3 MHz
.5 – 13	13.00 MHz	13.00 MHz ± 0.13 MHz
.5 – 1300	0100. MHz	0100. MHz ± 13 MHz
.5 – 130	010.0 MHz	010.0 MHz ± 1.3 MHz
.5 – 13	01.00 MHz	01.00 MHz ± 0.13 MHz

A-52. POWER OUTPUT LEVELING TEST AND ABSOLUTE POWER CALIBRATION

SPECIFICATION:

Power Output Range: +10 dBm to −72 dBm
Attenuator Accuracy: ±1.5 dB over the 70 dB range
Output Leveling: ±0.5 dB from 0.5 to 1300 MHz
Output Level Vernier Accuracy: ±1 dB

DESCRIPTION:

The power output is measured directly with a power meter.

The power output is monitored on a power meter while the frequency band is tuned with CW FREQUENCY control. The highest and lowest power spots are noted and the total difference must be less than the specification.

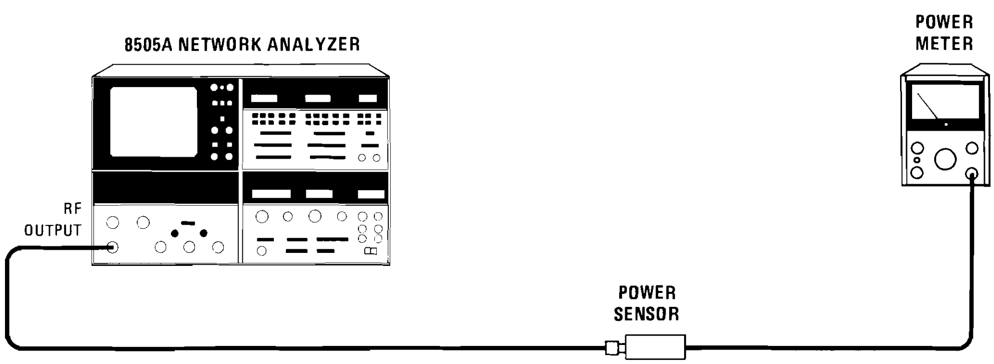


Figure A2-14. Power Output Range Test Setup

EQUIPMENT:

Power Meter .... HP 435A
Power Sensor .... HP 8482A

PROCEDURE:

POWER OUTPUT RANGE

a. Set 8505A controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm .... +10
OUTPUT LEVEL Vernier 0

On A2 Frequency Control:
RANGE MHz.............................. .5 — 1300
MODE.................................... LIN EXPAND
WIDTH .... CW
SCAN TIME SEC .... 1 — .1
CW FREQUENCY MHz........................ 30.0 MHz

A2-52. POWER OUTPUT LEVELING TEST AND ABSOLUTE POWER CALIBRATION (Cont'd)

b. Connect equipment as shown in Figure A2-14 and set Power Meter range to +15 dBm.

c. Measure power output at the OUTPUT LEVEL dBm settings of +10 dBm to −20 dBm. All readings should be within ±1.5 dB ± tolerance of power meter. (The HP 435A/8482A power meter has an uncertainty of ±0.4 dB.)

OUTPUT LEVEL VERNIER

d. Set power meter to +15 dBm range. Set OUTPUT LEVEL dBm switch to +10 dBm.

e. Turn the OUTPUT LEVEL dBm VERNIER from 0 to −12 dB position and the power meter indication should change by −12 dB ±1 dB ± tolerance of power meter used. (If slightly out of tolerance, go to Paragraph A5-14 for adjustment.)

POWER LEVELING

f. While watching the power meter, turn the CW FREQUENCY control through the entire band. The total variation between the highest power and the lowest power indication across the band should be ≤1 dB (or ±0.5 dB).

A2-53. CROSSTALK ISOLATION AND RECEIVER NOISE FLOOR

SPECIFICATION:

Crosstalk Error Limits: >100 dB isolation between inputs.

Noise floor in 10 kHz Bandwidth: —95 dBm (0.5 to 2 MHz)
—100 dBm (2 to 10 MHz)
—110 dBm (10 to 1300 MHz)

DESCRIPTION:

The noise floor is measured by offsetting the reference line —95 dB (0.5 to 2 MHz), —100dB (2 to 10 MHz), and —110 dB (10 to 1300 MHz).

In the Crosstalk Isolation test, a signal of —10 dBm is applied to the "R" Channel input. The "A" and "B" Channels are terminated and the signal is displayed on the CRT. The displayed signal of Channel "A" should be 100 dB below the —10 dBm level of the "R" port showing isolation between ports. The other ports are checked in the same manner.

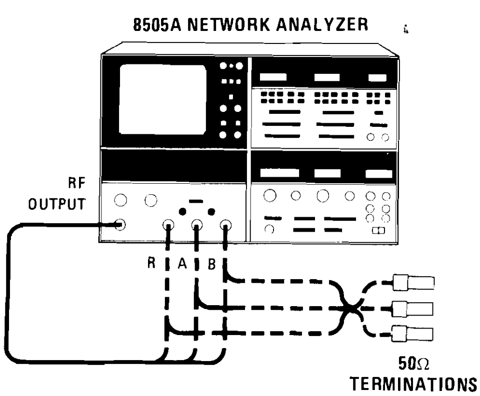


Figure A2-15. Crosstalk Isolation and Noise Floor Test Setup

EQUIPMENT:

50 Ohm Termination (3 required) . . . . HP 909A Option 012

A2-53. CROSSTALK ISOLATION AND RECEIVER NOISE FLOOR (Cont'd)

PROCEDURE:

a. Connect equipment as shown in Figure A4-15 with the three terminations on A, B, and R ports.

b. Set 8505A Controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm .... —60 dBm
OUTPUT LEVEL VERNIER .... 0 dB
INPUT LEVEL dBm MAX .... —30 dBm

On A2 Frequency Control:
RANGE MHz .... 0.5 — 13
MODE .... LIN EXPAND
WIDTH .... START/STOP 1
START FREQUENCY .... 00.50 MHz
STOP FREQUENCY...................... 02.00 MHz
MARKERS 1
Marker 1 .... Center of CRT
SCAN TIME SEC .... 10 — 1
SCAN TIME Vernier .... Fully Clockwise
TRIGGER .... AUTO

On A3 Signal Processor:
Channel 1
INPUT... R
MODE...................................... MAG
SCALE/DIV .... 10 dB/DIV

Channel 2
MODE.. OFF

CRT Display
BANDWIDTH kHz .... 10 kHz
VIDEO FILTER .... ON (in)

NOISE FLOOR FROM 0.5 to 2 MHz

c. Connect 50-Ohm terminations to "R", "A", and "B" ports. On Signal Processor Display, press REF LINE POSN, then adjust CH1 control to place the CRT reference trace on the center graticule line. Press REF LINE POSN again for normal operation.

d. At Channel 1, press DISPLAY REF, then CLR pushbutton until REL light goes out (if it was lit). Set INPUT switch to A, repeat above procedure, then set INPUT switch to B and repeat above procedure. Return Channel 1 INPUT switch to R position.

e. At Channel 1, press REF OFFSET pushbuttons to obtain —95 dB offset. The CRT trace should be below the center graticule line. This shows the noise floor below —95 dBm.

f. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line.

g. Set Channel 1 INPUT switch to "B". The CRT trace should be below the center graticule line.

A2-53. CROSSTALK ISOLATION AND RECEIVER NOISE FLOOR (Cont'd)

NOISE FLOOR FROM 2 TO 10 MHz

h. Set START frequency to 02.00 MHz and STOP frequency to 10.00 MHz. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain —100 dB offset. The CRT trace should be below the center graticule line. This shows the noise floor below —100 dBm.

i. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line.

j. Set Channel 1 INPUT switch to "R". The CRT trace should be below the center graticule line.

NOISE FLOOR FROM 10 TO 1300 MHz

k. Set RANGE MHz switch to .5 — 1300 MHz. Set START frequency to 0010 MHz and STOP frequency to 1300 MHz. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain —110 dB offset. The CRT trace should be below the center graticule line. This shows the noise floor below —110 dBm.

l. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line.

m. Set Channel 1 INPUT switch to "B". The CRT trace should be below the center graticule line.

CROSSTALK ISOLATION

n. On A1 Source/Converter, set INPUT LEVEL dBm MAX to −10 dBm.

o. Connect equipment as shown in Figure A2-15, with RF OUTPUT cable connected to "R" input and the two 50-Ohm terminations to "A" and "B" input ports. Set OUTPUT LEVEL dBm switch to —10 dBm.

p. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain —110 dB of offset. Set INPUT switch to "A". The CRT trace should be below the center graticule line for 100 dB of isolation.

q. At Channel 1, set INPUT switch to "B" and the CRT trace should be below the center graticule line.

r. Move the RF OUTPUT cable to "A" input port and connect the two 50-Ohm terminations to "R" and "A" input ports. Set INPUT switch to "R" and the CRT trace should be below the center graticule line for 100 dB of isolation.

s. At Channel 1, set INPUT switch to "A" and the CRT trace should be below the center graticule line.

A2-54. MAGNITUDE DYNAMIC ACCURACY TEST

SPECIFICATION:

Magnitude Dynamic Accuracy:	≤±0.01 dB/dB from −20 to −40 dBm
	≤±0.2 dB from −10 to −50 dBm
	≤±0.5 dB from −50 to −70 dBm
	≤±1 dB from −70 to −90 dBm
	≤±2 dB from −90 to −100 dBm
	≤±4 dB from −100 to −110 dBm

DESCRIPTION:

The signal level into the receiver is adjusted by setting the external step attenuator. The signal trace is monitored on the CRT and deviation from the expected position of the trace on the graticule is noted.

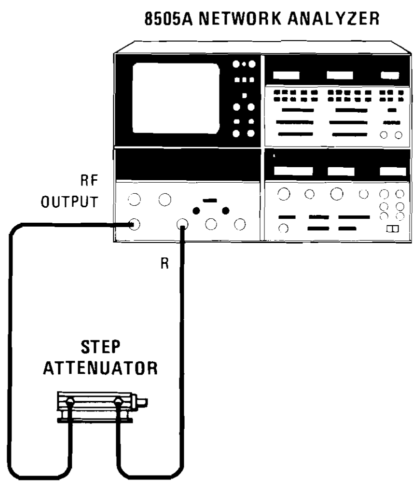


Figure A2-16. Dynamic Range Test Setup

EQUIPMENT:

0 — 110 dB STEP ATTENUATOR
(calibrated at 30 MHz) .... HP 8496A

PROCEDURE:

a. On 8505A, set the controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm 0
OUTPUT LEVEL Vernier 0
INPUT LEVEL dBm MAX .... −10

On A2 Frequency Control:
RANGE MHz .... .5 — 13
MODE .... LIN EXPAND
WIDTH .... CW
CW FREQUENCY .... 30.0 MHz

A2-54. MAGNITUDE DYNAMIC ACCURACY TEST (Cont'd)

On A3 Signal Processor:
Channel 1
INPUT .... R
MODE .... MAG
SCALE/DIV .... .5 dB

Channel 2
MODE .... OFF

Electrical Length
MODE .... OFF

Display Section
BANDWIDTH KHz .... 10 kHz ON (in)
REF LINE POSN .... Ref line to center graticule line
VIDEO FILTER ....ON (in)

b. Connect equipment as shown in Figure A2-16.

c. Set step attenuator to 30 dB. Press Channel 1 DISPLAY MKR, then ZRO pushbuttons until trace settles. Press CHAN 1 DISPLAY REF pushbutton. As attenuator is stepped down, offset −10 dB/step with Channel 1 REF OFFSET pushbutton to bring trace back to reference line within limits shown in Table A2-6. (It may be necessary to change CHAN 1 SCALE/DIV to a less sensitive setting if trace is off screen.)

d. Repeat step c with attenuator connected to "A" input and Channel 1 INPUT switch to "A".

e. Repeat step c with attenuator connected to "B" input and Channel 1 INPUT switch to "B".

Table A2-6. Dynamic Accuracy Table

External Attenuator Setting	Channel 1 REF OFFSET	OFFSET from REF LINE (Plus attenuator tolerance)
10 dB	+20.0 dB	± 0.20 dB
20 dB	+10.0 dB	± 0.1 dB
30 dB	0 dB	± 0.00 dB
40 dB	−10.0 dB	± 0.1 dB
50 dB	−20.0 dB	± 0.2 dB
60 dB	−30.0 dB	± 0.4 dB
70 dB	−40.0 dB	± 0.6 dB
80 dB	−50.0 dB	± 0.8 dB
90 dB	−60.0 dB	± 1 dB
100 dB	−70.0 dB	± 2 dB
110 dB	−80.0 dB	± 4 dB

A2-55. PHASE DYNAMIC RANGE

SPECIFICATION:

Phase Dynamic Accuracy (in 10 kHz Bandwidth):
±0.02 degree/dB from −20 to −40 dBm
±0.5 degree from −10 to −50 dBm
±1 degree from −50 to −70 dBm
±3 degrees from −70 to −90 dBm

DESCRIPTION:

A phase reference level is established on the CRT. Then the signal at the receiver is changed through the dynamic range of the instrument and the change in phase indication is noted.

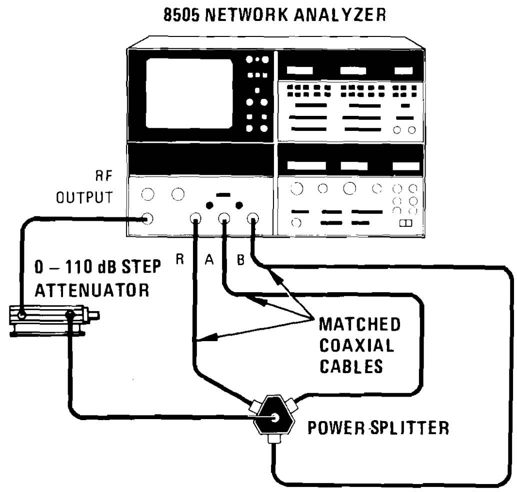


Figure A2-17. Phase Dynamic Range Test Setup

EQUIPMENT:

RF Cable Kit . . . . HP 11851A
3-Way Power Splitter . . . . HP 11850A
Step Attenuator, 0 — 110 dB . . . . HP 8496A

PROCEDURE:

a. On 8505A, set controls as follows:

On A1 Source/Converter
OUTPUT LEVEL dBm . . . .+10
OUTPUT LEVEL VERNIER 0
INPUT LEVEL dBm MAX . . . . —10

On A2 Frequency Control:
RANGE MHz . . . . .5 — 130
MODE . . . . LIN EXPAND
WIDTH . . . . .CW ± ΔF
SCAN TIME SEC . . . . .1 — .01
CW FREQUENCY . . . . 30 MHz
±ΔF FREQUENCY 00.0
MARKERS 1
Marker 1 . . . . .Center of CRT screen

A2-55. PHASE DYNAMIC RANGE (Cont'd)

On A3 Signal Processor:
Channel 1
INPUT. . . . . A/R
MODE. . . . . .PHASE
SCALE/DIV . . . . 1 degree

Channel 2
MODE. . . . . .OFF

Electrical Length
MODE. . . . . .OFF

Display Section
BANDWIDTH kHz . . . . 10 kHz On (in)
VIDEO FILTER . . . . .On (in)
REF LINE POSN . . . . .Adjust Reference Line to CRT center graticule line

b. Connect equipment as shown in Figure A2-17.

c. Set external step attenuator to 10 dB. If "R" OVERLOAD light comes on, adjust OUTPUT LEVEL VERNIER to clear overload. Press Channel 1 DISPLAY MKR, then ZRO pushbuttons to place the CRT trace on the center graticule line.

d. Step external step attenuator from 10 to 50 dB position. (This applies —50 dBm to ports "A" and "R".) The CRT trace should be within ±0.5 degree of Reference Line.

e. Step the external attenuator from 50 to 70 dB position. (This applies —70 dBm to ports "A" and "R".) The CRT trace should be within ±1 degree of Reference Line.

f. Step the external attenuator from 70 to 90 dB position. (This applies —90 dBm to ports "A" and "R".) The CRT trace should be within ±3 degrees of Reference Line.

A2-56. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE

SPECIFICATION:

Absolute Magnitude Frequency Response: ⩽±1.5 dB

Magnitude Tracking Frequency Response: ⩽±0.3 dB

Phase Frequency Response: ⩽±3° from 0.5 to 750 MHz; ⩽±5° from 750 to 1300 MHz

Group Delay Frequency Response: ⩽±1 ns (0.5 to 1300 MHz).

DESCRIPTION:

The receiver magnitude frequency response is tested by applying the RF OUTPUT first directly to the three individual ports. If the indication is slightly out of specifications, the RF OUTPUT is sent through a power splitter to one of the INPUT ports and to a power meter. The common mode power variations due to the source as indicated on the power meter is subtracted from the variations on the CRT trace, giving a resultant variation due only to the receiver and display section.

The receiver frequency response in ratio measurement mode may be red directly from the CRT display since all common mode variations due to the source are cancelled. Also,

A2-56. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE (Cont'd)

frequency response in group delay mode is read directly from the CRT trace by noting the deviation from the center graticule reference.

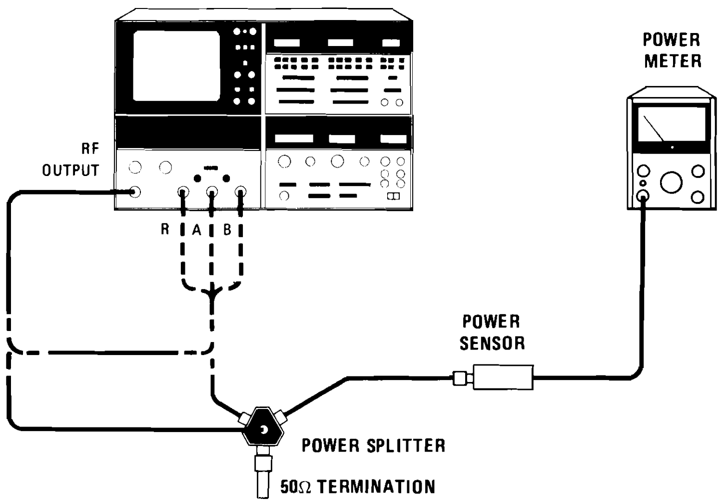


Figure A2-18. Absolute Magnitude Frequency Response Test Setup

EQUIPMENT:

Power Meter	HP 435A
Power Sensor	HP 8482A
Three-Way Power Splitter	HP 11850A
50-Ohm Termination	HP 909A Option 012

PROCEDURE:

ABSOLUTE MAGNITUDE FREQUENCY RESPONSE

a. On 8505A, set the controls as follows:

On A1 Source/Converter:

OUTPUT LEVEL dBm	–10
OUTPUT LEVEL VERNIER	–10
INPUT LEVEL dBm MAX	–10

On A2 Frequency Control:

RANGE MHz	0.5 – 1300
MODE	LIN FULL
WIDTH	START/STOP 1
SCAN TIME SEC	1 – .1
SCAN TIME VERNIER	Midrange

NOTE

It may be necessary to make slight adjustment at 0.50 MHz of Frequency Calibrate pot behind FREQUENCY CONTROL front panel. (See paragraph A2-51, steps d through i.)

MARKERS	1
Marker 1	Midrange

A2-56. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE (Cont'd)

On A3 Signal Processor:

Channel 1
INPUT . . . . R
MODE . . . . MAG
SCALE/DIV . . . . 0.5 dB/DIV

Channel 2
MODE . . . . OFF

CRT Display
REF LINE POSN . . . . Center Graticule Line
BW . . . . 10 kHz On (in)
VIDEO FILTER . . . . Off (out)

b. Connect equipment as shown in Figure A2-18 with "R" INPUT cable connected directly to RF OUTPUT connector.

c. Press DISPLAY CLR, MKR, then ZRO pushbuttons. Observe the highest and lowest point on the CRT trace between 0.5 and 1300 MHz. They should not be greater than 3 dB difference. If the CRT trace is within tolerance, go to step h and check "A" input port. If "A" port has been checked, go to step i and check "B" input port. If the CRT trace is out of tolerance, go to step d and cancel the affect of the RF source variations to see if the receiver section is actually within tolerance.

d. Connect equipment as shown in Figure A2-18 with RF OUTPUT to center of Power Splitter and one leg of power splitter to port "R" and the other leg to Power Sensor and Power Meter.

e. Set Marker 1 to the point on CRT trace that is maximum. Note Marker reading and Power Meter reading.

f. Set Marker 1 to the point on CRT trace that is minimum. Adjust OUTPUT LEVEL VERNIER and step attenuator to set Power Meter to the same indication noted in step e.

g. The difference between the Marker indication noted in step e and the displayed marker reading in step f should be $\leqslant$3 dB.

h. Disconnect RF Cable from "R" INPUT and connect to "A" INPUT. Set Signal Processor Channel 1 INPUT switch to A. Repeat preceding step c and observe the power level variations for "A" INPUT.

i. Disconnect RF Cable from "A" INPUT and connect to "B" INPUT. Set Signal Processor Channel 1 INPUT switch to B. Repeat preceding step c and observe the power level variations for "B" INPUT.

A2-56. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE (Cont'd)

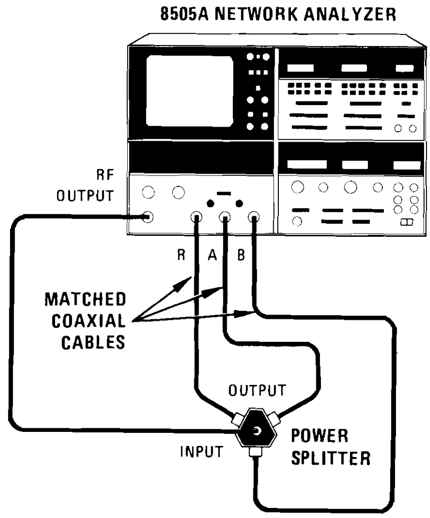


Figure A2-19. Ratio Frequency Response Test Setup

EQUIPMENT:

Three-way POWER SPLITTER .... HP 11850A
Matched Cable Kit .... HP 11851A

RATIO MEASUREMENT MAGNITUDE FREQUENCY RESPONSE

j. Connect equipment as shown in Figure A2-19 with the power splitter connected to "R", "A", and "B" inputs and Power Meter disconnected from setup.

k. On A2 Frequency Control, set RANGE MHz switch to 0.5 — 1300 MHz position, set MODE to LIN FULL, WIDTH to START/STOP 1, SCAN TIME SEC to 1 — .1, and TRIGGER to AUTO. Set MARKERS switch to 1 position and Marker 1 control to approximately 640 MHz.

l. On A3 Signal Processor, set CHANNEL 1 INPUT switch to A/R, set MODE to MAG, set SCALE/DIV switch to 0.1 dB position and set VIDEO FILTER off (out). Press DISPLAY MKR, then ZRO pushbutton.

m. On A2 Frequency Control, adjust MARKER 1 frequency control between 0.5 MHz (left end of CRT trace) and 1300 MHz (right end of CRT trace). Note the highest and lowest reading on the Signal Processor Channel 1 readout. The difference between the highest and lowest reading (peak-to-peak variation due to frequency response) should be $\leqslant$0.6 dB.

n. Set Signal Processor Channel 1 INPUT switch to B/R. Press DISPLAY MKR, then ZRO pushbuttons. Repeat preceding step m.

A2-56. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE (Cont'd)

PHASE MEASUREMENT FREQUENCY RESPONSE

o. Set MODE to LIN EXPAND, WIDTH to START/STOP 1, MARKERS switch to 1 position, and Marker 1 control to mid-position. Set START to 0000. MHz, STOP to 0750 MHz. Set Channel 1 INPUT to B/R, MODE to PHASE, and SCALE/DIV to 2 degrees.

p. Set WIDTH to START/STOP 2. Set START to 0750 MHz and STOP to 1300 MHz. Return WIDTH to START/STOP 1.

q. Set ELECTRICAL LENGTH INPUT to B and MODE to LENGTH X1. Press LENGTH pushbuttons to make the overall CRT trace as horizontal as possible. (It may be necessary to press Channel 1 DISPLAY MKR, then ZRO to bring trace on CRT.)

r. Press Channel 1 DISPLAY MKR, then ZRO pushbutton to position the trace near the center graticule line. The maximum trace deviation from the highest point to the lowest point should be ≤6 degrees (3 divisions). If the reading is out of tolerance, the power splitter tracking may be at fault. Check the power splitter tracking as follows. Reverse the connections to the power splitter legs, then make the phase measurements again and subtract the two readings. The difference in readings is the power splitter tracking error. Correct the original phase measurements by subtracting one-half the power splitter tracking error.

s. Set WIDTH to START/STOP 2 for the 750 to 1300 MHz range. The trace deviation should be ≤ 10 degrees (5 divisions).

t. Repeat steps o through s for A/R measurement. Set all switches the same, except set Channel 1 INPUT switch to A/R in step o and set ELECTRICAL LENGTH INPUT switch to A in step q.

GROUP DELAY FREQUENCY RESPONSE

u. On A3 Signal Processor, set Channel 1 INPUT switch to A/R, MODE switch to DLY and set SCALE/DIV switch to 1 ns. Set Frequency Control MODE switch to LIN FULL.

v. Press Electrical Length DISPLAY CLR pushbutton. Press Channel 1 DISPLAY MKR then ZRO pushbuttons to center CRT trace about center graticule line and zero digital readout.

w. On A2 Frequency Control, adjust MARKER 1 frequency control between 0.5 and 1300 MHz and note the highest and lowest reading on the Signal Processor Channel 1 readout. The difference between the highest and the lowest reading (peak-to-peak variation due to frequency response) should be ≤2 ns.

x. Repeat steps t through v for B/R measurement. Set all switches the same except set Channel 1 INPUT switch to B/R in step u.

A2-57. PHASE ACCURACY AND ELECTRICAL LENGTH TEST

SPECIFICATION:

Phase Accuracy:

±0.01 degrees/degree for ±170 degrees
±0.01 degrees/degree ±0.5 degrees for ±180 degrees.

A2-57. PHASE ACCURACY AND ELECTRICAL LENGTH TEST (Cont'd)

Polar Accuracy:
Actual value is within less than a 3 mm circle of displayed value.

Electrical Length Accuracy: ±3% of reading ±1% of length range.

DESCRIPTION

The hysteresis loop is observed to see that the 180 degree transition occurs at precisely +180 degrees and —180 degrees. The electrical length offset is checked by inserting two phase cyles and reading the resultant Electrical Length digital readout of 720 degrees.

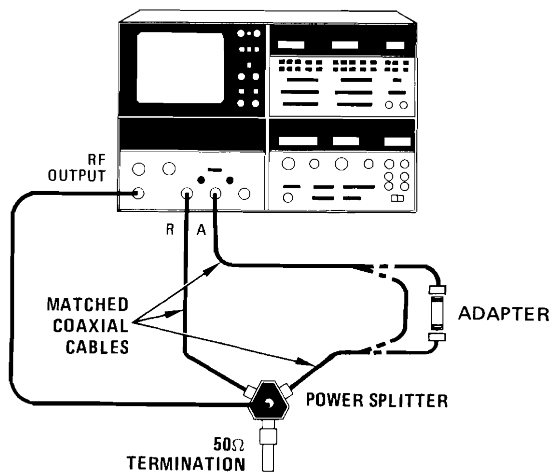


Figure A2-20. Phase Accuracy Test Setup

EQUIPMENT:

3-Way Power Splitter	HP 11850A
RF Cable Kit	HP 11851A
Type N Female to Type N Female Adapter	HP 1250-0777
50-ohm Termination	HP 909A Option 012

PROCEDURE:

PHASE ACCURACY TEST

a. On the 8505A, set the controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	—10
OUTPUT LEVEL VERNIER	.0
INPUT LEVEL dBm MAX	—10

On A2 Frequency Control

RANGE MHz	0.5 — 130
MODE	LIN EXPAND
WIDTH	CW ±ΔF
CW FREQUENCY	60 MHz
±ΔF FREQUENCY	6.0 MHz
SCAN TIME SEC	0.1 —.01

A2-57. PHASE ACCURACY AND ELECTRICAL LENGTH TEST (Cont'd)

A2 Frequency Control (Cont'd)
TRIGGER . . . . AUTO
MARKERS 1
Marker 1 . . . . 60 MHz

On A3 Signal Processor
Channel 1
INPUT . . . . A/R
MODE . . . . PHASE
SCALE/DIV . . . . 90°/DIV

Channel 2
MODE . . . . OFF

CRT Display
BW (Bandwidth) . . . . 10 kHz
Video Filter . . . . Off (out)

ELECTRICAL LENGTH Panel
MODE . . . . OFF

b. Connect equipment as shown in Figure A2-20 with two 24-inch matched cables connected in series between Port "A" and the 3-way power splitter.

c. Offset the phase trace with the Channel 1 REF OFFSET pushbuttons to place a phase transition to the right of midscreen as shown in Figure A2-21.

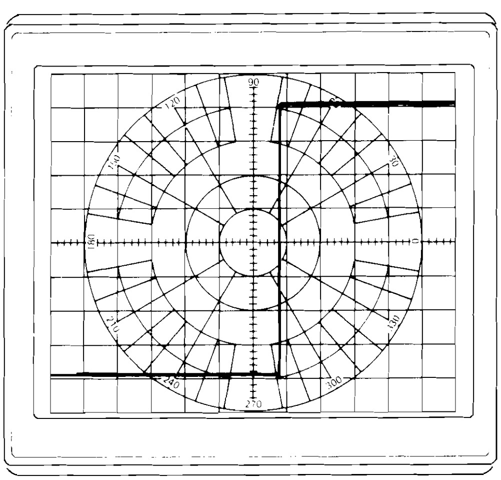


Figure A2-21. CRT Trace of Phase Transition

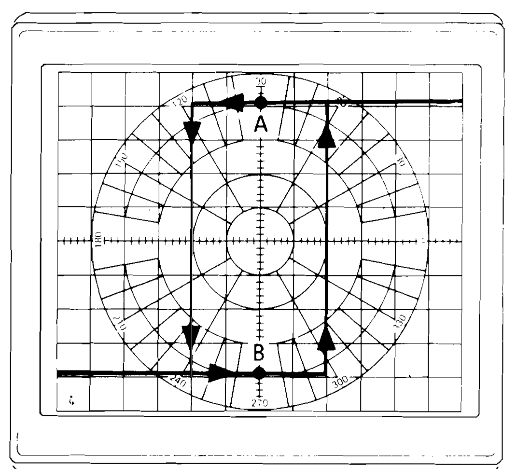


Figure A2-22. Hysteresis Loop of Phase Trace

d. Set SCAN TIME SEC to MANUAL. Sweep through the transition in both forward and reverse direction using the Manual sweep control. Note the hysteresis loop as shown in Figure A2-22.

e. Adjust both CW FREQUENCY and ±ΔF FREQUENCY to make the hysteresis loop six divisions wide and centered on the vertical center line of CRT. (See Figure A2-22.)

NOTE

If either step f or g is out of tolerance, refer to Section V for adjustment of A3A12 Phase Detector.

A2-57. PHASE ACCURACY AND ELECTRICAL LENGTH TEST (Cont'd)

f. Press Channel 1 DISPLAY MKR. Center trace dot on the vertical center line at point "A" on Figure A2-22 trace. The marker readout should be +180 degrees ±3.3 degrees.

g. Center trace dot on the vertical center line at point "B" on Figure A2-22 trace. The Channel 1 marker readout should be −180 degrees ±3.3 degrees.

ELECTRICAL LENGTH LINE STRETCHER TEST

h. Remove extra 24-inch cable and adapter and reconnect Port "A" to the three-way power splitter through one of the matched cables.

i. On Frequency Control, set:

RANGE MHz .... 0.5 — 1300 MHz
MODE .... LIN EXPAND
WIDTH .... CW ±ΔF
±ΔF FREQUENCY .... 0 MHz
CW FREQUENCY
(read on FREQ COUNTER MHz panel) .... 1000 MHz

On Signal Processor, set:

Channel 1:
INPUT .... A/R
MODE .... POLAR MAG
SCALE/DIV .... POLAR FULL 1

CRT Display:
BW (Bandwidth) .... 10 kHz On (in)
VIDEO FILTER .... Off (out)

j. At ELECTRICAL LENGTH panel, set:

INPUT .... A
MODE LENGTH X10
VERNIER A .... 0 (fully counterclockwise)
DISPLAY CLR .... Press and release

k. On Channel 1, press DISPLAY MKR, then ZRO pushbuttons. Set Channel 1 MODE Switch to POLAR PHASE, then press DISPLAY ZRO. This should place the trace dot within 3 mm of the outside circle and zero degrees.

l. Press ELECTRICAL LENGTH pushbuttons to add +30 cm length. The trace dot should move around the outside circle back to 0 degrees ±10 degrees.

m. Set ELECTRICAL LENGTH MODE switch to LENGTH X1 position. Press ELECTRICAL LENGTH pushbuttons to read +15 cm. The trace dot should be at 180 degrees ±5 degrees. The same indication appearing on the CRT should appear on the Channel 1 digital readout.

LINEAR PHASE RANGE

n. Set Channel 1 MODE to PHASE and SCALE/DIV to 90 degrees. On A2 Frequency Control, set SCAN TIME SEC switch to 0.1 – .01. Set ELECTRICAL LENGTH MODE switch to PHASE X10 degrees/SCAN. Press Channel 1 DISPLAY REF, then CLR and press ELECTRICAL LENGTH DISPLAY CLR.

A2-57. PHASE ACCURACY AND ELECTRICAL LENGTH TEST (Cont'd)

o. With ELECTRICAL LENGTH offset pushbuttons, put in +1800 degrees of electrical length. (The electrical length readout displays +180.) Verify that five transistions are displayed and that the linear phase display limits over approximately the last 5% of the trace. (See Figure A2-23, Photo A.)

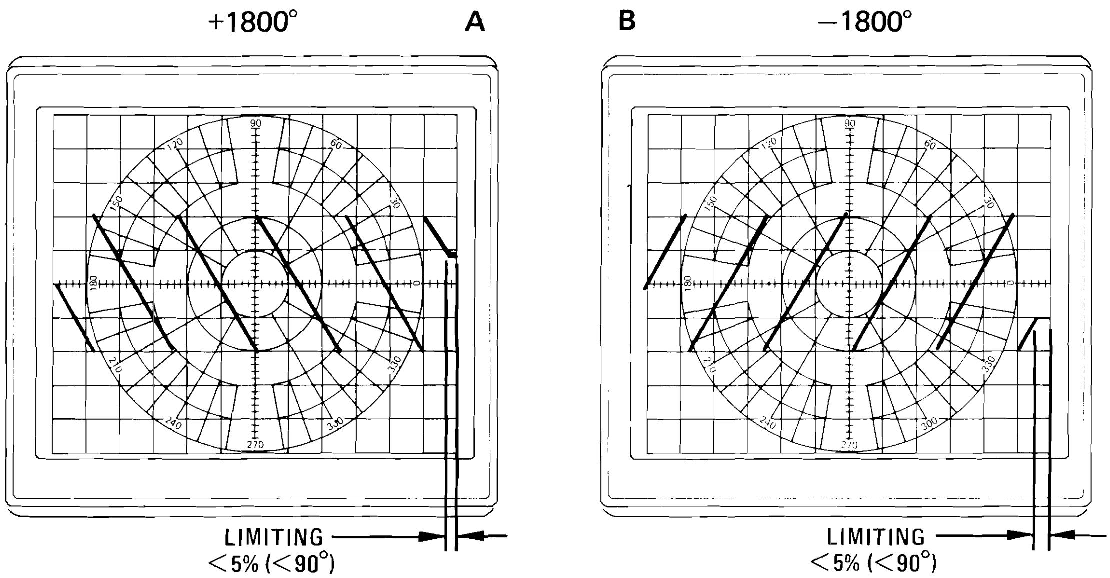


Figure A2-23. Phase Trace with Maximum Electrical Length Added

p. Reduce electrical length with LENGTH pushbuttons until the limiting section just goes off-screen. The digital readout at ELECTRICAL LENGTH panel should be ⩾+173 (⩾1730 degrees).

q. With ELECTRICAL LENGTH offset pushbuttons, put in —1800 degrees of electrical length. (The electrical length readout displays —180.) Verify that five transitions are displayed and that the linear phase display limits over approximately the last 5% of the trace. (See Figure A2-23, photo B.)

r. Reduce electrical length with LENGTH pushbuttons until the limiting section just goes off-screen. The digital readout at ELECTRICAL LENGTH panel should be equal to or more negative than —173 (equal to or more negative than —1730 degrees).

LINEAR PHASE ACCURACY

s. On ELECTRICAL LENGTH panel, set MODE switch to PHASE X 10 degrees/SCAN, set VERNIER A to zero, then press DISPLAY CLR pushbutton.

t. On Channel 1, set MODE switch to PHASE. Press DISPLAY REF, then CLR pushbuttons. Press MKR, then ZRO pushbuttons. Press DISPLAY REF, then REF OFFSET pushbuttons to place —180 degrees of offset in Channel 1.

u. On ELECTRICAL LENGTH panel, press LENGTH pushbutton to obtain two complete phase cycles on the CRT screen. The ELECTRICAL LENGTH digital readout should be ±72 ±2, corresponding to ±720 degrees ±20 degrees of electrical length.

A2-58. GROUP DELAY ACCURACY TEST

SPECIFICATIONS:

Group Delay Accuracy: ≤±3% of reading ±1 ns for 0.5 to 1300 MHz range, or ±10 ns for 0.5 to 130 MHz range, or ±100 ns for 0.5 to 13 MHz range.

DESCRIPTION:

A 50-foot coaxial cable is measured for group delay using the phase function of the 8505A. The group delay mode is then used to measure the 50-foot cable to obtain a direct group delay reading.

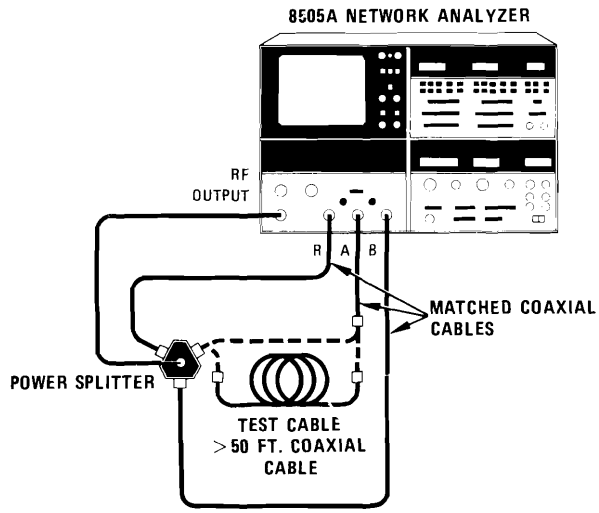


Figure A2-24. Test Setup to Measure Group Delay of Test Cable

EQUIPMENT:

3-Way Power Splitter	HP 11850A
Matched Type-N Coaxial Cables	HP 11851A
Test Cable	≥50 foot of coaxial cable (RG-223/u or similar)
BNC to Type-N Adapters	HP 1250-0780

PROCEDURE:

a. A coaxial cable greater than 50 feet in length is used as a standard in the group delay test. Group delay of the test cable is measured with the 8505A in phase mode as follows:

(1) Connect the "Test Cable" in A channel between the matched cable and the power splitter as shown in Figure A2-24.

(2) Set 8505A controls as follows:

On A1 Source/Converter:

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL VERNIER	0
INPUT LEVEL dBm MAX	−10

A2-58. GROUP DELAY ACCURACY TEST (Cont'd)

On A2 Frequency Control:

RANGE MHz . . . . 0.5 — 1300
MODE. . . . . LIN EXPAND
WIDTH . . . . CW
SCAN TIME SEC . . . . 0.1 — .01
TRIGGER. . . . . AUTO
MARKERS 1
SCAN TIME SEC Vernier . . . . Midrange

On A3 Signal Processor:

Channel 1
INPUT. . . . . A/R
MODE. . . . . PHASE
SCALE/DIV . . . . 45 DEG

Channel 2
MODE. . . . . OFF

Electrical Length
INPUT. . . . . A
MODE. . . . . OFF

(3) Press Electrical Length DISPLAY CLR pushbutton. Set A2 Frequency Control CW FREQUENCY and VERNIER for 700.00 MHz. Press Channel 1 DISPLAY MKR pushbutton, then ZRO pushbutton to zero the digital readout.

(4) On A2 Frequency Control, adjust CW FREQUENCY up in frequency until the marker digital readout again indicates 0 degrees. Record frequency for use in later calculation. (NOTE: The phase change between the two zero points is 360 degrees.)

Frequency = ____________________ MHz

(5) Calculate the group delay of the "Test Cable".

$$t_D = \frac{\text{(Phase change in degrees)}}{360 \text{ X (Change in Frequency in Hz)}}$$

EXAMPLE

Change in Phase = 360 degrees

Change in Frequency = 713 MHz —700 MHz

= 13 MHz

$$t_D = \frac{360 \text{ degrees}}{360\ (13 \text{ X } 10^6 \text{ Hz})} = \frac{1}{13 \text{ X } 10^6 \text{ Hz}}$$

$$= 77 \text{ ns}$$

A2-58. GROUP DELAY ACCURACY TEST (Cont'd)

b. Connect equipment as shown in Figure A2-24 with both matched cables and adapters connected to power splitter and "test cable" not connected in circuit.

c. On 8505A, set controls as follows:

On A1 Source/Converter:

OUTPUT LEVEL dBm	—10
OUTPUT LEVEL VERNIER	.0
INPUT LEVEL dBm MAX	—10

On A2 Frequency Control:

RANGE MHz	0.5 — 1300
MODE	LIN FULL
WIDTH	START/STOP 1
SCAN TIME SEC	1 — .1
SCAN TIME VERNIER	Fully clockwise
MARKERS	1
Marker 1	Midrange
TRIGGER	AUTO

On A3 Signal Processor:

Channel 1

INPUT	A/R
MODE	DLY
SCALE/DIV	DELAY 100 ns

Channel 2

MODE	OFF

Electrical Length

INPUT	A
MODE	OFF

d. Press Electrical Length DISPLAY CLR pushbutton.

e. Press Channel 1 DISPLAY REF pushbutton, then CLR pushbutton until REL light goes out (if it was lit). Then press MKR pushbutton.

f. Connect "Test Cable" between adapters in the A channel. The Channel 1 digital readout should indicate the group delay calculated for the "Test Cable" in step a (5) above ± (1 ns +3% of reading).

SECTION III
OPERATING AND PROGRAMMING INSTRUCTIONS

A3-1. INTRODUCTION

A3-2. This section of the manual contains instructions showing how to make transmission and reflection measurements in both manual and automatic modes.

A3-3. Included are step-by-step instructions on manual operation supplied in Application Note 219, as well as detailed instructions for programming the 8505A in automatic mode from an external controller through the Hewlett-Packard Interface Bus (HP-IB).

A3-4. Manual Operation

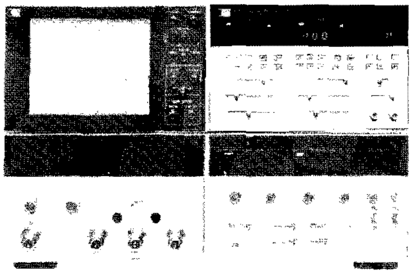
A3-5. Application Note 219 is included in this section to introduce you to the various manual operating modes, and to give you a step-by-step sequence of operations to make specific measurements on a device.

A3-6. If you are interested in the operation of specific controls on the 8505A, go to Figures A3-1 through A3-4. In these figures, the function of each control is described in detail.

A3-7. Remote Operation and Programming

A3-8. The HP 8505A has a remote programming interface using the Hewlett-Packard Interface Bus (HP-IB). All measurements that can be taken by the standard 8505A Network Analyzer can be automatically programmed and controlled remotely via the HP-IB. This provides a remote operator with the same control of the instrument as does a manual (local) operator. Remote control is maintained by a system controller (desk-top computer, etc.) that sends commands or instructions to and receives data from the 8505A using the HP-IB. The HP-IB is Hewlett-Packard's implementation of the IEEE Standard 488-1975. A complete general description of the HP-IB is provided in the manual entitled "Condensed Description of the Hewlett-Packard Interface Bus," HP Part Number 59401-90030.

A3-9. Programming information for the 8505A is given in Paragraph A3-14 and on. Specific examples are given for HPL and BASIC languages: the HP 9825A Desk-top Computer in HPL and the HP 9830A/B in BASIC. A table of HP-IB commands together with sample command statements are given in Table A3-1. A glossary of HP-IB terms is given in Table A3-7. A summary of codes to command the 8505A is given in Tables A3-2 and A3-3. Figure A3-5 gives the 8505A programming codes in pictorial form. Some programming functions require programmed time delays to allow completion of an operation. These are listed in Table A3-4.



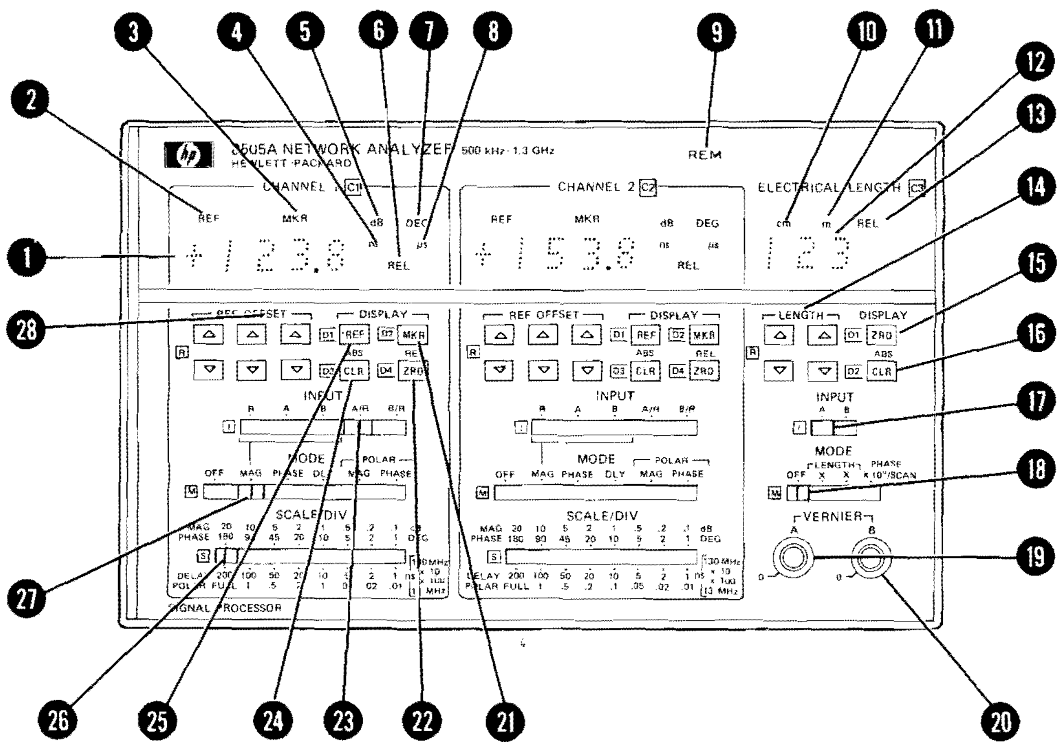

8505A NETWORK ANALYZER 500 kHz - 1.3 GHz
HEWLETT-PACKARD
REM
CHANNEL 1
CHANNEL 2
ELECTRICAL LENGTH
REF
MKR
dB
DEG
ns
μs
REL
cm
m
REF OFFSET
DISPLAY
LENGTH
ABS
INPUT
MODE
POLAR
SCALE/DIV
VERNIER
SIGNAL PROCESSOR

Table A3-1. HP-IB Commands (1 of 2)

Message Name	Function	Sample Statement Forms	
		9825A	**9830A/B**
Commands to Signal Processor			
Data	Write data to 8505A Read data from 8505A	wrt 716 red 716	CMD "?UØ", "<data>" CMD "?P5", <variable>
Remote	Set HP-IB to Remote; (required only after lcl 7)	rem 7	10 CMD "?UØ" 20 FORMAT B 30 OUTPUT (13, 20) 768;
	Set 8505A to Remote; (required only after lcl 716)	wrt 716	CMD "?UØ", "<data>"
Local	Set HP-IB to Local	lcl 7	10 CMD "?UØ" 20 FORMAT B 30 OUTPUT (13, 20) 1024;
	Set 8505A to Local	lcl 716	10 CMD "?UØ" 20 FORMAT 3B 30 OUTPUT (13, 20) 256, 1, 512;
Local Lockout	Disable Local Pushbutton	llo 7	10 CMD "?UØ" 20 FORMAT 3B 30 OUTPUT (13, 20) 256, 17, 512;
Clear Local Lockout/Set Local	Clear Local Lockout, set 8505A to Local, enable Remote	lcl 7, rem 7	10 CMD "?UØ" 20 FORMAT 2B 30 OUTPUT (13,20) 1024, 768;
Abort	Clear interface, clear binary input mode, clear text mode	cli 7	Not available
Commands to Frequency Control			
Data	Write data to 8505A Read data from 8505A	wrt 719 red 719	CMD "?U3", "<data>" CMD "?S5", <variable>
Remote	Set HP-IB to Remote; (required only after lcl 7)	rem 7	10 CMD "?U3" 20 FORMAT B 30 OUTPUT (13, 20) 768;
	Set 8505A to Remote; (required only after lcl 719)	wrt 719	CMD "?U3", "<data>"
Local	Set HP-IB to Local	lcl 7	10 CMD "?U3" 20 FORMAT B 30 OUTPUT (13, 20) 1024;
	Set 8505A to Local	lcl 719	10 CMD "?U3" 20 FORMAT 3B 30 OUTPUT (13,20) 256, 1, 512;
Local Lockout	Disable Local Pushbutton	llo 7	10 CMD "?U3" 20 FORMAT 3B 30 OUTPUT (13,20) 256, 17, 512;

Table A3-1. HP-IB Commands (2 of 2)

Message Name	Function	Sample Statement Forms: 9825A	Sample Statement Forms: 9830A/B
Commands to Frequency Control			
Clear Local Lockout/Set Local	Clear Local Lockout, set 8505A to Local, enable Remote	lcl 7, rem 7	10 CMD "?U3" 20 FORMAT 2B 30 OUTPUT (13,20) 1024, 768;
Abort	Clear interface, clear binary input mode, clear text mode.	cli 7	Not available

Table A3-2. Summary of Programming Codes for Source/Converter and Frequency Control (1 of 2)

ASCII Code and Sequence	Functions and Comments
	OUTPUT LEVEL dBm
O	RF Output, Coarse control in 10 dB steps
O1	−60 dBm
O2	−50 dBm
O3	−40 dBm
O4	−30 dBm
O5	−20 dBm
O6	−10 dBm
O7	0 dBm
O8	+10 dBm
	OUTPUT LEVEL dBm VERNIER
V	RF Output, Vernier control. LLO must be set (true) to program. Non-learned programming code. The code is V_{xx}, where attenuation V is calculated: $V = \frac{xx}{99} \times 12\text{ dB} - 12\text{ dB}$ or $xx = 99\left(\frac{V+12}{12}\right)$ Examples:
V0	−12 dB
V17	−10 dB (approx. value in Remote).
V25	−9 dB
V50	−6 dB
V75	−3 dB
V99	0 dB
	INPUT LEVEL dBm MAX
I	Maximum input level before overload.
I1	−10 dBm max.
I2	−30 dBm max.

ASCII Code and Sequence	Functions and Comments
	RANGE MHz
R	Frequency Range
R1	.5 – 13 MHz
R2	.5 – 130 MHz
R3	.5 – 1300 MHz
	MODE
M	Sweep Mode
M1	LOG FULL, sweeps full band
M2	LIN FULL, sweeps full band
M3	LIN EXPAND, WIDTH switch selects which Start/Stop sweep ranges or CW.
	WIDTH
W	Frequency displayed is between START and STOP Markers. Program M3 prior to a "W" code.
W1	START/STOP 1
W2	START/STOP 2
W3	START/STOP ALTernately 1 and 2*
W4	CW ±ΔF
W5	CW
	*Not normally used in remote.
	SCAN TIME SEC
S	SCAN TIME VERNIER defaults to maximum (CW) when LLO is set.
S1	MANUAL
S2	100 – 10 seconds
S3	10 – 1 seconds
S4	1 – .1 seconds
S5	.1 – .01 seconds

Table A3-2. Summary of Programming Codes for Source/Converter and Frequency Control (2 of 2)

ASCII Code and Sequence	Functions and Comments	ASCII Code and Sequence	Functions and Comments
 T T1 T2 T3	**TRIGGER** SINGLE not programmable. Position is used to select LOCAL. AUTO LINE EXTernal	 FC FC10	**FREQ COUNTER MHz** (0 = START, 99 = STOP) Non-learned programming code. Only one marker available in REMOTE. 0 – 99 = Percentage of Sweep Width. **PROGRAMMING EXAMPLE** With Start (FA) = 800 MHz and Stop (FB) = 1000 MHz, therefore, Sweep Width = FB-FA = 200 MHz 200 X 10% = 20 MHz, so the marker position is at 820 MHz.
 FA FB	**START-STOP FREQUENCY** START or CW FREQUENCY MHz STOP or ΔF FREQUENCY MHz **NOTE** FREQUENCY VERNIER controls default to minimum (CCW) when LLO is set. RANGE MHz codes determine placement of decimal point.	 E	**TERMINATOR (EXECUTE)** Followed by CR, LF

Table A3-3. Summary of Programming Codes for Signal Processor and Display (1 of 2)

ASCII Code and Sequence	Functions and Comments	ASCII Code and Sequence	Functions and Comments
  CØB CØB1 CØB2 CØB3 CØB4	**BW VIDEO FILTER** (Display bandwidth) Selects bandwidth and video filter IN or OUT. BW = 10 kHz, Video Filter OUT BW = 1 kHz, Video Filter OUT BW = 10 kHz, Video Filter IN BW = 1 kHz, Video Filter IN	 M C1M1 C1M2 C1M3 C1M4 C1M5 C1M6	**MODE** Selects parameter being processed. OFF MAGnitude PHASE DLY (Delay) POLAR MAGnitude POLAR PHASE
 C1 C2	**SET CHANNEL, INPUT, AND MODE** Channel 1 (left channel) Channel 2 (right channel) The channel code above must precede the INPUT and MODE codes. The following codes show channel 1 selected, however, they also apply to channel 2 by changing C1 to C2.	 S	**SCALE/DIV** (Selects sensitivity or resolution for CRT display in units/division) Values for positions S1 through S8 depend on MODE selected. For group delay, Frequency RANGE is also a determining factor.
 I C1I1 C1I2 C1I3 C1I4 C1I5	**INPUT** Selects input port being processed R Input A Input B Input A/R Inputs Ratioed B/R Inputs Ratioed	 C1D1 C1D2	**DISPLAY REF** Display indicates value of REFerence line. **DISPLAY MKR** Display indicates parameter value at Marker frequency.

Table A3-3. Summary of Programming Codes for Signal Processor and Display (2 of 2)

ASCII Code and Sequence	Functions and Comments
	ABS CLR
C1D3	ABSolute Clear; sets reference line to zero.
	REF OFFSET (Up/down pushbuttons offset reference line)
R±19999	Decimal position automatically inserted and depends on MODE and SCALE/DIV. Displayed resolution increases at S = >5. Up/Down pushbuttons are not programmable but their position (valid value) at time of local-to-remote transition is loaded directly.
	PROGRAMMING EXAMPLES
C1R45Ø	45° in M3 Mode
C1R2ØØØ	20 dB in M2 Mode
	CALIBRATION (ZERO) REGISTER
O ±1999	Not displayed on front panel. Value goes to reference offset register with REL ZRO pressed. Value equals zero with ABSolute CLR pressed.
	ELECTRICAL LENGTH
C3	Amount of electrical length added is determined by position of RANGE MHz on Frequency Control panel. (When cm and m lights, electrical lengths displayed in centimeters and meters respectively.)
	INPUT
I	Selects input port being processed
C3I 1	A Input Connector
C3I 2	B Input Connector
	MODE
M	Maximum value depends on frequency range.
C3M1	OFF
C3M2	LENGTH x; minimum calibrated (length) range.
C3M3	LENGTH X; maximum calibrated (length) range.
C3M4	PHASE x 10°/SCAN; uncalibrated x 10°/SCAN.
	DISPLAY
D	Non-learned programming code.

ASCII Code and Sequence	Functions and Comments
	ABS CLR
C3D1	ABSolute Clear; sets reference line to zero.
	LENGTH Offset
C3R ±nnn	Position of decimal point and lamps m or cm ON is determined by RANGE MHz switch and MODE LENGTH switch. Up/Down pushbuttons are not programmable but position (valid value) at time of local-to-remote transition, is loaded directly.
	EXAMPLES of RANGE, MODE, and lamps lit:
	RANGE MHz — **C3M2** — **C3M3**
	R1 — XX.X m — XXX.m
	R2 — X.XX m — XX.X m
	R3 — XX.X cm — XXX. cm
	VERNIER A AND B
	Vernier controls for LENGTH Offset switches. (Length offset adjusted by VERNIER controls is not stored in length-offset register.) VERNIER A and B default to zero (CCW) when LLO is set.
	CALIBRATION REGISTER
C3O ±199	Not displayed on front panel. Similar to "R" except value goes to offset calibrate register instead of length offset register.
	TERMINATOR (EXECUTE
E	Terminator is needed after each R, D, and O.
	EXAMPLES:
	Incorrect: "C1D1R45ØO9ØE"
	Correct:. "C1D1EC1R45ØEC1O9ØE"

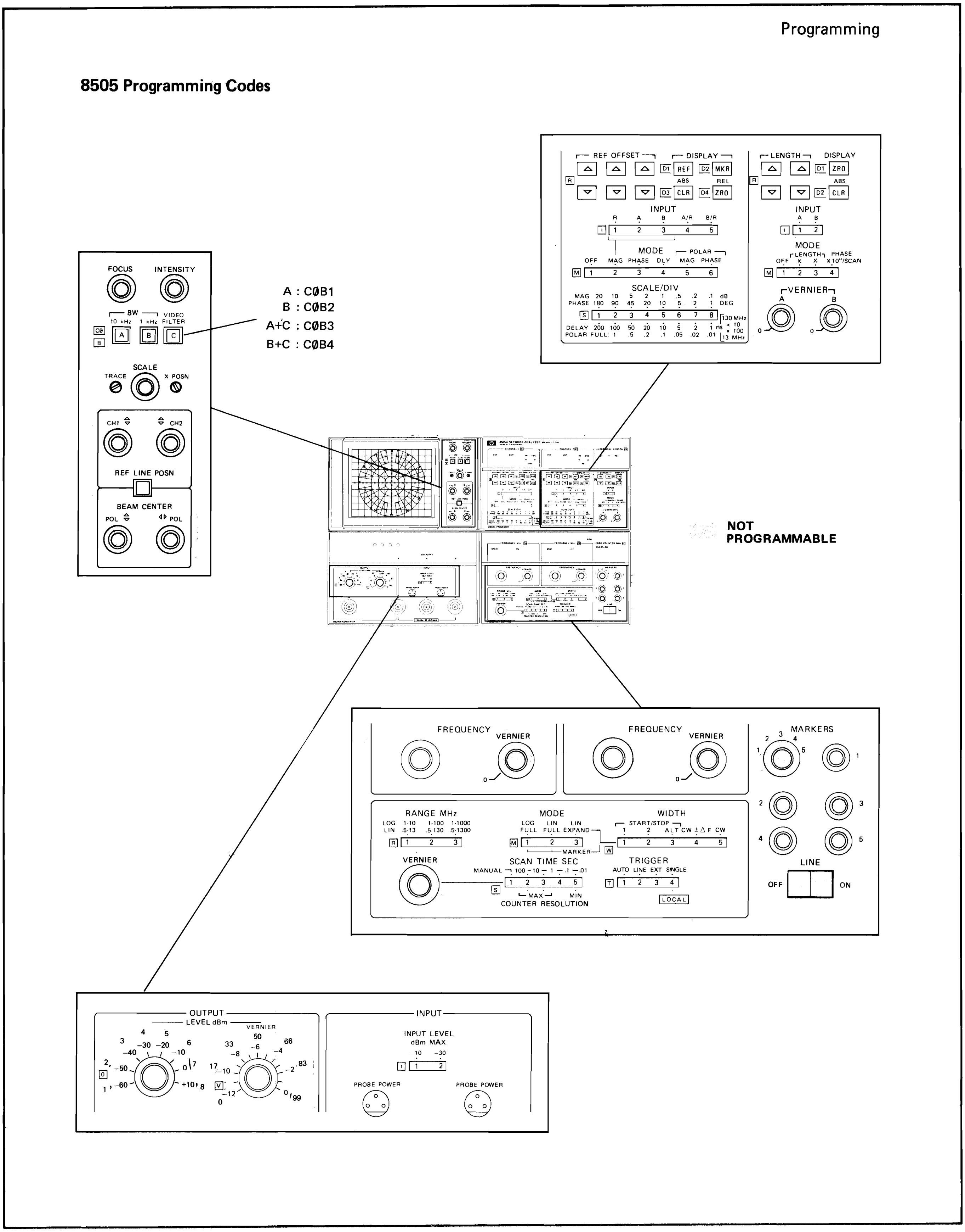


Figure A3-5. 8505A Programming Codes

Table A3-4. 8505A Timing Requirements

Operation	Timing Delay Required
SIGNAL PROCESSOR	
Front Panel Programming Overhead	
Per digit or character	0.2 ms*
Per "E"	60 ms*
Settling	
Smoothing	
10 kHz	10 ms
1 kHz	25 ms
Video Filter	300 ms
Channel 1, Channel 2	
Any change affecting Reference Level (includes REF OFFSET, CLR, INPUT, MODE, and 8503A Test Set switching.)	3000 ms (to 0.01%) 1000 ms (to 1%)
ZRO (MKR mode) ZRO (REF mode), CLR, INPUT, MODE, and SCALE/DIV	At least 3 sweep times per channel + 3,000 ms
Electrical Length	
Any change affecting LENGTH (includes LENGTH, CLR, Channel 1 and 2 MODE, INPUT, and 8503A Test Set switching).	3000 ms
ZRO, CLR, INPUT, and MODE	20 ms
Read Marker value and determine if autoranging occurs (resolution changes):	
Resolution constant:	1 sweep/Channel +25 ms
Autoranging	2 sweeps/Channel +100 ms
SOURCE/CONVERTER	
Front Panel Programming Overhead	
Per digit or character	0.2 ms*
Per "E"	6 ms
Settling	
OUTPUT, INPUT LEVEL dBm MAX	20 ms
SCAN TIME SEC, TRIGGER	20 ms
RANGE, MODE, WIDTH, FREQUENCY	
START/STOP, ±ΔF	120 ms
CW (to 0.01%)	1000 ms (first freq.) 360 ms (next freqs.)

*Indicates hardwired holdoff. All other timing requirements must be handled using programmed delays.

A3-14. PROGRAMMING THE 8505A

A3-15. HP-IB Addresses

A3-16. The instrument "address" distinguishes one instrument from another in parallel with it on the HP-IB (similar to the phone number in a telephone system). An HP-IB device may have either a *TALK* address, a *LISTEN* address or both. Using the appropriate address code, all instruments in the system can be either talkers or listeners. The 8505A Network Analyzer uses two sets of codes; one for the Frequency Control, bottom half (see Figure A3-6) and one for the Signal Processor/Display, top half (see Figure A3-7). The Frequency Control listens when switches or registers are being programmed; the talk output consists of frequency counter readings and the learn mode string. Likewise, the Signal Processor listens while being programmed and talks with marker parameter readings or learn mode strings.

A3-17. The 8503A Test Set is a listener while being switched and talks with a "learn mode" value for the state of its switch. Instruments shipped from the factory as an HP 8507A/B system have the factory preset addresses listed in Table A3-5.

Table A3-5. Address Table (Preset Addresses)

Instrument	Talk	Listen	5-Bit Decimal Value
8505A Source/Converter	S	3	19
8505A Processor/Display	P	Ø	16
8503A Test Set	T	4	20
9825A or 9830A/B Desk-top Computer	U	5	21

These addresses may be modified by removing instrument covers and manipulating appropriate slide switches or jumpers on various circuit cards. For detailed instructions, see the applicable Operating and Service Manual. To change the addresses in the 8505A, see Paragraph A2-16.

A3-18. Programming Code Conventions

A3-19. 8505A functions are programmed using a two-character format:

a. The first letter of the control or switch name (for example, "R" for Range).

b. Plus a number indicating the position of the control beginning with 1 at the left or full CCW position. Thus the 130 MHz RANGE (the second position from the left) is programmed "R2".

Since the Signal Processor has duplicate controls for each display channel, a prefix code is used to indicate what channel is being programmed, as follows:

a. "C1" is used for CHANNEL 1.

b. "C2" is used for CHANNEL 2.

c. "C3" is used for ELECTRICAL LENGTH controls.

d. "CØ" is used for the bandwidth programming on the display.

The letter "E" is used to indicate the end of programming information and must be used when controls are programmed. Any controls not programmed will assume their "front panel" state (as manually positioned). Programming code notations on the front panel of the 8505A are shown in Figure A3-5. A summary of

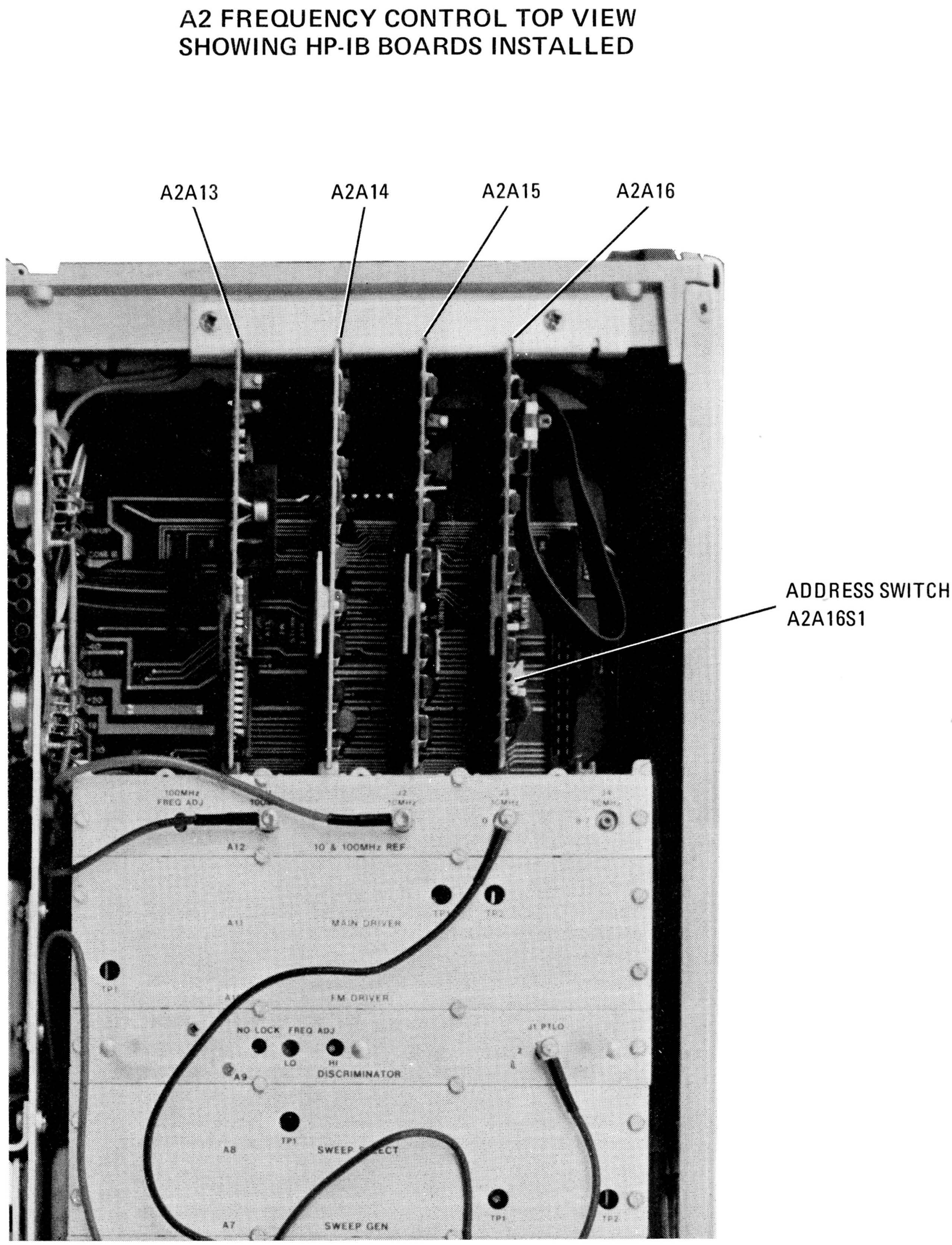


Figure A3-6. Frequency Control HP-IB Assemblies

A3 SIGNAL PROCESSOR TOP VIEW
SHOWING HP-IB BOARDS INSTALLED

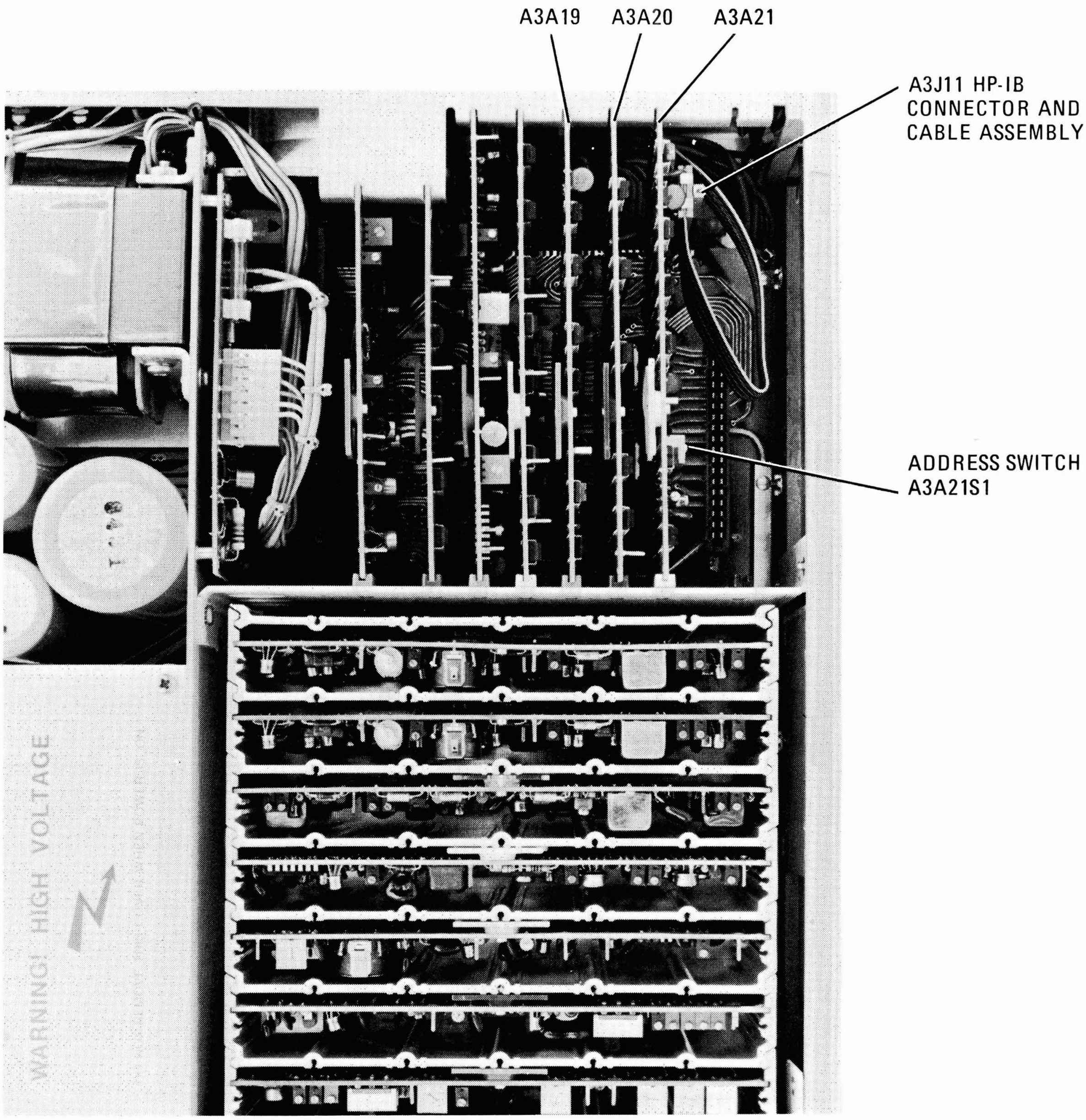


Figure A3-7. Signal Processor HP-IB Assemblies

Codes for the Source/Converter and Frequency Control are given in Table A3-2. Codes for the Signal Processor and Display are given in Table A3-3.

Examples:

a. Code for source SCAN TIME in 1 — 10 sec position.

```
          S3E ← End of data
SCAN TIME    3rd switch position
```

b. Code for Signal Processor CHANNEL 1 INPUT to B/R and MODE to PHASE:

```
C1I5M3E
```

c. Calculator sets source OUTPUT attenuator to 0 dBm position:

9825A

```
                      cmd 7, "U?3",   "Ø7E"
HP-IB         Calculator   Unlisten   Source to listen
SELECT CODE   talks        command
```

9830A/B

```
             CMD "U?3",   "07E"
Calculator   Unlisten   Source to listen
talks        command
```

d. Calculator tells Processor: CHANNEL 1: MODE to DLY (delay) and CHANNEL 2: INPUT to A/R, MODE to PHASE:

9825A

```
1Ø: cmd 7, "U?Ø", "C1M4C2I4M3E"
```

or

```
1Ø: wrt 716, "C1M4C2I4M3E"
```

9830A/B

```
1Ø CMD "U?Ø", "C1M4C2I4M3E"
```

A3-20. Using Variable Values as Program Codes

A3-21. It is often necessary to program an instrument using a code that takes the value of a variable stored in the calculator. Applications of this are : (a) cycle through all attenuator steps, and (b) branch if a switch is in a specific position.

The *fmt* and *wrt* statements can be used to output the variable value. The *wrt* also performs the addressing function, eliminating the need to *cmd 7*.

Example: to cycle through all MODE settings, using CHANNEL 1 of the Processor:

9825A

```
Ø: for I = 1 to 6
1: fmt 1, "C1M", f, Ø, "E", Z
2: wrt 716.1, I
3: wait 1ØØØ
4: next I
```

9830A/B

```
1Ø FOR I = 1 TO 6
2Ø CMD "U?Ø"
3Ø FORMAT "C1M", F1ØØØ.Ø, "E"
4Ø OUTPUT (13, 30) I
5Ø WAIT 1ØØØ
6Ø NEXT I
```

In the above example, f.0 (9825A) or F1000.0 (9830A/B) is a special format code used to suppress leading blanks. The Z suppresses the carriage return and line feed that can cause the Processor to fail to update the new codes. Details are contained in the Extended I/O ROM Programming Manual.

A3-22. Local/Remote

A3-23. Each of the 8505A instruments goes to REMOTE when addressed. To return to local (front panel operation) either:

a. Slide the TRIGGER switch first to its extreme right position and then to the trigger mode desired in local operation. Both source and Processor are switched to local.

OR

b. Program a GO TO LOCAL:

9825A	9830A/B
Ø: lcl 7	1Ø CMD "U?Ø3" — Listen addresses for all instruments desired. 2Ø FORMAT 3B 3Ø OUTPUT (13, 2Ø) 256, 1, 512;

All front panel controls except the verniers are disabled in REMOTE.

A3-24. Local Lockout

A3-25. To disable the verniers as well as the front panel GO TO LOCAL (TRIGGER switch), program LOCAL LOCKOUT:

9825A	9830A/B
Ø: llo 7	1Ø CMD "U?" 2Ø FORMAT 3B 3Ø OUTPUT (13, 2Ø) 256, 17, 512;

To restore manual vernier control in REMOTE after LOCAL LOCKOUT has been commanded:

9825A	9830A/B
Ø: lcl 7; rem 7	1Ø CMD "U?" 2Ø FORMAT 2B 3Ø OUTPUT (13, 2Ø) 1024, 768;

This commands the bus to LOCAL, then enables REMOTE (toggling the REN line which clears local LOCKOUT). Upon the next addressing sequence, the addressed instrument switches to REMOTE (with manual vernier control).

A3-26. Programming Frequency

A3-27. There are three recommended ways to program the frequency at which parameter measurements are made. Basically the CW $\pm\Delta F$ ($\Delta F = 0$) mode is the most generally useful. The MARKER/SWEPT mode is the fastest while the CW mode has the greatest resolution and potential accuracy. The following section has more details.

NOTE

To prevent errors in the Start/Stop Frequencies displayed, the WIDTH switch must be programmed in the Data String prior to the START and STOP FREQUENCY MHz registers.

NOTE

Changing the frequency of "FA" or "FB" when in "W3" (ALT sweep) or entering a frequency > 1300 MHz will cause errors in the frequency readout.

A3-28. In general, when programming the frequency registers, the decimal point is *not* accepted. Its position is assumed and changes with the frequency range switch setting:

Range 1 (.5 — 13 MHz) —	XX.XX MHz
Range 2 (.5 — 130 MHz) —	XXX.X MHz
Range 3 (.5 — 1300 MHz) —	XXXX MHz

For example, FA1ØØØ programs 10 MHz on Range 1 while FAØØ1Ø programs 10 MHz on Range 3. This shift in decimal points, the determination of the frequency range switch setting, R, and scale factor, T (9825A) or FØ (9830A/B), are easily determined for any frequency, F (in MHz):

9825A

```
Ø: 1 + (F> 13) + (F > 13Ø) → R
1: tn↑ (3-R) → T
2: TF → F
```

9830A/B

```
1Ø R=1 + (F > 13) + (F > 13Ø)
2Ø FØ= 1Ø↑ (3-R)
3Ø F = F * FØ
```

A3-29. Fast CW Mode. For most automatic applications, the CW ±ΔF mode with ΔF set to zero is recommended. In this mode (and all swept modes) the capacitive filter used in CW is bypassed so that the wait to settle to 0.1% of frequency step is 130 ms. This is effectively a fast CW mode with four digit resolution.

Example: To set 1113 MHz in "fast CW":

9825A

```
Ø: cmd 7, "U?3", "R3M3W4FBØE"
1: 1113→F
2: fmt 1, "FA", f.Ø, "E"
3: wrt 719.1, F
4: wait 13Ø
```

9830A/B

```
1Ø CMD "U?3", "R3M3W4FBØE"
2Ø F=1113
3Ø CMD "U?3"
4Ø OUTPUT (13, 5Ø) F
5Ø FORMAT "FA", F1ØØØ.Ø,"E"
6Ø WAIT 2ØØ
```

Typically a program would be structured so that line Ø (9825A) or 1Ø (9830A/B) was executed only once. To program 10.14 MHz the code would be "R1M3. . ." and F would be 1014.

A3-30. CW Mode. This mode is programmed by cmd 7 "U?3", "M3W5E" (9825A) or CMD "U?3", "M3W5E" (9830A/B). The actual frequency is programmed by "FAXXXXE" where XXXX is the coarse frequency.

A3-31. To achieve greater resolution in CW you may use "FAXXXZFBYYYYE". FBYYYY is essentially a vernier in CW where 1000 counts in FB equal 2 counts in the Z position of FA. The following examples show how various frequencies would be programmed using the FAXXXZBYYYY format:

$\underbrace{12.36}_{FA = 1236}\ \underbrace{286}_{FB = 143}$ MHz $\underbrace{110.5}_{FA = 1105}\ \underbrace{732}_{FB = 366}$ MHz $\underbrace{1126.}_{FA = 1126}\ \underbrace{382}_{FB = 191}$ MHz

9825A

```
3: llo 7; cmd 7, "U?3", "M3W5E"
4: fmt 1, "R", f.Ø, "FA", f.Ø, "FB", f.Ø, "E"
5: wrt 719.1, R, int (F), 5ØØ (F—int (F))
6: wait 15ØØ
```

9830A/B

```
4Ø CMD "U?3", "M3W5E"
5Ø OUTPUT (13, 6Ø) R, INT (F), (F—INT (F)) * 5ØØ
6Ø FORMAT "R", F1ØØØ.Ø, "FA", F1ØØØ.Ø, "FB",F1ØØØ.Ø, "E"
7Ø WAIT 15ØØ
```

A3-32. While this mode provides highest resolution, the absolute accuracy of the digital-to-analog converters (1%) are not compatible with this resolution. However, the DAC's offset and linearity errors can be removed by using the frequency counter to feedback corrections. (See Paragraph A3-43.) To provide best residual FM in this mode, capacitive filtering is employed. This filter requires a wait after setting frequency of 1500 ms to settle to 0.1% of frequency stepped.

A3-33. Marker Swept Modes. Displaying the full sweep while taking data at a single frequency is a new technique in automatic testing. It allows you to actually "see" the data being taken. It is accomplished by first programming the instrument to either START/STOP 1, START/STOP 2, or CW ±ΔF and then programming the frequency marker. Any swept mode is programmed by entering the frequency limits into the FA and FB registers. For example, in START/STOP 1 or 2:

START/STOP 1 or 2: FA = start frequency
FB = stop frequency

Example: to sweep between 50 and 100 MHz on START/STOP 2 in RANGE 2:

9825A	9830A/B
cmd 7, "U?3","R2M3W2FA5ØØFB1ØØØE"	CMD "U?3", "R2M3W2FA5ØØFB1ØØØE"

CW ±ΔF: FA = center frequency
FB = ±ΔF * 10

Example: To sweep 10 ± 0.5 MHz (9.5 to 10.5 MHz) in RANGE 1:

9825A	9830A/B
cmd 7, "U?3", "R1M3W4FA1ØØØFB5ØØE"	CMD "U?3", "R1M3W4FA1ØØØFB5ØØE"

Once a sweep has been programmed, the *frequency marker* is positioned on the display using FCXX. XX corresponds to screen position in % of screen from left to right with 1% to 99% in 1% steps equal to the range of allowable positions.

Example: To set up a 100 — 300 MHz display with the marker at 180 MHz:

9825A

```
Ø: cmd 7, "U?3", "R3M3W1FA1ØØFB3ØØE"
1: (18Ø — 1ØØ) 1ØØ/(3ØØ — 1ØØ) →F
2: fmt 1, "FC", f.Ø, "E"
3: wrt 719.1, F
```

9830A/B

```
1Ø CMD "U?3", "R3M3W1FA1ØØFB3ØØ"
2Ø F = (18Ø — 1ØØ) * 1ØØ/(3ØØ — 1ØØ)
3Ø OUTPUT (13, 4Ø) F
4Ø FORMAT "FC", F1ØØØ.Ø, "E"
```

To set up a 50 MHz center frequency with a 5 MHz total window and the marker at 49 MHz, the line 0 code would be "R2M3W4FA500FB25E" and F would be (49 — 47.5) * 100/5, or 30.

A3-34. Different applications may well require any of the three frequency setting techniques. For example, in production testing, it is often fastest to set up in a swept/marker mode. Adjustments are made, then representative data is taken using the marker at 5% or 10% steps. The operator can quickly visually check for glitches eliminating the need for testing at 100 — 500 individual points. On the other hand, to take the highest accuracy data it might be necessary to use CW with counter feedback. This is particularly true when the device characteristics change rapidly with frequency or when vector errors are being stored for complex setups. The accuracy of the error correction depends on the ability to return to the same frequency during each of the calibration and measurement cycles. Characteristics of the various methods of setting frequency are listed in Table A3-6.

Table A3-6. Characteristics of Frequency Setting Modes

		CW	Fast CW	Marker/Swept
Resolution:	13 MHz	.02 kHz	.01 MHz	1 – 99% of Sweep Span in 1% Steps
	130 MHz	0.2 kHz	0.1 MHz	
	1300 MHz	2 kHz	1 MHz	
*Wait time**		1500 MS	130 MS	130 MS
Accuracy		**	1% of Range	1% of Range

*Time to settle to 0.1% of frequency stepped.

**Can be corrected to counter accuracy ($1/10^5$).

A3-35. Reading the Frequency Counter

A3-36. The counter reading is output by simply telling the source to talk.

Example: Read counter and place value in variable F.

9825A	9830A/B
Ø : red 719, F	1Ø CMD "S?5" 2Ø ENTER (13, *)F1

The frequency reading is in Hz with the decimal point positioned correctly.

On the 9825A, *red* like *wrt* also performs the addressing function, eliminating the need to *cmd 7.*

The counter output depends on the mode selected:

a. **In CW:** Reading is actual frequency with maximum resolution.

b. **In Swept Modes:** Frequency at the FREQ COUNTER MARKER (FC) with output resolution dependent on sweep speed (highest resolution at "S3").

The counter output of zero may occur under the following conditions:

a. When the FREQ COUNTER MARKER is positioned too near the end of the sweep (typically ⩾97) on the fastest scan time.

b. When the counter and I/O are not properly synchronized. This will be avoided if each counter request is preceded by an "E".

A3-37. The counter has a built-in delay after the "E" is passed to the source to compensate for scantime settings. It will delay until a sweep is completed before outputting a frequency. Therefore, it is not necessary to wait between setting the marker and reading the counter. However, there is *no* built-in delay for oscillator *settling time.* WAIT's in accordance with Table A3-6 should be programmed.

A3-38. Reading Magnitude, Phase, and Delay

A3-39. The Processor can output the marker values for each display channel. These are the same parameter values that appear in the LED display when MKR is pushed. Both channels output after the Processor is addressed to talk.

9825A	9830A/B
Ø: red 716, D, A	1Ø CMD "P?5" 2Ø ENTER (13, *) C1, C2

Channel 1 and 2 marker values are automatically measured on alternate sweeps when both channels are ON. No delays are built-in so WAIT's for two sweeps should be programmed prior to requesting Processor readings with two channels turned on. W = 3 * 10 ↑ (7 — S) where W = wait in ms and S = setting of SCAN-TIME switch. This allows the scan vernier to be set anywhere. (If vernier is set at MAXIMUM, sweep can be faster.) If a request is made prior to completion of a sweep, the last valid processor reading will be output. This will also be the case when a channel or channels are switched off.

A3-40. With slow sweep speeds, it will be to your advantage to program a frequency counter operation in the marker mode. This will allow faster repetitive readings. This mode can provide an adaptive holdoff until the sweep reaches the marker settings. Then the sweep may be retriggered with an "E" and the counter process used again to update the second processor channel prior to outputting both processor marker values. This avoids a fixed wait for two full slow sweeps at each marker position (particularly wasteful when the marker is positioned at the beginning of the sweep).

A3-41. As in manual operation, the *resolution* of the data output can vary with the SCALE/DIV setting. If readings meet the conditions in List A below, the outputs will be at maximum resolution with an automatic factor of ten reduction in resolution, independent of the SCALE/DIV switch setting, if the limits are exceeded. The Processor can be forced to produce valid maximum resolution readings when the conditions of List B are met by programming SCALE/DIV to position 5 (S5) and switching to the REF mode. If S5 is set and the conditions of List B are exceeded, invalid readings equal to List B values will result.

MODE	LIST A	LIST B
MAG	<± 8.0 dB	<± 19.99 dB
PHASE	<± 80.0 DEG	<± 199.9 DEG
DELAY (13 MHz)	<± 8.0 μs	<± 19.99 μs
DELAY (130 MHz)	<± 0.8 μs	<± 1.999 μs
DELAY (1300 MHz)	<± 80.0 ns	<± 199.9 ns

NOTE

The MKR mode when autoranging can require up to a 3-second wait for settling time.

NOTE

When programming the Signal Processor with a *wrt* statement, the terminating carriage return-line feed may suppress data updating. To eliminate this problem, use *cmd* instead of *wrt*, or use format "z" with *wrt*.

NOTE

To guarantee 0.1° phase resolution independent of angle, it is necssary to switch to REF mode with reference of 0 degrees: cmd7, "U?Ø", "C2M3RØEC2D1E" (9825A) or CMD "U?Ø", "C2M3RØEC2D1E" (9830A/B).

A3-42. Example Measurement Programs

A3-43. Marker Swept Mode Example. In the following example, it is assumed that Channels 1 and 2 of the Signal Processor have been programmed to the appropriate mode and input settings, and that the source has been programmed to the desired S/S1, S/S2, or CW ±ΔF settings with the SCAN TIME set to the 10 ms (fastest) position.

Example: Read Frequency, CHAN 1 Marker, and CHAN 2 Marker at 19 points across the CRT display and print out the results.

9825A

```
0: for J=1 to 96 by 5
1: fmt 1,"FC",f.0,"E"
2: wrt 719.1,J
3: wait 130
4: red 719,F
5: red 716,D,A
6: prt F/1e6,D,A
7: next J
8: end
```

9830A/B

```
10 FOR J=1 TO 96 STEP 5
20 CMD "U?3"
30 FORMAT "FC",F1000.0,"E"
40 OUTPUT (13,30) J
50 WAIT 200
60 CMD "?S5"
70 ENTER (13,*) F
80 CMD "P?5"
90 ENTER (13,*) C1,C2
100 PRINT F/1E+06,C1,C2
110 NEXT J
120 END
```

A3-44. Counter Feedback Technique Example. Counter feedback should be used when the best possible frequency accuracy is desired. The technique uses the 8505A's built-in counter and the CW Frequency mode in the following multi-step process:

a. Coarse tune FA only with FB set to zero. (Set FA slightly lower than desired frequency.)

b. Count resultant frequency.

c. Output corrected FA and initial FB value.

d. Count again.

e. Correct FB.

Repeat steps d and e for greater accuracy, if desired. This technique can correct for non-linearity and offset in both FA and FB DAC's. It does not provide any improvement in short term (residual FM) characteristics.

Example: Set frequency from 100 to 1000 MHz in steps of 100 MHz using the counter feedback technique. Print frequency (MHz), Channel 1 and Channel 2 marker values.

9825A

```
0: dim F[3]
1: llo 7;wrt 719,"M3W5E"
2: for J=100 to 1000 by 100
3: gsb "FREQ"
4: red 719,F
5: red 716,D,A
6: prt F/1e6,D,A
7: next J
8: stp
```

(cont'd)

9830A/B

```
10 CMD "?U"
20 FORMAT 3B
30 OUTPUT (13,20) 256,17,512;
40 FOR J=100 TO 1000 STEP 100
50 GOSUB 200
60 CMD "?S5"
70 ENTER (13,*) F
80 CMD "P?5"
90 ENTER (13,*) C1,C2
```

(cont'd)

9825A

```
9: "FREQUENCY FEEDBACK SUBROUTINE":
10: "FREQ":
11: fmt 1, "FA", f . 0, "FB", f . 0, "E"
12: wrt 719. 1, J, 0
13: wait 1500
14: for I = 1 to 2
15: red 719, F; F/1e6→F
16: if I > 1; gto "fine"
17: J + (J – F) → F [1]
18: int (F [1] ) → F [2]
19: 500 (F [1] – F [2] ) → F [3]
20: gto +2
21: "fine" : F [3] + 500 (J – F)→ F [3]
22: wrt 719.1, F [2] , F [3] ; wait 1500
23: next I; ret
24: end
```

9830A/B

```
100 PRINT F/1 E + 06, C1, C2
110 NEXT J
120 END
200 REM FREQ FEEDBACK SUBROUTINE
210 CMD "U?3"
220 FORMAT "FA", F 100.0, "FB", F1000.0, "E"
230 OUTPUT (13, 220) J, 0
240 FOR I=1 TO 2
250 WAIT 1500
260 CMD "S?5"
270 ENTER (13, *) F
280 F=F/1E+06
290 IF I> 1 THEN 340
300 F1 = J + (J–F)
310 F2 = INT (F1)
320 F3 = (F1–F2) *500
330 GOTO 350
340 F3 = F3 + ((J–F) *500)
350 CMD "U?3"
360 OUTPUT (13,220) F2, F3
370 NEXT I
380 RETURN
```

A3-45. Learn Mode

A3-46. The unique learn mode capability allows the calculator to command the instrument to output the state of its manually setup switches and registers in a mult-character code string which can be stored in the calculator. Then at a later time this string can be used to recall the previous instrument setup.

This is simply implemented by programming the character "L" to the instrument and then addressing it to talk:

Example: To learn the signal source's current settings:

9825A

```
1: rem 7; wrt 719, "L"
2: red 719, S$
```

9830A/B

```
20 CMD "U?3", "L", "S?5"
30 ENTER (13, *) S$
```

In this case the code string from the source is stored in S$. A typical string is shown below:

S$ = "O7I1R3M3W1S5T1, FA0100, FB0200, E"

Example: To learn the signal processor's current settings:

9825A

```
3: wrt 716, "L"
4: red 716, P$
```

9830A/B

```
40 CMD "U?0", "L", "P?5"
50 ENTER (13, *) P$
```

P$ = "C0B1C1I4M2S3RO8OOOC2 . . . . "

The string variables must initially be dimensioned properly. 30 characters are in the source learn string and 82 in the Processor learn string. The dimension statement is shown below:

9825A

```
0 : dim S$ [30] , P$ [82]
```

9830A/B

```
10: DIM S$ [30] , P$ [82]
```

Table A3-4 defines both the source and processor strings. Even though the learned data will vary, the string position of each switch code remains the same and is therefore easily decoded. The SCANTIME switch position code is the 12th character in the source string. In the example (Table A3-7), its value is extracted from S$ and stored in "A".

Table A3-7. "LEARN MODE" Strings

```
SOURCE:
"Ox  Ix   Rx   Mx   Wx   Sx   Tx,   FAxxxx,   FBxxxx,  E"
 |   |    |    |    |    |    |      |          |
 2   4    6    8    10   12   14     18         25

PROCESSOR:
"CØ Bx,  C1  Ix   Mx   Sx   R±xxxxx,  C2  Ix  Mx  Sx  R±xxxxx,
    |        |    |    |    |             |   |   |   |
    4        9    11   13   15            25  27  29  31

C3  Ix  Mx  Sx  R±xxx,  E,  C1  O±xxxxx,  C2  O±xxxxx,  C3  O±xxx,  E"
    |   |   |   |               |             |             |
    41  43  45  47              57            67            77
```

Example: To determine the SCAN TIME setting:

9825A	9830A/B
Ø: val (S$[12])→A	1Ø A=VAL (S$[12]

A3-47. While the learned strings include the current values of switch positions and reference registers, this may not be a complete definition of the state of the instrument. This can be important for polar displays where both phase and mag references may be necessary and for alternate sweep where the FA, FB for both Start Stop 1 and Start Stop 2 are necessary. For electrical length a code SX (val P$(45)) is provided to indicate the mode switch position for the non-switched input. In these cases it may be necessary to switch modes and learn the other registers to have a complete definition of the state of the machine. The "learn" strings used in the Basic Measurement Program have this "enhanced" capability.

A3-48. Verniers. The state of *verniers cannot be learned.* Thus, it is important to leave vernier settings untouched between the "learn" time and when they are recalled. For longer term storage, it is recommended controls be set to the "preset" position (shown below) before "learning." When the instrument is switched to the remote state, the verniers are *not* automatically set to the preset state. This allows the convenient use of the verniers to fine tune measurement even in automatic operation. However, all verniers are automatically "preset" by using LOCAL LOCKOUT.

9825A	9830A/B
Ø: llo 7	1Ø CMD "U?" 2Ø FORMAT 3B 3Ø OUTPUT (13,2Ø) 256, 17, 512;

LOCAL LOCKOUT also disables the manual LOCAL capability on the TRIGGER switch.

VERNIER CONTROL	"PRESET" POSITION
Output Level Vernier	−10 dBm
Scantime Vernier	MAX CW (Fastest Sweep)
Frequency Verniers (2)	0 Position MAX CCW
Electrical Length Verniers (2)	0 Position MAX CCW

A3-49. Learn Mode Example Program. In the following example the manually set controls of the 8505A are "learned" and the instrument then switched back to local. The instrument's settings can then be switched to any other position. When CONTINUE (9825A) or SPACE BAR EXECUTE (9830A/B) is pressed, the instrument will return to its exact original settings.

9825A

```
0: dim S$[30], P$[82] ;lcl 7; stp
1: rem 7; wrt 716, "L"
2: red 716, P$
3: wrt 719, "L"
4: red 719, S$
5: lcl 7
6: dsp "NEXT SETUP"; stp
7: rem 7; wrt 716, P$
8: wrt 719, S$
9: end
```

9830A/B

```
10 DIM S$[39], P$[82]
20 CMD "U?0", "L", "P?5"
30 ENTER (13, *) P$
40 CMD "U?3", "L", "S?5"
50 ENTER (13, *) S$
60 CMD "U?30"
70 FORMAT 3B
80 OUTPUT (13, 70) 256, 1, 512;
90 DISP "NEXT SETUP";
100 INPUT X$
110 CMD "U?3", S$, "U?0", P$
120 END
```

A3-50. Advanced Programming Techniques

A3-51. Expanded Codes. Programming codes are not limited to a single letter. It may be desirable in some cases to use all the letters of the name of the control, e.g., "RANGE 2" instead of "R2". However, some names will produce the wrong code if letters of the name are recognized as a valid code. Example: "FREQUENCY A" will uncode as "FC" and code the "Frequency Counter" rather than START frequency.

A3-52. Programming Register Values. Values for Channels 1 and 2 *Reference Register* and the corresponding *Stored Reference* (MKR, ZRO) registers are programmed with R or O followed by five digits with a maximum stored value of 19999.

Reference	R±XXXXX
Stored Reference	O±XXXXX

The decimal point is not programmed; its position is assumed as a function of mode.

MAG	XXX.XX dB
PHASE	XXXX.X degrees
DELAY (13 MHz)	XXX.XX μs
DELAY (130 MHz)	XX.XXX μs
DELAY (1300 MHz)	XXXX.X ns

Reference registers may take up to 1.5 seconds to settle after being programmed.

A3-53. Electrical Length Registers. Electrical Length Registers for reference and stored reference are programmed with R or O followed by three digits with a maximum value of 199.

Reference	R±XXX
Stored Reference	O±XXX

Again, the decimal point is not programmed. Its position is assumed depending on the Source RANGE and Signal Processor MODE switch settings:

RANGE	MODE x 1	MODE x 10	MODE x10°/SCAN
13 MHz	XX.X m	XXX m	X10 DEG/SCAN
130 MHz	X.XX m	XX.X m	X10 DEG/SCAN
1300 MHz	XX.X cm	XXX cm	X10 DEG/SCAN

A3-54. DAC Settling Time. All reference registers may take up to three seconds to settle. This means whenever there is a change in INPUT (B, A/R, etc.), MODE (MAG, PHASE, etc.), or 8503A/B Test Set state (forward or reverse), there will be a change of reference registers. If the value of the register changes, no new program codes or reading of data should be done until the DAC has settled.

A3-55. Multiple E's. If Reference and Stored Reference registers (R & O) are to be programmed in the same string, separate "E" or end-of-data commands are required for each.

Example: "C1 R+18900O0100E" – Incorrect

C1 R+18900EC1O0100E" – Correct

Note that the C1 or C2 Signal Processor prefix codes also need to be repeated when changing both the "O" and "R" registers. The repeated "E" and "C1"/"C2" requirement also applies to the "D" codes used for switching between the Reference (REF) and Markers (MKR) data readout modes.

Example: C1D2EC1R+08000EC1O0100E"

A3-56. Serial Poll. When the source is used in serial poll mode, the SRQ line can report loss of phaselock or RF input overload.

Example: To check for valid measurement conditions on the source:

9825A

```
0: rds (719)→A
1: if bit (6, rds (719)) = 0; gto +2
2: prt "OVERLOAD"; stp
3: prt "GOOD"; stp
```

9830A/B

```
10  GOSUB 110
20  IF (STAT13) THEN 200
30  PRINT "MEASUREMENT VALID"
.
.
200 GOSUB 110
210 IF A$64 THEN 30
220 PRINT"OVERLOAD"
```

(cont'd)

9825A	9830A/B	
	110 CMD "U?" 120 FORMAT 3B 130 OUTPUT (13, 120) 256, 24, 512;	Set Serial Poll Enable
	140 CMD "S?5" 150 A=RBYTE13	Read Source Status
	160 CMD "U?" 170 OUTPUT (13, 120)256, 25, 512;	Clear Serial Poll Enable

A3-57. Phase Measurement Speed Limitations. At phase crossovers (±180° transitions) the response time of the system is such that readings can occur on the transition slope at the faster scantimes. Invalid Phase Readings in Swept Modes can be eliminated by programming SCANTIME to position S4. There are no problems with the CW or FAST CW Modes.

A3-58. Polar Output. Marker parameter output can be switched into real and imaginary format by issuing a "C0D3C1I6C2I6E" to the Processor. Channel 1 then reads —Y and Channel 2 reads —X with a reading of 250 corresponding to full scale (unity circle). "C0D0E" switches back to the standard dB and angle format.

A3-59. Programming ZRO. To ensure a correct marker zero for all measurement conditions, use the following program code. (The Channel 2 zero could also be done at the same time.)

9825A	9830A/B
0: wrt "P", "C1R0EC1O0E"	10: CMD "U?0", "C1R0EC1O0E"
1: wait 3000	20: WAIT 3000
2: wrt "P", "C1D4E"	30: CMD "U?0", "C1D4E"
3: wait 3000	40: WAIT 3000
4: wrt "P", "C1D2E"	50: CMD "U?0", "C1D2E"

For slower sweep speeds, wait three seconds plus three sweep times for each channel.

A3-60. Programming CLR. Programming D3 is equivalent to momentarily pressing the CLR pushbutton (only the reference offset register "R" is cleared). To clear the calibration register "O" and the reference offset register "R" (equivalent to manually holding down the CLR pushbutton), use the following program code.

9825A	9830A/B
0: wrt "P", "C1R0EC1O0E"	10 CMD "U?0", "C1R0EC1O0E"
1: wait 3000	20 WAIT 3000

Table A3-8. Glossary of HP-IB Terms (1 of 2)

ADDRESS – A 7-bit code applied to the HP-IB in "Command Mode" that enables instruments, capable of responding, to listen and/or talk on the Bus.

ADDRESSED COMMANDS – These commands allow the Bus controller to initiate simultaneous actions from addressed instruments which are capable of responding.

ATN – Mnemonic referring to the attention control line on the HP-IB. This refers to the Command Mode of operation on the HP-IB, or the control line that places the HP-IB in this mode.

BIT – The smallest part of an HP-IB character (Byte) that contains intelligible information.

BUS COMMANDS – A group of Special Codes that initiate certain types of operation instruments capable of responding to these codes. Each instrument on the HP-IB is designed to respond to those codes that have useful meaning to the device and ignore all others. (See Table E2-2.)

BYTE – An HP-IB character sent over the Data Input/Output (DIO) lines, normally consisting of eight-bits.

COMMAND MODE – In this mode, devices on the HP-IB can be addressed or unaddressed as talkers or listeners. Bus commands are also issued in this mode.

CONTROLLER – Any device on the HP-IB that is capable of setting the ATN line and addressing instruments on the Bus as talkers and listeners. (Also see System Controller.)

DEVICE CLEAR (DCL) – ASCII character DC4 (Octal 024)which, when sent on the HP-IB, will return all devices capable of responding to pre-defined states.

DATA MODE – The HP-IB is in this mode when the ATN control line is high (false). In this mode, data or instructions are transferred between instruments on the HP-IB.

DAV – Mneumonic referring to the Data Valid control line on the HP-IB. This line is used in the HP-IB Handshake sequence.

DIO – Mnemonic referring to the eight Data Input/Output lines of the HP-IB.

EOI – Mnemonic referring to the control line End or Identify on the HP-IB. This line is used to indicate the end of a message on the Bus. It is also used in parallel polling.

EXTENDED LISTENER – An instrument that requires two HP-IB bytes to address it as a listener. (Also see Listener.)

EXTENDED TALKER – An instrument that requires two HP-IB bytes to address it as a talker. (Also see Talker.)

GO TO LOCAL (GTL) – ASCII character SOH (Octal 001) which, when sent on the HP-IB, will return devices addressed to listen (and capable of responding) back to local control.

GROUP EXECUTE TRIGGER (GET) – ASCII character BS (Octal 010) which, when sent on the HP-IB, initiates simultaneous actions by devices addressed to listen and capable of responding to this command.

HANDSHAKE – Refers to the sequence of events on the HP-IB during which each data byte is transferred between addressed devices. The conditions of the HP-IB handshake sequence are as follows:

a. NRFD, when false, indicates that a device is ready to receive data.

b. DAV, when true, indicates that data on the DIO lines is stable and available to be accepted by the receiving device.

Table A3-8. Glossary of HP-IB Terms (2 of 2)

c. NDAC, when false, indicates to the transmitting device that data has been accepted by the receiver.

HP-IB – An abbreviation that refers to the Hewlett-Packard Interface Bus.

IFC – Mnemonic referring to the Interface Clear control line on the HP-IB. Only the system controller can activate this line. When IFC is set (true), all talkers and listeners on the HP-IB are unaddressed and controllers go to the inactive state.

LISTENER – A device which has been addressed to receive data or instructions from other instruments on the HP-IB. (Also see Extended Listener.)

LOCAL LOCKOUT (LLO) – ASCII character DC1 (Octal 021) which, when sent on the HP-IB, disables the front panel controls of responding devices.

NDAC – Mnemonic referring to the Data Not Accepted control line on the HP-IB. This line is used in the Handshake sequence.

NRFD – Mnemonic referring to the Not Ready For Data control line on the HP-IB. This line is used in the HP-IB Handshake sequence.

PARALLEL POLLING – A method of simultaneously checking status on up to eight instruments on the HP-IB. Each instrument is assigned a DIO line with which to indicate whether it requested service or not.

PRIMARY COMMANDS – The group of ASCII characters which are typically used on the HP-IB. (See Table E2-2.

REN – Mnemonic referring to the Remote Enable control line on the HP-IB. This line is used to enable Bus-compatible instruments to respond to commands from the controller or another talker. It can be issued only by the system controller.

SECONDARY COMMANDS – The group of ASCII characters that are used to increase the address length of extended talkers and listeners to two bytes.

SELECTIVE DEVICE CLEAR (SDC) – ASCII character EOT (Octal 004) which, when sent on the HP-IB, returns addressed devices capable of responding to a predetermined state.

SERIAL POLLING – The method of sequentially determining which device connected to the HP-IB has requested service. Only one instrument is checked at a time.

SERIAL POLL DISABLE (SPD) – ASCII character EM (Octal 031) which, when sent on the HP-IB, will cause the Bus to go out of serial-poll mode.

SRQ – Mnemonic referring to the Service Request control line on the HP-IB. This line is set low (true) by any instrument requesting service.

SYSTEM CONTROLLER – An instrument on the HP-IB having all the features of a standard controller with the added ability to control the IFC and REN lines. (Also see Controller.)

TALKER – A device addressed to transmit data on the HP-IB. (Also see Extender Talker.)

UNADDRESS COMMANDS – These commands are the Unlisten Command (?) and the Untalk Command (–). When the Unlisten Command (?) is transmitted on the HP-IB, all devices on the Bus will be unaddressed as listeners. When the Untalk Command (–) is transmitted, all devices will be unaddressed as talkers.

UNIVERSAL COMMANDS – These commands affect every device capable of responding on the HP-IB, regardless of whether they have been addressed or not; e.g., Serial Poll Enable (SPE) and Serial Poll Disable (SPD).

UNLISTEN COMMAND – See UNADDRESS COMMANDS.

UNTALK COMMAND – See UNADDRESS COMMANDS.

CHAPTER A
MODEL 8505A NETWORK ANALYZER

SECTION IV
PERFORMANCE TEST

A4-1. INTRODUCTION

A4-2. The procedures in this section test the electrical performance of the instrument using the specifications of Table A1-1 as the performance standards. All tests can be performed without access to the interior of the instrument. A simpler operational test is included in Paragraphs A3-1 through A3-10.

A4-3. The performance test procedures should be performed in the sequence given. If a test measurement is slightly out of tolerance, go to Section V and perform the appropriate adjustment procedures. If a function fails to operate, go to Section VI Troubleshooting to find which major assembly has failed, then to the appropriate assembly section to troubleshoot to the printed circuit or assembly that has the trouble.

A4-4. EQUIPMENT REQUIRED

A4-5. Equipment required for the performance tests is listed in the Recommended Test Equipment in Table A1-4. Any equipment that satisfies the critical specifications given in the table may be substituted for the recommended model.

A4-6. TEST RECORD

A4-7. Results of the performance tests may be tabulated on the Test Record at the end of the procedures. The Test Record lists all of the tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting and after repairs or adjustments.

PERFORMANCE TESTS

A4-8. FREQUENCY RANGE AND ACCURACY TEST

NOTE
Allow one hour warm-up time before making the Performance Tests or Adjustments.

SPECIFICATIONS:

CW Mode Accuracy: ± 2 counts of LSD ± time-base accuracy*
Swept Frequency Accuracy: ±1% of range for linear sweep

Counter Accuracy: ±2 counts ± time-base accuracy*

*Time-base Accuracy = 5 ppm ±1 ppm/°C ±3 ppm/90 days.

PERFORMANCE TESTS

A4-8. FREQUENCY RANGE AND ACCURACY TEST (Cont'd)

DESCRIPTION:

The 8505A built-in frequency counter calibration is checked against a known good electronic counter by monitoring the CW RF signal. In CW $\pm\Delta F$ mode, the FREQUENCY READOUT is compared to the counter readout. If necessary, the CW RF signal is adjusted to match the FREQUENCY readout. This calibrates the digital FREQUENCY readout to the actual RF OUTPUT signal being read on the built-in counter. The START/STOP sweep signal frequency is measured using an external counter to monitor the frequencies with both START and STOP frequencies the same.

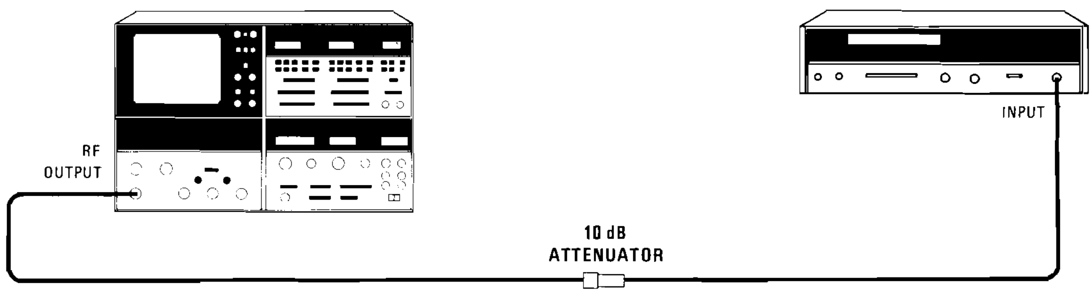


Figure A4-1. Frequency Accuracy Test Setup

EQUIPMENT:

Electronic Counter	HP 5340A
10 dB Attenuator	HP 8491B Option 010

PROCEDURE:

COUNTER ACCURACY

a. Set 8505A controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL VERNIER	0

On A2 Frequency Control:

RANGE MHz	.5 — 1300
MODE	LIN EXPAND
WIDTH	CW
SCAN TIME SEC	10 — 1
VERNIER SCAN TIME	Clockwise
TRIGGER	AUTO
MARKERS	1

b. Connect equipment as shown in Figure A4-1 and set external counter resolution to 100 Hz.

PERFORMANCE TESTS

A4-8. FREQUENCY RANGE AND ACCURACY TEST (Cont'd)

c. Set CW FREQUENCY control and VERNIER control for 700.000 MHz indication on external Electronic Counter. The 8505A CW FREQUENCY digital display should indicate 0700.00 MHz ±0.02 MHz. (If the indication is not within tolerance, the built-in counter is malfunctioning; go to Troubleshooting in Chapter C.

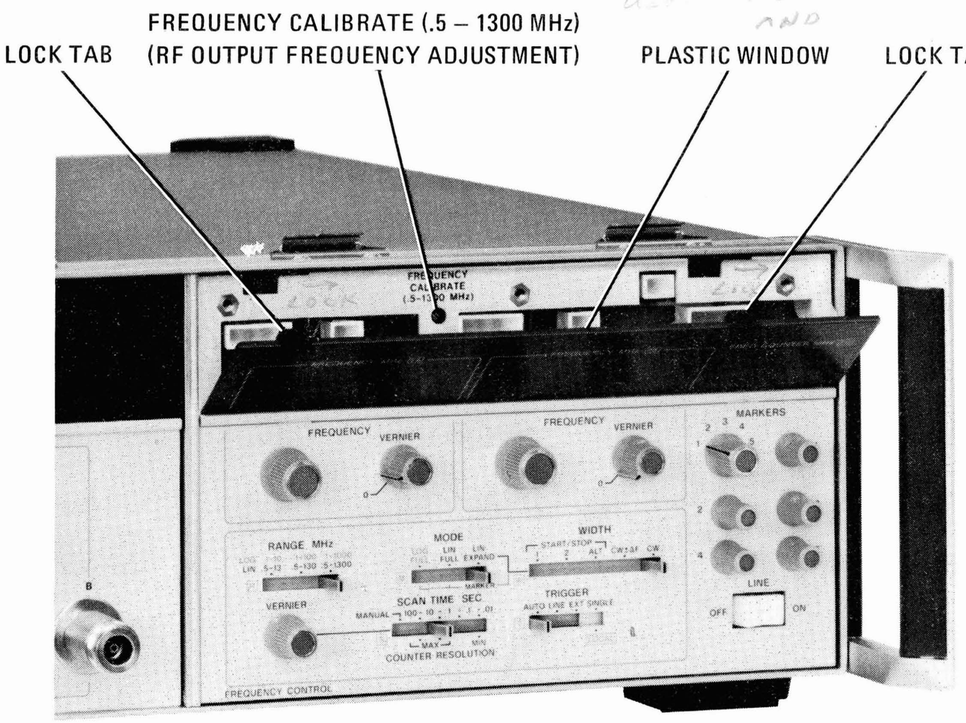
FREQUENCY CALIBRATION

d. Set A2 Frequency Control WIDTH switch to CW ±ΔF.

e. Set CW FREQUENCY to 700 MHz and set CW FREQUENCY VERNIER to 0.

f. Set ±ΔF FREQUENCY to 000.0, and set ±ΔF FREQUENCY VERNIER to 0.

g. Remove the front-panel window of A2 Frequency Control (Figure A4-2).



1. MOVE LOCK TABS TO LEFT ABOUT 1/2 INCH UNTIL THEY UNLATCH WINDOW.
2. REMOVE WINDOW BY PULLING OUT ON LOCK TAB.

Figure A4-2. Frequency Control Front-Panel Window Removal

PERFORMANCE TESTS

A4-8. FREQUENCY RANGE AND ACCURACY TEST (Cont'd)

h. Adjust FREQUENCY CALIBRATE (.5 — 1300 MHz) screw driver adjustment in the middle of exposed subpanel so the FREQ COUNTER MHz reads 700 MHz plus or minus 2 counts of least significant digit (LSD). (The FREQ COUNTER MHz readout will OVERFLOW, dropping the most significant digit (6 or 7) and showing just the last two digits of the CW FREQUENCY plus tenths and hundredths. This allows a more precise adjustment of frequency.)

i. Reinstall the window.

SWEPT FREQUENCY ACCURACY

j. At A2 Frequency Control, set RANGE MHz switch to .5 — 1300, MODE switch to LIN EXPAND, WIDTH switch to START/STOP 1, and SCAN TIME SEC switch to .1 — .01. Set A2 Frequency Control RANGE MHz switch and START and STOP frequency as listed in the table below and read the frequency on the external Electronic Counter.

RANGE MHz Switch Set At A2 Frequency Control	START and STOP FREQUENCY Digital Readout Set At A2 Frequency Control	Frequency Indicated on External Electronic Counter
.5 - 1300	1300. MHz	1300 MHz ± 13 MHz
.5 - 130	130.0 MHz	130.0 MHz ± 1.3 MHz
.5 - 13	13.00 MHz	13.00 MHz ± 0.13 MHz
.5 - 1300	0700. MHz	700 MHz ± 13 MHz
.5 - 130	070.0 MHz	70.00 MHz ± 1.3 MHz
.5 - 13	07.00 MHz	7.00 MHz ± 0.13 MHz
.5 - 1300	0010. MHz	10.0 MHz ± 13 MHz
.5 - 130	001.0 MHz	1.00 MHz ± 1.3 MHz
.5 - 13	01.00 MHz	1.00 MHz ± 0.13 MHz

PERFORMANCE TESTS

A4-9. CW FREQUENCY STABILITY TEST

SPECIFICATION:

Frequency Stability over 10 Minute period after one hour initial warmup: better than ±0.01% of reading ±0.01% of frequency range.

DESCRIPTION:

The frequency of the RF output signal is indicated on an external Electronic Counter over a period of 10 minutes (after an initial warmup period of one hour).

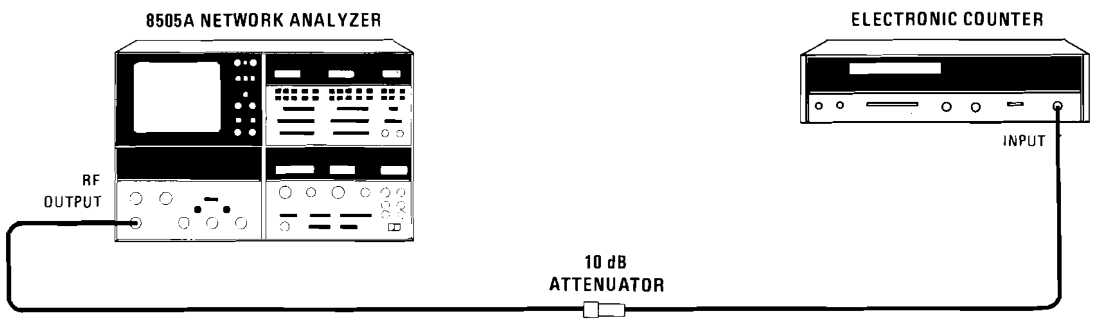


Figure A4-3. Frequency Stability Test Setup

EQUIPMENT:

Electronic Counter . . . . HP 5340A
10 dB Attenuator . . . . HP 8491B Option 010

PROCEDURE:

a. Set 8505A controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm . . . . −10

On A2 Frequency Control:
RANGE MHz . . . . .5 — 13
MODE . . . . LIN EXPAND
WIDTH . . . . CW
CW FREQUENCY MHz and VERNIER 10.000

b. Connect equipment as shown in Figure A4-3.

c. Allow one hour warmup for the 8505A temperature to stabilize. If the instrument has been operating more than one hour, wait three minutes for frequency to stabilize, then proceed with the test.

d. Record frequency indicated by external electronic counter. Allow 10 minutes of operation then record electronic counter indication again. The second reading should be within ±2.3 kHz of the first reading.

PERFORMANCE TESTS

A4-10. POWER OUTPUT LEVELING TEST AND ABSOLUTE POWER CALIBRATION

SPECIFICATION:

Output Leveling: ±0.5 dB from 0.5 to 1300 MHz
Output Level Vernier Accuracy: ±1 dB

DESCRIPTION:

The power output is monitored on a power meter while the frequency band is tuned manually. The highest and lowest power spots are noted and the total difference must be less than the specification. The output level vernier is adjusted through its range and the change in power level is read on the power meter.

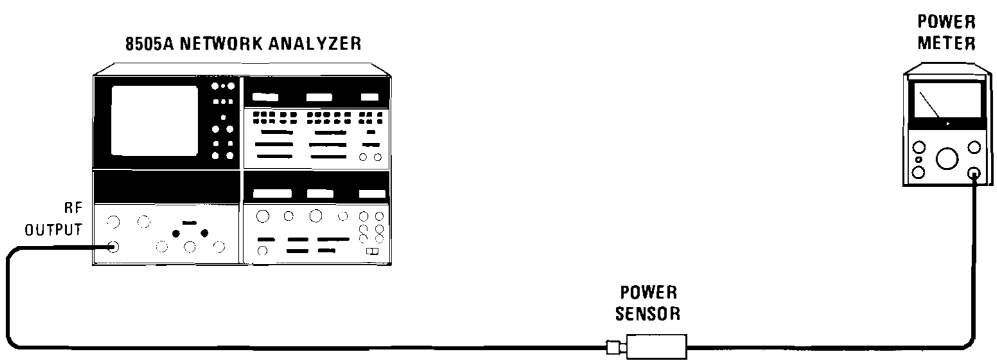


Figure A4-4. Output Leveling Test Setup

EQUIPMENT:

Power Meter .... HP 435A
Power Sensor .... HP 8482A

PROCEDURES:

a. Set 8505A controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm .... 0 dBm
OUTPUT LEVEL Vernier .... 0 dB

On A2 Frequency Control:
RANGE MHz .... 0.5 – 1300
MODE.. LIN FULL
WIDTH .... START/STOP 1
SCAN TIME SEC .... MANUAL

b. Connect equipment as shown in Figure A4-4.

PERFORMANCE TESTS

A4-10. POWER OUTPUT LEVELING TEST AND ABSOLUTE POWER CALIBRATION (Cont'd)

POWER LEVELING

NOTE

If excessive variation occurs at the low or high end of the band, check the high and low end frequencies with a counter to be sure frequency is within the 0.5 to 1300 MHz band.

c. While watching the power meter, turn the MANUAL sweep control from fully counterclockwise to clockwise position. The total variation between the highest power and the lowest power indication across the band should be ≤1 dB (or ±0.5 dB).

OUTPUT LEVEL VERNIER

d. On A1 Source/Converter, set OUTPUT LEVEL dBm to +10 dBm and VERNIER to 0.

On A2 Frequency Control, set:

MODE . . . . LIN EXPAND
WIDTH . . . . CW
CW FREQUENCY . . . . 30.0 MHz

The power meter should indicate +10 dBm ±1 dB ± tolerance of power meter used. Set OUTPUT LEVEL dBm VERNIER to —12 dB and power meter should indicate —2 dBm ± 1 dBm ± tolerance of the power meter. (If slightly out of tolerance, go to Paragraph A5-14 for adjustment.)

A4-11. POWER OUTPUT RANGE TEST

SPECIFICATIONS:

Power Output Range: +10 dBm to —72 dBm
Attenuator Accuracy: ±1.5 dB over the 70 dB range.

DESCRIPTION:

The power output and attenuator accuracy is measured by substitution, using an external step attenuator.

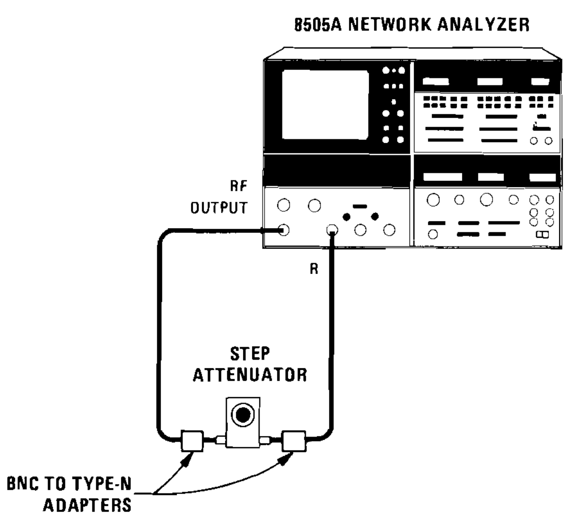


Figure A4-5. Power Output Range Test Setup

PERFORMANCE TESTS

A4-11. POWER OUTPUT RANGE TEST (Cont'd)

EQUIPMENT:

0 – 110 dB Step Attenuator (calibrated at 30 MHz). . . . . HP 355D Opt. H89
Type-N female to BNC male adapter (2 required). . . . . HP 1250-0077

PROCEDURES:

a. Set 8505A controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm . . . . +10 dBm
OUTPUT LEVEL VERNIER . . . . 0 dB
INPUT LEVEL dBm MAX . . . . —10 dBm

On A2 Frequency Control:
RANGE MHz . . . . 0.5 — 130
MODE. . . . . LIN EXPAND
WIDTH . . . . CW±ΔF
SCAN TIME SEC . . . . 0.1 — .01
CW FREQUENCY MHz . . . . 30.0 MHz
±ΔF FREQUENCY . . . . 00.00 MHz
MARKERS 1
Markers 1 . . . . Center of CRT

On A3 Signal Processor:
Channel 1:
INPUT. . . . . R
MODE. . . . . MAG
SCALE/Div . . . . 1 dB/DIV

Channel 2:
MODE. . . . . OFF

CRT Display:
BW (Bandwidth) . . . . 10 kHz
VIDEO FILTER . . . . On (in)

b. Connect equipment as shown in Figure A4-5. Set external step attenuator to 80 dB.

c. On Signal Processor CRT Display, press REF LINE POSN and adjust CH 1 up-down control to place the trace on the center line; press REF LINE POSN pushbutton again for normal operation.

d. Press Channel 1 DISPLAY MKR, then ZRO to place CRT trace on the center graticule line.

e. Step the OUTPUT LEVEL dBm switch to each 10 dB step between +10 dBm and —60 dBm and step the external step attenuator as listed in the following table. The step-to-step accuracy should be within ±1.5 major divisions of the center line (i.e., ±1.5 dB) ± calibration correction of the external attenuator at each step.

PERFORMANCE TESTS

A4-11. POWER OUTPUT RANGE TEST (Cont'd)

OUTPUT LEVEL dBm SETTING	EXTERNAL STEP ATTENUATOR SETTING
+10 dBm	80 dB
0 dBm	70 dB
—10 dBm	60 dB
—20 dBm	50 dB
—30 dBm	40 dB
—40 dBm	30 dB
—50 dBm	20 dB
—60 dBm	10 dB

A4-12. MAGNITUDE REFERENCE OFFSET AND MARKER ACCURACY TEST

SPECIFICATION:

Magnitude Reference Offset:
Range: ±199.9 dB
Accuracy: ±0.03 dB ±0.003 dB/dB of offset.

DESCRIPTION:

The trace is zeroed on the center reference line, then the trace is offset by ±190 dB. The resultant position of the trace is read on the marker.

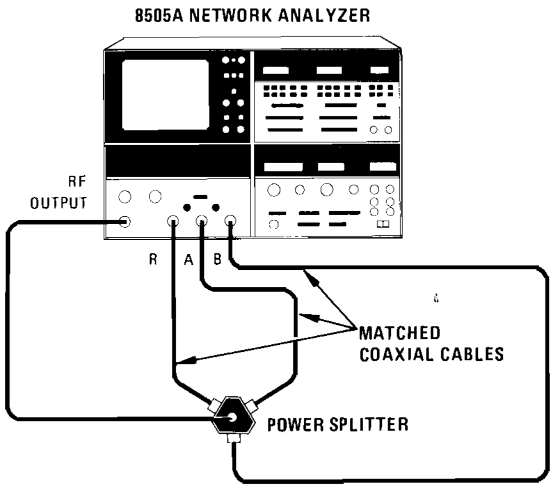


Figure A4-6. Marker Accuracy Test Setup

EQUIPMENT:

Three-Way Power Splitter . . . . HP 11850A
Matched Cable Kit. . . . . HP 11851A

PERFORMANCE TESTS

A4-12. MAGNITUDE REFERENCE OFFSET AND MARKER ACCURACY TEST (Cont'd)

PROCEDURE:

RECTANGULAR MARKER ZERO

a. Connect equipment as shown in Figure A4-6.

b. On 8505A, set the controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm . . . . —10 dBm
OUTPUT LEVEL VERNIER . . . . 0 dB
INPUT LEVEL dBm MAX . . . . —10 dBm

On A2 Frequency Control:
RANGE MHz . . . . .0.5 — 130
MODE. . . . . LIN EXPAND
WIDTH . . . . CW ±ΔF
CW FREQUENCY. . . . . .30.0 MHz
±ΔF FREQUENCY 00.0
MARKERS 1
Marker 1 . . . . .Marker at Center Screen

On A3 Signal Processor:
Channel 1:
INPUT. . . . . A/R
MODE. . . . . MAG
SCALE/DIV . . . . 0.1 dB/DIV

Channel 2:
MODE. . . . . .OFF

Electrical Length:
MODE. . . . . .OFF

CRT Display Section:
BANDWIDTH (BW) . . . . 10 kHz
VIDEO FILTER . . . . On (in)

Press REF LINE POSN, adjust CH1 up-down control to place the reference line at the center of the CRT, then press REF LINE POSN again for normal operation.

c. Press Channel 1 DISPLAY MKR pushbutton, then press and hold ZRO pushbutton approximately 10 seconds until the trace settles on center graticule line. The Channel 1 marker readout should indicate 0.00 dB ± 0.01 dB.

POLAR MARKER ZERO

d. Set Channel 1 MODE switch to POLAR MAG. Set SCALE/DIV to POLAR 1. On CRT Display panel, press BEAM CENTER pushbutton. Adjust up-down and left-right controls to center polar dot at center of CRT graticule. Press BEAM CENTER again for normal operation.

PERFORMANCE TESTS

A4-12. MAGNITUDE REFERENCE OFFSET AND MARKER ACCURACY TEST (Cont'd)

e. Press Channel 1 DISPLAY MKR, then ZRO pushbuttons. The dot (and marker) should be displayed within ±3 mm of the outside circle on CRT graticule.

f. Set Channel 1 MODE switch to POLAR PHASE. Press DISPLAY ZRO pushbutton. The dot trace (and marker) should be at 0 degrees ±1 degree on CRT graticule.

MARKER ACCURACY

g. Set 8505A controls as follows:

Channel 1:
INPUT . . . . A/R
MODE . . . . MAG
SCALE/DIV . . . . 20 dB/DIV

Channel 2:
MODE . . . . OFF

h. On Channel 1, press DISPLAY MKR, then ZRO pushbuttons to place the trace on the center line of CRT.

i. Press Channel 1 DISPLAY REF, then press REF OFFSET pushbuttons to offset the trace by +190.0 dB as indicated on the digital readout.

j. Press Channel 1 DISPLAY MKR and the digital readout should be −190.0 dB ±0.6 dB.

k. Press Channel 1 DISPLAY ZRO pushbutton to place the CRT trace on the center line.

l. Press Channel 1 DISPLAY REF, then press REF OFFSET pushbuttons to offset the trace by −190.0 dB as indicated on the digital readout.

m. Press Channel 1 DISPLAY MKR and the digital readout should be +190.0 dB ±0.6 dB.

A4-13. RECEIVER NOISE FLOOR

SPECIFICATION:

Noise floor in 10 kHz Bandwidth: − 95 dBm (0.5 to 2 MHz)
− 100 dBm (2 to 10 MHz)
− 110 dBm (10 to 1300 MHz)

DESCRIPTION:

The noise floor is measured by offsetting the reference −95 dB (0.5 to 2 MHz), −100 dB (2 to 10 MHz), and −110 dB (10 to 1300 MHz). Each signal at the three input ports is compared with the −95 dBm, −100 dBm, or −110 dBm reference line to verify that the noise floor is below −95 dBm, −100 dBm, or −110 dBm.

A4-13. RECEIVER NOISE FLOOR (Cont'd)

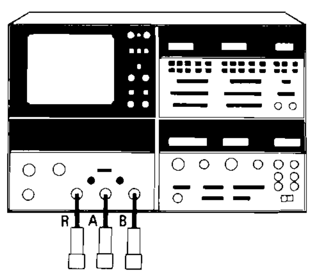


Figure A4-7. Noise Floor Test Setup

EQUIPMENT:

50 Ohm Termination (3 required) . . . . HP 909A Option 012

PROCEDURE:

a. Connect equipment as shown in Figure A4-7.

b. Set 8505A Controls as follows:

On A1 Source/Converter:
- OUTPUT LEVEL dBm . . . . —60 dBm
- OUTPUT LEVEL VERNIER . . . . 0 dB
- INPUT LEVEL dBm MAX . . . . —30 dBm

On A2 Frequency Control:
- RANGE MHz . . . . 0.5 — 13
- MODE . . . . LIN EXPAND
- WIDTH . . . . START/STOP 1
- START FREQUENCY . . . . 00.50 MHz
- STOP FREQUENCY . . . . 02.00 MHz
- MARKERS 1
- Marker 1 . . . . Center of CRT
- SCAN TIME SEC . . . . 10 — 1
- SCAN TIME Vernier . . . . Fully Clockwise
- TRIGGER . . . . AUTO

On A3 Signal Processor:

Channel 1:
- INPUT . . . . R
- MODE . . . . MAG
- SCALE/DIV . . . . 10 dB/DIV

Channel 2:
- MODE . . . . OFF

PERFORMANCE TESTS

A4-13. RECEIVER NOISE FLOOR (Cont'd)

CRT Display:
BANDWIDTH kHz . . . . 10 kHz
VIDEO FILTER . . . . On (in)

NOISE FLOOR FROM 0.5 to 2 MHz

c. On Signal Processor Display, press REF LINE POSN pushbutton, then adjust CH 1 up-down control to place the CRT reference trace on the center graticule line. Press REF LINE POSN pushbutton again for normal operation.

d. At Channel 1, press DISPLAY REF, then CLR pushbutton until REL light goes out (if it was lit). Set INPUT switch to A, repeat above procedures then set INPUT switch to B and repeat above procedures. Return Channel 1 INPUT switch to R position.

e. At Channel 1, press REF OFFSET pushbuttons to obtain —95 dB offset. The CRT trace should be below the center graticule line. This shows the noise floor below —95 dBm.

f. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line.

g. Set Channel 1 INPUT switch to "B". The CRT trace should be below the center graticule line.

NOISE FLOOR FROM 2 TO 10 MHz

h. Set START frequency to 02.00 MHz and STOP frequency to 10.00 MHz. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain —100 dB offset. The CRT trace should be below the center gratidule line. This shows the noise floor below —100 dBm.

i. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line.

j. Set Channel 1 INPUT switch to "R". The CRT trace should be below the center graticule line.

NOISE FLOOR FROM 10 TO 1300 MHz

k. Set RANGE switch to .5 — 1300 MHz. Set START frequency to 0010 MHz and STOP frequency to 1300 MHz. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain —110 dB offset. The CRT trace should be below the center graticule line. This shows the noise floor below —110 dBm.

l. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line.

m. Set Channel 1 INPUT switch to "B". The CRT trace should be below the center graticule line.

A4-14. CROSSTALK ISOLATION

SPECIFICATION:

Crosstalk Error Limits: >100 dB isolation between inputs.

PERFORMANCE TESTS

A4-14. CROSSTALK ISOLATION (Cont'd)

DESCRIPTION:

A signal of —10 dBm is applied to the "R" Channel inputs. The "A" and "B" Channels are terminated and the channel signal is displayed on the CRT display. The displayed signal of Channel "A" should be 100 dB below the —10 dBm level of the "R" port showing isolation between ports. The other ports are checked in the same manner.

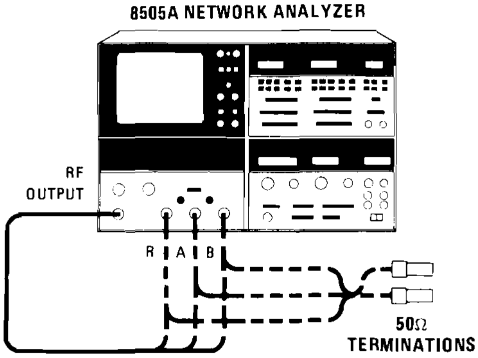


Figure A4-8. Crosstalk Isolation Test Setup

EQUIPMENT:

50 Ohm Termination (2 required) .... HP 909A Option 012

PROCEDURE:

NOTE

It is possible to verify the 100 dB crosstalk specifications only over the 10—1300 MHz range where the noise level is below —110 dBm.

a. Set 8505A Controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm .... —10 dBm
OUTPUT LEVEL VERNIER .... 0 dB
INPUT LEVEL dBm MAX .... —10 dBm

On A2 Frequency Control:
RANGE MHz .... 0.5 – 1300
MODE .... LIN EXPAND
WIDTH .... START/STOP 2
START FREQUENCY .... 0010 MHz
STOP FREQUENCY .... 1300 MHz
MARKERS 1
Marker 1 .... Midscreen
SCAN TIME SEC .... 10 – 1
SCAN TIME VERNIER .... Fully Clockwise
TRIGGER .... AUTO

A4-14. CROSSTALK ISOLATION (Cont'd)

On A3 Signal Processor:

Channel 1:

INPUT . . . . A

MODE . . . . MAG

SCALE/DIV . . . . 10 dB/DIV

Channel 2:

MODE . . . . OFF

CRT Display:

BANDWIDTH kHz . . . . 10 kHz

VIDEO FILTER . . . . Off (out)

b. Connect equipment as shown in Figure A4-8 with the RF output cable connected to "R" port and "A" and "B" ports terminated with 50-ohm loads.

c. At Channel 1, press CLR pushbutton until REL light goes out (if it was lit). Set INPUT switch to A, repeat above procedure, then set INPUT switch to B and repeat above procedure. Return Channel 1 INPUT switch to A position.

d. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain −110 dB offset. The CRT trace should be below the center graticule line for 100 dB of isolation.

e. Set Channel 1 INPUT switch to "B" and the CRT trace should be below the center graticule line.

f. Change setup by moving 50-ohm loads to port "R" and "B" and connect cable to port "A". Set Channel 1 INPUT switch to "R" and the CRT trace should be below the center graticule line.

g. Set Channel 1 INPUT switch to "B" and the CRT trace should be below the center graticule line.

h. Change setup by moving 50-ohm loads to ports "R" and "A" and connect cable to port "B". Set Channel 1 INPUT switch to "R" and the CRT trace should be below the center graticule line.

i. Set Channel 1 INPUT switch to "A" and the CRT trace should be below the center graticule iine.

A4-15. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE

SPECIFICATION:

Absolute Magnitude Frequency Response: $\leqslant \pm 1.5$ dB

Magnitude Tracking Frequency Response: $\leqslant \pm 0.3$ dB

Phase Frequency Response: $\leqslant \pm 3°$ from 0.5 to 750 MHz
$\leqslant \pm 5°$ from 750 to 1300 MHz

Group Delay: ± 1 ns from 0.5 to 1300 MHz.

DESCRIPTION:

The receiver magnitude frequency response is tested by applying the RF OUTPUT first directly to the three individual ports. If the indication is slightly out of specifications, the RF OUTPUT is sent through a power splitter to one of the INPUT ports and to a power meter. The common mode power variations due to the source as indicated on the power meter is subtracted from the variations on the CRT trace, giving a resultant variation due only to the receiver and display section.

PERFORMANCE TESTS

A4-15. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE (Cont'd)

The receiver frequency response in ratio measurement mode may be read directly from the CRT display since all common mode variations due to the source are cancelled.

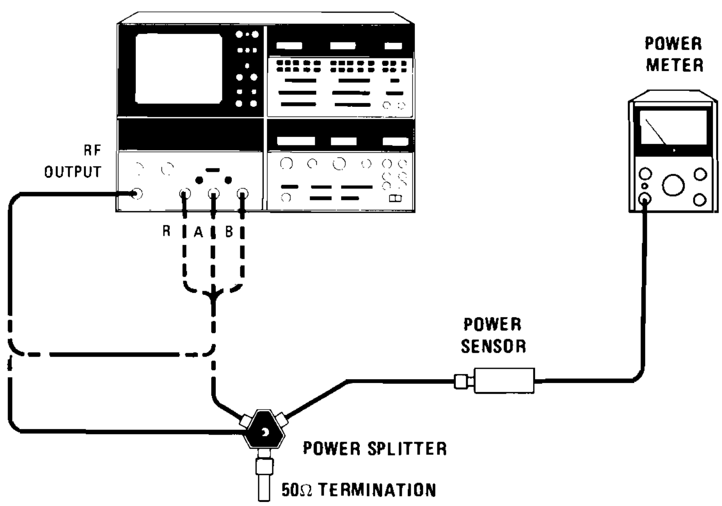


Figure A4-9. Absolute Magnitude Frequency Response Test Setup

EQUIPMENT:

Power Meter	HP 435A
Power Sensor	HP 8482A
Three-way Power Splitter	HP 11850A
50-Ohm Termination	HP 909A Option 012

PROCEDURE:

ABSOLUTE MAGNITUDE FREQUENCY RESPONSE

a. On 8505A, set the controls as follows:

On A1 Source/Converter:

OUTPUT LEVEL dBm	−10 dB
OUTPUT LEVEL VERNIER	−10 dB
INPUT LEVEL dBm MAX	−10

On A2 Frequency Control:

RANGE MHz	0.5 — 1300
MODE	LIN FULL
WIDTH	START/STOP 1
SCAN TIME SEC	1 – 0.1
SCAN TIME VERNIER	Fully Counterclockwise

NOTE

It may be necessary to make slight adjustment at 0.50 MHz of Frequency Calibrate pot behind FREQUENCY CONTROL front panel. (See paragraph A4-8.)

MARKERS	1
Marker 1	Midrange

PERFORMANCE TESTS

A4-15. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE (Cont'd)

On A3 Signal Processor:
Channel 1:
INPUT . . . . R
MODE . . . . MAG
SCALE/DIV . . . . 0.5 dB/DIV

Channel 2:
MODE . . . . OFF

CRT Display:
REF LINE POSN . . . . Center Graticule Line
BW . . . . 10 kHz On (in)
VIDEO FILTER . . . . Off (out)

b. Connect equipment as shown in Figure 4-9 with "R" INPUT cable connected directly to RF OUTPUT connector.

c. Press DISPLAY CLR, MKR, then ZRO pushbuttons. Observe the highest and lowest point on the CRT trace between 0.5 and 1300 MHz. They should not be greater than 3 dB difference. If the CRT trace is out of tolerance, go to step d and cancel the effect of the RF source variations to see if the receiver section is actually within tolerance. If the CRT trace is within tolerance, go to step h and check "A" input port. If "A" port has been checked, go to step i and check "B" input port.

d. Connect equipment as shown in Figure A4-9, with RF OUTPUT to center of Power Splitter and one leg of power splitter to port "R" and the other leg to Power Sensor and Power Meter.

e. Set Marker 1 to the point on CRT trace that is maximum. Note Marker reading and Power Meter reading.

f. Set Marker 1 to the point on CRT trace that is minimum. Adjust OUTPUT LEVEL VERNIER and step attenuator to set Power Meter to the same indication noted in step e.

g. Subtract the Marker indication noted in step e from the displayed marker reading. The difference should be $\leq$3 dB.

h. Disconnect RF Cable from "R" INPUT and connect to "A" INPUT. Set Signal Processor Channel 1 INPUT switch to A. Repeat preceding step c and observe the power level variations for "A" INPUT.

i. Disconnect RF Cable from "A" INPUT and connect to "B" INPUT. Set Signal Processor Channel 1 INPUT switch to B. Repeat preceding step c and observe the power level variations for "B" INPUT.

RATIO MEASUREMENT MAGNITUDE FREQUENCY RESPONSE

j. Connect equipment as shown in Figure A4-10 with the power splitter connected to "R", "A", and "B" inputs and Power Meter disconnected from setup.

k. On A2 Frequency Control, set RANGE MHz switch to 0.5 — 1300 MHz position, set MODE to LIN FULL, WIDTH to START/STOP 1, SCAN TIME SEC to 1 — .1, and TRIGGER to AUTO. Set MARKER switch to 1 position and Marker 1 control to approximately 640 MHz.

l. On A3 Signal Processor, set CHANNEL 1 INPUT switch to A/R, set MODE to MAG, and set SCALE/DIV switch to 0.1 dB position. Press DISPLAY MKR, then ZRO pushbutton.

A4-15. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE (Cont'd)

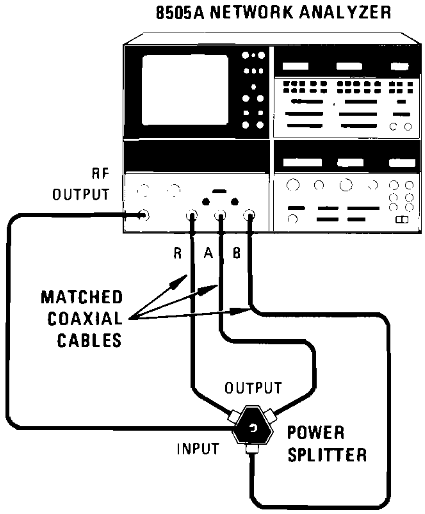


Figure A4-10. Ratio Frequency Response Test Setup

EQUIPMENT:

Three-way Power Splitter . . . . HP 11850A
Matched Cable Kit. . . . . HP 11851A

m. On A2 Frequency Control, adjust MARKER 1 frequency control between 0.5 MHz (left end of CRT trace) and 1300 MHz (right end of CRT trace). Note the highest and lowest reading on the Signal Processor Channel 1 readout. The difference between the highest and lowest reading (peak-to-peak variation due to frequency response) should be ≤0.6 dB.

n. Set Signal Processor Channel 1 INPUT switch to B/R. Press DISPLAY MKR then ZRO pushbuttons. Repeat preceding step.

PHASE MEASUREMENT FREQUENCY RESPONSE

o. Set MODE to LIN EXPAND, WIDTH to START/STOP 1. Set START to 0000. MHz, STOP to 0750 MHz. Set Channel 1 INPUT to B/R, MODE to PHASE, and SCALE/DIV to 2 degrees.

p. Set WIDTH to START/STOP 2. Set START to 750 MHz and STOP to 1300 MHz. Return the WIDTH control to START/ STOP 1.

q. Set ELECTRICAL LENGTH INPUT to B and MODE to LENGTH X1. Press LENGTH pushbuttons to make the overall CRT trace as horizontal as possible.

r. Press Channel 1 DISPLAY MKR, then ZRO pushbutton to position the trace near the center graticule line. The maximum trace deviation from the highest point to the lowest point should be ≤6 degrees (3 divisions). If the reading is out of tolerance, the power splitter tracking may be at fault. Check the power splitter tracking as follows. Reverse the connections to the power splitter legs, then make the phase measurements again and subtract the two readings. The difference in readings is the power splitter tracking error. Correct the original phase measurements by subtracting the power splitter tracking error.

s. Set WIDTH to START/STOP 2 and repeat step r for the 750 to 1300 MHz range. The trace deviation should be ≤ 10 degrees (5 divisions).

t. Repeat steps o through s for A/R measurement except set Channel 1 INPUT switch to A/R in step o and set ELECTRICAL LENGTH INPUT switch to A in step q.

PERFORMANCE TESTS

A4-15. MAGNITUDE, PHASE, AND GROUP DELAY FREQUENCY RESPONSE (Cont'd)

GROUP DELAY FREQUENCY RESPONSE

u. On A3 Signal Processor, set Channel 1 INPUT switch to A/R, MODE switch to DLY and set SCALE/DIV switch to 1 ns. Set Frequency Control MODE switch to LIN FULL.

v. Press Electrical Length DISPLAY CLR Pushbutton. Press Channel 1 DISPLAY MKR, then ZRO pushbuttons to center CRT trace about center graticule line and zero digital readout.

w. On A2 Frequency Control, adjust MARKER 1 frequency control between 0.5 and 1300 MHz and note the highest and lowest reading on the Signal Processor Channel 1 readout. The difference between the highest and the lowest reading (peak-to-peak variation due to frequency response) should be ⩽2 ns.

x. Repeat steps u through w for B/R measurements. Set all switches the same except set Channel 1 INPUT switch to B/R in step u.

A4-16. MAGNITUDE DYNAMIC ACCURACY TEST

SPECIFICATION:

Magnitude Dynamic Accuracy: ⩽±0.01 dB/dB from −20 to −40 dBm
⩽±0.2 dB from −10 to −50 dBm
⩽±0.5 dB from −50 to −70 dBm
⩽±1 dB from −70 to −90 dBm
⩽±2 dB from −90 to −100 dBm
⩽±4 dB from −100 to −110 dBm

DESCRIPTION:

The signal level into the receiver is adjusted by setting the external step attenuator. The signal trace is monitored on the CRT and deviation from the expected position of the trace on the graticule is noted.

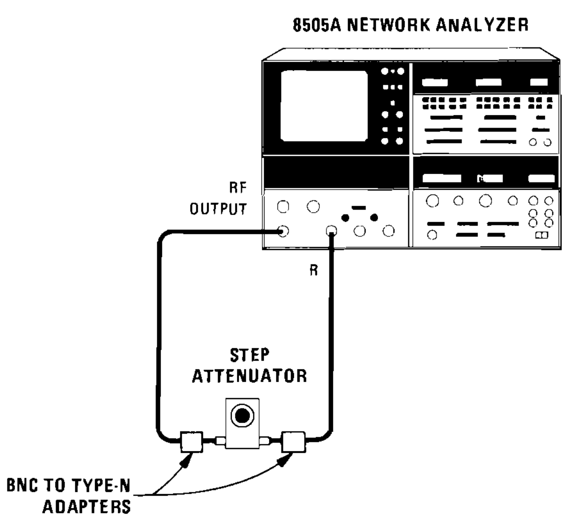


Figure A4-11. Dynamic Range Test Setup

EQUIPMENT: 0 – 110 dB Step Attenuator (calibrated at 20 MHz)........ HP 355D Opt. H89
Type-N female to BNC male Adapter (2 required) .... HP 1250-0077

PERFORMANCE TESTS

A4-16. MAGNITUDE DYNAMIC ACCURACY TEST (Cont'd)

PROCEDURE:

a. On 8505A, set the controls as follows:

On A1 Source/Converter:
- OUTPUT LEVEL dBm 0
- OUTPUT LEVEL VERNIER 0
- INPUT LEVEL dBm MAX . . . . —10

On A2 Frequency Control:
- RANGE MHz . . . . 0.5 — 130
- MODE . . . . LIN EXPAND
- WIDTH . . . . CW±ΔF
- CW FREQUENCY . . . . 30.0 MHz
- ±ΔF FREQUENCY 00.0

On A3 Signal Processor:

Channel 1:
- INPUT . . . . R
- MODE . . . . MAG
- SCALE/DIV . . . . 0.2 dB/DIV

Channel 2:
- MODE . . . . OFF

Electrical Length:
- MODE . . . . OFF

Display Section:
- BANDWIDTH kHz . . . . 10 kHz On (in)
- REF LINE POSN . . . . Reference Line to Center Graticule Line
- VIDEO FILTER . . . . On (in)

b. Connect equipment as shown in Figure A4-11.

c. Connect calibrated attenuator between RF output and input "R", and set to 30 dB. Press Channel 1 DISPLAY MKR, then ZRO pushbuttons until trace settles. Press CHAN 1 DISPLAY REF pushbutton. As attenuator is stepped down, offset —10 dB/step to bring trace back to reference line within limits shown in following table. (It may be necessary to change CHAN 1 SCALE/DIV to less sensitivity settings if trace is off screen.)

d. Repeat step c with attenuator connected to "A" input and Channel 1 INPUT switch to "A".

e. Repeat step c with attenuator connected to "B" input and Channel 1 INPUT switch to "B".

PERFORMANCE TESTS

A4-16. MAGNITUDE DYNAMIC ACCURACY TEST (Cont'd)

External Attenuator Setting	Channel 1 REF OFFSET	OFFSET from REF LINE (Plus attenuator tolerance)
10 dB	+20.0	±0.20 dB
20 dB	+10.0 dB	±0.1 dB
30 dB	0 dB	±0.00 dB
40 dB	−10.0 dB	±0.1 dB
50 dB	− 20.0 dB	±0.2 dB
60 dB	− 30.0 dB	±0.4 dB
70 dB	− 40.0 dB	±0.6 dB
80 dB	− 50.0 dB	±0.8 dB
90 dB	− 60.0 dB	±1 dB
100 dB	− 70.0 dB	±2 dB
110 dB	− 80.0 dB	±4 dB

A4-17. PHASE DYNAMIC RANGE

SPECIFICATION:

Phase Dynamic Accuracy (in 10 kHz Bandwidth):
±0.02 degree/dB from −20 to −40 dBm
±0.5 degree from −10 to −50 dBm
±1 degree from −50 to −70 dBm
±3 degrees from −70 to −90 dBm

DESCRIPTION:

A phase reference level is established on the CRT. Then the signal at the receiver is changed through the dynamic range of the instrument and the change in phase indication is noted.

PERFORMANCE TESTS

A4-17. PHASE DYNAMIC RANGE (Cont'd)

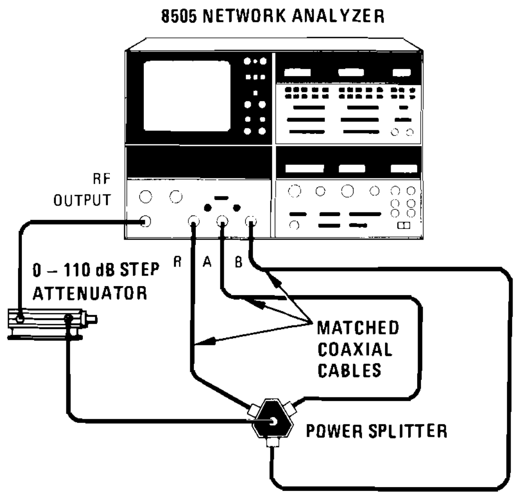


Figure A4-12. Phase Dynamic Range Test Setup

EQUIPMENT:

RF Cable Kit	HP 11851A
3-Way Power Splitter	HP 11850A
Step Attenuator, 0 — 110 dB	HP 8496A

PROCEDURE:

a. On 8505A, set controls as follows:

On A1 Source/Converter:

OUTPUT LEVEL dBm	+10 dB
OUTPUT LEVEL VERNIER	.0
INPUT LEVEL dBm MAX	—10

On A2 Frequency Control

RANGE MHz	0.5 — 130
MODE	LIN EXPAND
WIDTH	CW ±ΔF
SCAN TIME SEC	.1 — .01
CW FREQUENCY	30 MHz
±ΔF FREQUENCY	00.0
MARKERS	1
Marker 1	Center of CRT Screen

On A3 Signal Processor:

Channel 1:

INPUT	A/R
MODE	PHASE
SCALE/DIV	1 degree

PERFORMANCE TESTS

A4-17. PHASE DYNAMIC RANGE (Cont'd)

Channel 2:
MODE . . . . OFF

Electrical Length:
MODE . . . . OFF

Display Section:
BANDWIDTH kHz . . . . 10 kHz On (in)
VIDEO FILTER . . . . On (in)
REF LINE POSN . . . . Adjust Reference Line to CRT center graticule line

b. Connect equipment as shown in Figure A4-12.

c. Set external step attenuator to 10 dB. If "R" OVERLOAD light comes on, adjust OUTPUT LEVEL VERNIER to clear overload. Press Channel 1 DISPLAY MKR, then ZRO pushbuttons to place the CRT trace on the center graticule line.

d. Step external step attenuator from 10 to 50 dB position. (This applies —50 dBm to ports "A" and "R".) The trace should be within ±0.5 degree of Reference Line.

e. Step the external attenuator from 50 to 70 dB position. (This applies —70 dBm to ports "A" and "R".) The CRT trace should be within ±1 degree of Reference Line.

f. Step the external attenuator from 70 to 90 dB position. (This applies —90 dBm to ports "A" and "R".) The CRT trace should be within ±3 degrees of Reference Line.

A4-18. PHASE REFERENCE OFFSET

SPECIFICATION:

Phase Reference Offset:

Range: ±1700 degrees
Accuracy: ±0.3° ±0.5% of offset

DESCRIPTION:

The CW phase signal is observed on the CRT. The signal is offset multiples of 360 degrees and observed if it returns to the reference line.

A4-18. PHASE REFERENCE OFFSET (Cont'd)

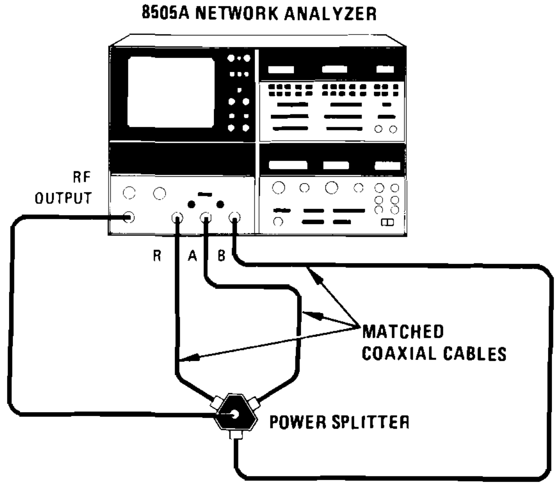


Figure A4-13. Phase Reference Offset Test Setup

EQUIPMENT:

3-Way Power Splitter. . . . . HP 11850A
Matched Type-N Coaxial Cables . . . . HP 11851A

PROCEDURE:

a. On 8505A, set controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm . . . . —10
OUTPUT LEVEL VERNIER 0
INPUT LEVEL dBm MAX . . . . —10

On A2 Frequency Control:
RANGE MHz . . . . .0.5 — 130
MODE. . . . . LIN EXPAND
WIDTH . . . . CW ±ΔF
SCAN TIME SEC . . . . .1 — .01
SCAN TIME VERNIER . . . . Fully Clockwise
TRIGGER. . . . . AUTO
CW FREQUENCY. . . . . 60 MHz
±ΔF FREQUENCY . . . . .4.5 MHz

On A3 Signal Processor:
Channel 1:
INPUT. . . . . A/R
MODE. . . . . PHASE
SCALE/DIV . . . . 1°/DIV

Channel 2:
MODE. . . . . .OFF

PERFORMANCE TESTS

A4-18. PHASE REFERENCE OFFSET (Cont'd)

Electrical Length:
INPUT . . . . A
MODE . . . . OFF

CRT Display:
BANDWIDTH kHz 10
REF LINE POSN . . . . Adjust Reference Line to center of CRT
VIDEO FILTER . . . . On (in)

b. Connect equipment as shown in Figure A4-13.

c. Press Channel 1 DISPLAY MKR, then ZRO pushbuttons to place the CRT trace on the reference line. If trace is not on CRT center line, make slight adjustment with CRT Display CH 1 to place the trace directly on the center line.

d. Press Channel 1 DISPLAY REF. Press REF OFFSET pushbuttons to obtain offset shown below, then check that the phase trace is within the limits of the reference line listed below.

REF OFFSET	TRACE ACCURACY FROM CENTER LINE
±360°	≤± 2.1°
±720°	≤± 3.9°
±1080°	≤± 5.7°
±1440°	≤± 7.5°

A4-19. PHASE ACCURACY AND ELECTRICAL LENGTH TEST

SPECIFICATION:

Phase Accuracy: ±0.01 degrees/degree for ±170 degrees
±0.01 degrees/degree ±0.5 degrees for ±180 degrees.

Polar Accuracy: actual value is within less than a 3 mm circle of displayed value.

Electrical Length Accuracy: ±3% of reading ±1% of length range.

DESCRIPTION:

The hysteresis loop is observed to see that the 180 degree transition occurs at precisely +180 degrees and −180 degrees. The electrical length offset is checked by inserting two phase cycles and reading the resultant Electrical Length digital readout of 720 degrees.

PERFORMANCE TESTS

A4-19. PHASE ACCURACY AND ELECTRICAL LENGTH TEST

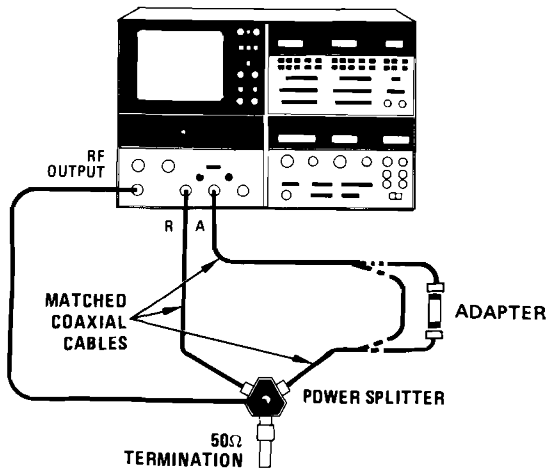


Figure A4-14. Phase Accuracy Test Setup

EQUIPMENT:

50-Ohm Termination	HP 909A Option 012
Type-N Female to Type-N Female Adapter	HP 1250-0777
3-Way Power Splitter	HP 11850A
RF Cable Kit	HP 11851A

PROCEDURE:

PHASE ACCURACY TEST

a. On 8505A, set the controls as follows:

On A1 Source/Converter:

OUTPUT LEVEL dBm	—10
OUTPUT LEVEL VERNIER	.0
INPUT LEVEL dBm MAX	—10

On A2 Frequency Control:

RANGE MHz	0.5 — 130
MODE	LIN EXPAND
WIDTH	CW ±ΔF
CW FREQUENCY	60 MHz
±ΔF FREQUENCY	4.5 MHz
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO
MARKERS	1
Marker 1	60 MHz

PERFORMANCE TESTS

A4-19. PHASE ACCURACY AND ELECTRICAL LENGTH TEST (Cont'd)

On A3 Signal Processor:

Channel 1:

INPUT . . . . A/R
MODE . . . . PHASE
SCALE/DIV . . . . 90°/DIV

Channel 2:

MODE . . . . OFF

CRT Display:

BW (Bandwidth) . . . . 10 kHz
Video Filter . . . . Off (out)

Electrical Length Panel:

MODE . . . . OFF

b. Connect equipment as shown in Figure A4-14 with two 24-inch matched cables connected in series between Port "A" and the 3-way power splitter.

c. Offset the phase trace with the Channel 1 REF OFFSET pushbuttons to place a phase transistion to the right of midscreen as shown in Figure A4-15.

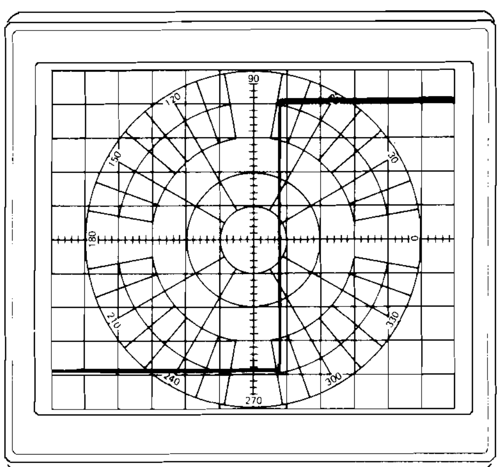


Figure A4-15. CRT Trace of Phase Transistion

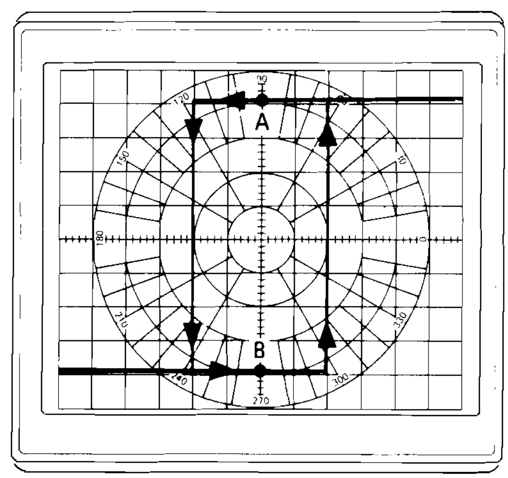


Figure A4-16. Hysteresis Loop of Phase Trace

d. Set SCAN TIME SEC to MANUAL. Sweep through the transition in both forward and reverse direction using the Manual sweep control. Note the hysteresis loop as shown in Figure A4-16.

e. Adjust both CW FREQUENCY and ±ΔF FREQUENCY to make the hysteresis loop six divisions wide and centered on the vertical center line of CRT. (See Figure A4-16.)

NOTE

If either step f or g is out of tolerance, refer to Section V for adjustment of A3A12 Phase Detector.

f. Press Channel 1 DISPLAY MKR. Center trace dot on the vertical center line at point "A" on Figure A4-16 trace. The marker readout should be +180 degrees ±2 degrees.

PERFORMANCE TESTS

A4-19. PHASE ACCURACY AND ELECTRICAL LENGTH TEST (Cont'd)

g. Center trace dot on the vertical center line at point "B" on Figure A4-16 trace. The Channel 1 marker readout should be −180 degrees ±2 degrees.

ELECTRICAL LENGTH LINE STRETCHER TEST

h. Remove extra 24-inch cable and adapter and reconnect Port "A" to the three-way power splitter through one of the matched cables.

i. On Frequency Control, set:

RANGE MHz . . . . 0.5 — 1300 MHz
MODE . . . . LIN EXPAND
WIDTH . . . . CW ±ΔF
±ΔF FREQUENCY . . . . 0 MHz
CW FREQUENCY (read on FREQ COUNTER MHz panel) . . . . 1000 MHz
SCAN TIME SEC . . . . 1 – .1
SCAN TIME VERNIER . . . . Fully Clockwise

On Signal Processor, set:

Channel 1:

INPUT . . . . A/R
MODE . . . . POLAR MAG
SCALE/DIV . . . . POLAR FULL 1

CRT Display:

BW (Bandwidth) . . . . 10 kHz On (in)
VIDEO FILTER . . . . Off (out)

j. At ELECTRICAL LENGTH Panel, set:

INPUT . . . . A
MODE LENGTH X10
VERNIER A . . . . 0 (fully counterclockwise)
DISPLAY CLR . . . . Press and release

k. On Channel 1, press DISPLAY MKR, then ZRO pushbuttons. Set Channel 1 MODE switch to POLAR PHASE, then press DISPLAY ZRO. This should place the trace dot within 3 mm of the outside circle and zero degrees.

l. Press ELECTRICAL LENGTH pushbuttons to add +30 cm length. The trace dot should move around the outside circle back to 0 degrees ±10 degrees.

m. Set ELECTRICAL LENGTH MODE switch to LENGTH X1 position. Press ELECTRICAL LENGTH pushbuttons to read +15 cm. The trace dot should be at 180 degrees ±5 degrees. The same indication appearing on the CRT should appear on the Channel 1 digital readout.

LINEAR PHASE RANGE

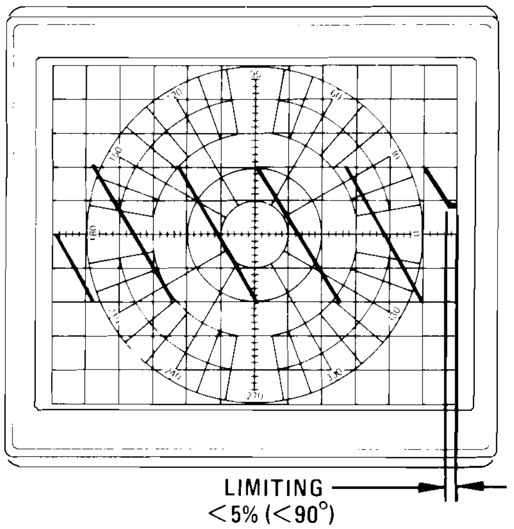
n. Set Channel 1 MODE to PHASE and SCALE/DIV to 90 degrees. Set ELECTRICAL LENGTH MODE switch to PHASE X10 degrees/SCAN. Press Channel 1 DISPLAY REF, then CLR and press ELECTRICAL LENGTH DISPLAY CLR.

PERFORMANCE TESTS

A4-19. PHASE ACCURACY AND ELECTRICAL LENGTH TEST (Cont'd)

o. With ELECTRICAL LENGTH offset pushbuttons, put in +1800 degrees of electrical length. (The electrical length readout displays +180.) Verify that five transitions are displayed and that the linear phase display limits over approximately the last 5% of the trace or 0.6 divisions. (See Figure A4-17, Photo A.)

+1800° (PHOTO A)



−1800° (PHOTO B)

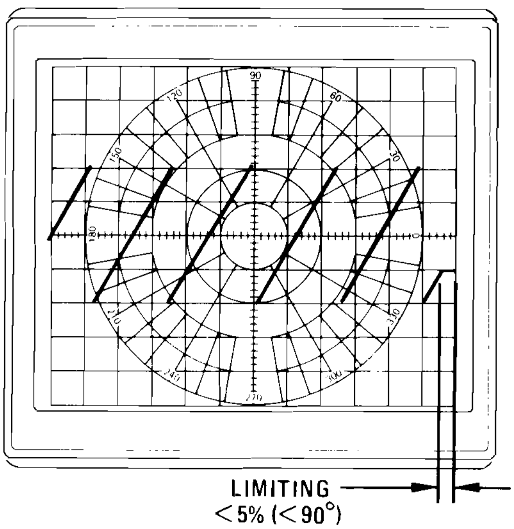


Figure A4-17. Phase Trace with Maximum Electrical Length Added

p. Reduce electrical length with LENGTH pushbuttons until the limiting section just goes off-screen. The digital readout at ELECTRICAL LENGTH panel should be ⩾+173 (⩾+1730 degrees).

q. With ELECTRICAL LENGTH offset pushbuttons, put in −1800 degrees of electrical length. (The electrical length readout displays −180.) Verify that five transitions are displayed and that the linear phase display limits over approximately the last 5% of the trace or 0.6 division. (See Figure A4-17, Photo B.)

r. Reduce electrical length with LENGTH pushbuttons until the limiting section just goes off-screen. The digital readout at ELECTRICAL LENGTH panel should be equal to or more negative than −173 (equal to or more negative than −1730 degrees).

LINEAR PHASE ACCURACY

s. On ELECTRICAL LENGTH panel, set MODE switch to PHASE X 10 degrees/SCAN, set VERNIER A to zero, then press DISPLAY CLR pushbutton.

t. On Channel 1, set MODE switch to PHASE. Press DISPLAY REF, then CLR pushbuttons. Press MKR, then ZRO pushbuttons. Press DISPLAY REF, then REF OFFSET pushbuttons to place −180 degrees of offset in Channel 1.

u. On ELECTRICAL LENGTH panel, press LENGTH pushbutton to obtain two complete phase cycles on the CRT screen. The ELECTRICAL LENGTH digital readout should be ±72 ±2, corresponding to ±720 degrees ±20 degrees of electrical length.

PERFORMANCE TESTS

A4-20. GROUP DELAY ACCURACY TEST

SPECIFICATIONS:

Group Delay Accuracy: ≤±3% of reading ±1 ns for 0.5 to 1300 MHz range, or ±10 ns for 0.5 to 130 MHz range,or ±100 ns for 0.5 to 13 MHz range.

DESCRIPTON:

A 50-foot coaxial cable is measured for group delay using the phase function of the 8505A. The group delay mode is then used to measure the 50-foot cable to obtain a direct group delay reading.

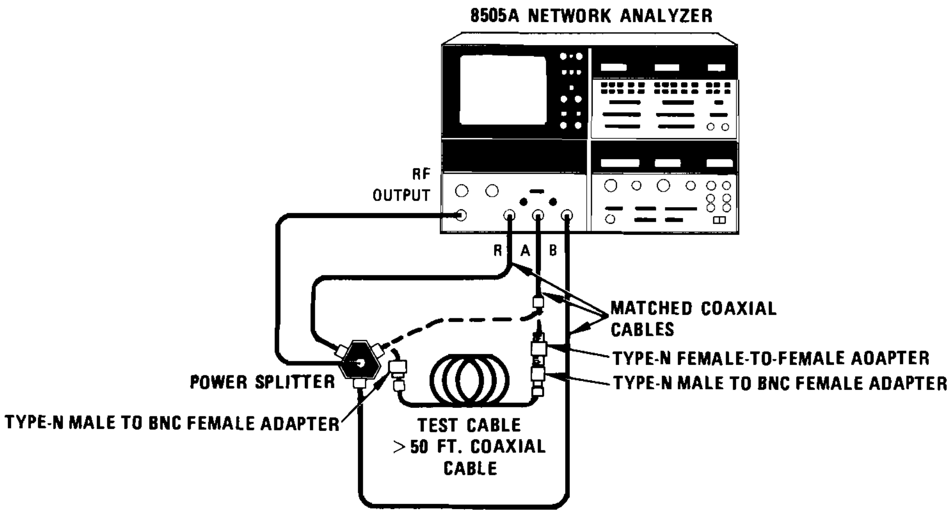


Figure A4-18. Test Setup to Measure Group Delay of Test Cable

EQUIPMENT:

3-Way Power Splitter. . . . . HP 11850A
Matched Type-N Coaxial Cables . . . . HP 11851A
Test Cable . . . . ≥50 feet of coaxial cable (RG-223/U or similar)
BNC to Type-N Adapters (2 required). . . . . HP 1250-0780
Type-N female to Type-N female Adapter . . . . HP 1250-0777

PROCEDURE:

a. A coaxial cable greater than 50 feet in length is used as a standard in the group delay test. Group delay of the test cable is measured with the 8505A in phase mode as follows:

(1) Connect the "Test Cable" in A channel between the matched cable and the power splitter as shown in Figure A4-18.

(2) Set 8505A controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm . . . . −10
OUTPUT LEVEL Vernier 0
INPUT LEVEL dBm MAX . . . . −10

PERFORMANCE TESTS

A4-20. GROUP DELAY ACCURACY TESTS (Cont'd)

On A2 Frequency Control:

RANGE MHz	0.5 — 1300
MODE	LIN EXPAND
WIDTH	CW
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO
MARKERS	1
SCAN TIME SEC VERNIER	Midrange

On A3 Signal Processor:

Channel 1

INPUT	A/R
MODE	PHASE
SCALE/DIV	45 DEG

Channel 2

MODE	OFF

Electrical Length

INPUT	A
MODE	OFF

(3) Set A2 Frequency Control CW FREQUENCY and VERNIER for 700.00 MHz. Press Channel 1 DISPLAY MKR pushbutton, then ZRO pushbutton to zero the digital readout.

(4) On A2 Frequency Control, adjust CW FREQUENCY up in frequency until the marker digital readout again indicates 0 degrees. Record frequency for use in later calculation. (NOTE: The phase change between the two zero points is 360 degrees.)

Frequency = __________ MHz

(5) Calculate the group delay of the ''Test Cable''

$$t_D = \frac{\text{(Phase change in degrees)}}{360 \times \text{(Change in Frequency in Hz)}}$$

EXAMPLE

Change in Phase = 360 degrees

Change in Frequency = 713 MHz − 700 MHz

= 13 MHz

$$t_D = \frac{360 \text{ degrees}}{360\ (13 \times 10^6 \text{ Hz})} = \frac{1}{13 \times 10^6 \text{ Hz}}$$

= 77 ns

PERFORMANCE TESTS

A4-20. GROUP DELAY ACCURACY TEST (Cont'd)

b. Connect equipment as shown in Figure A4-18 with both matched cables connected to power splitter and "test cable" with adapters not connected in circuit.

c. On 8505A, set controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm .... −10
OUTPUT LEVEL VERNIER 0
INPUT LEVEL dBm MAX .... −10

On A2 Frequency Control:
RANGE MHz .... 0.5 — 1300
MODE .... LIN FULL
WIDTH .... START/STOP 1
SCAN TIME SEC .... 1 — .1
SCAN TIME VERNIER .... Fully clockwise
MARKERS 1
Marker 1 .... Midrange
TRIGGER .... AUTO

On A3 Signal Processor:
Channel 1
INPUT .... A/R
MODE .... DLY
SCALE/DIV .... DELAY 1 ns*

Channel 2
MODE .... OFF

Electrical Length
INPUT .... A
MODE .... OFF

d. Press Channel 1 DISPLAY REF pushbutton, then CLR pushbutton until REL light goes out (if it was lit). Then press MKR pushbutton.

e. Connect "Test Cable" between adapters in the A channel. The channel 1 digital readout should indicate the group delay calculated for the "Test Cable" in step a (5) above ±(1 ns +3% of reading).

*SCALE/DIV is set to 1 ns to obtain 0.1 ns resolution. The CRT trace may be off screen.

PERFORMANCE TESTS

A4-21. INPUT IMPEDANCE TEST

SPECIFICATION:

Input Impedance: 50 Ohms
Return Loss: ⩾20 dB (⩽1.22 SWR)

DESCRIPTION:

A short is placed on the TEST port of the Transmission/Reflection Test Set and a reference level is establised. The Test Set is then connected to a port and the return loss is the difference between the reference level and the measured level of signal.

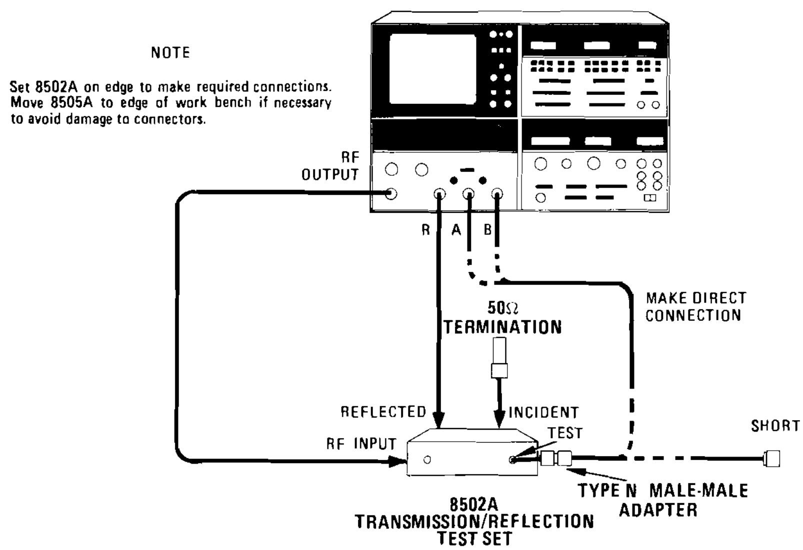


Figure A4-19. Input Impedance Test Setup

EQUIPMENT :

Matched Cable Kit . . . . HP 11851A
Transmission/Reflection Test Set . . . . HP 8502A
Type-N Female Short . . . . HP 11511A
Type-N Male-Male Adapter . . . . HP 1250-0778
50-Ohm Termination. . . . . HP 909A Option 012

PROCEDURE:

a. On 8505A, set controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm . . . . —10
OUTPUT LEVEL VERNIER 0
INPUT LEVEL dBm MAX . . . . —10

On A2 Frequency Control:
RANGE MHz . . . . 0.5 — 1300
MODE. . . . . LIN FULL
WIDTH . . . . START/STOP 1
SCAN TIME SEC . . . . 1 — 0.1

A4-21. INPUT IMPEDANCE TEST (Cont'd)

A2 Frequency Control (cont'd)
SCAN TIME VERNIER . . . . Clockwise
MARKERS 1
Marker 1 . . . . Midscreen

On A3 Signal Processor:
Channel 1:
INPUT . . . . R
MODE . . . . MAG
SCALE/DIV . . . . 5 dB

Channel 2:
MODE . . . . OFF

CRT Display:
BW (Bandwidth) . . . . 10 kHz
VIDEO FILTER . . . . Off (out)

b. Connect equipment as shown in Figure A4-19 with the short connected to the TEST port of the 8502A Transmission/Reflection Test Set and RF INPUT ATTENUATION switch set to 0 dB.

c. Press Channel 1 DISPLAY MKR, then ZRO pushbuttons to center trace on the CRT.

CAUTION

Use only water soluble "grease pencil" on CRT.

d. Draw a grease pencil mark over the trace on the CRT display.

e. Remove short from the TEST connector of the test set and connect the TEST port directly to the 8505A "A" port (no coaxial cable between).

NOTE

One dB is added to the 20 dB return loss specification to account for the directivity of the 8502A Test Set.

f. Press Channel 1 DISPLAY REF pushbutton. Press Channel 1 REF OFFSET pushbuttons to obtain −21 dB at digital display.

g. Compare the CRT trace to the grease pencil reference line. The CRT trace should be below the grease pencil mark for ≥20 dB of return loss (≤1.22 SWR).

h. Disconnect Test Set TEST port from "A" port and connect to "B" port. Repeat step g above.

i. Remove grease pencil marks from CRT display. Disconnect Test Set TEST port from "B" port and connect a short on the TEST port. Disconnect REFLECTED port of Test Set from 8505A "R" port and connect it to "A" port. Set Channel 1 INPUT switch to A.

PERFORMANCE TESTS

A4-21. INPUT IMPEDANCE TEST (Cont'd)

j. Press Channel 1 DISPLAY MKR then ZRO pushbutton to center the trace on the CRT. Draw a grease pencil mark over the trace on the CRT display.

k. Remove short from the Test Set TEST port and connect port to 8505A "R" port.

l. Press Channel 1 DISPLAY REF pushbutton. Press Channel 1 REF OFFSET pushbuttons to obtain −21 dB at digital display.

m. Compare the CRT trace to the grease pencil reference line. The CRT trace should be below the grease pencil mark for ≥20 dB of return loss (≤1.22 SWR).

A4-22. SOURCE IMPEDANCE TEST

SPECIFICATION:

Impedance: 50 Ohms; ≥16 dB return loss at −10 dBm output level (<1.38 SWR).

DESCRIPTION:

The incident signal from the Source/Converter is measured using a directional coupler and the receiver portion of the 8505A. The incident signal contains (1) the initial signal from the source, and (2) the reflected signal. The reflected signal is developed as follows. The original source signal travels down the 50-ohm coaxial cable, sees the open end, and is reflected back to the source. If the reflected signal going into the RF OUTPUT connector sees a perfect 50-ohm source match, no signal is reflected back out of the source. However, the greater the mismatch, the greater the reflected signal out of the source. This reflected signal adds and subtracts in and out of phase with the incident signal and is displayed on the CRT.

PERFORMANCE TESTS

A4-22. SOURCE IMPEDANCE TEST (Cont'd)

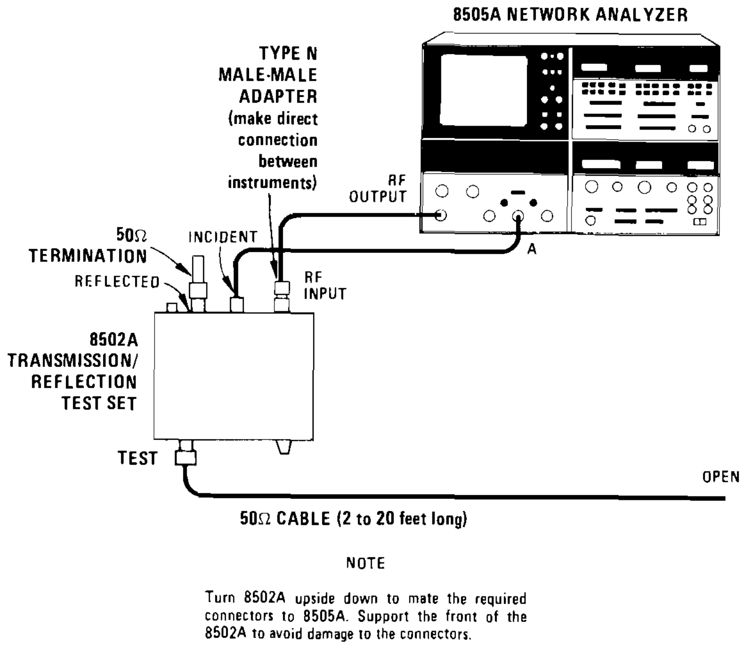


Figure A4-20. Test Setups for Equivalent Source Match

EQUIPMENT:

2-to-20 ft. 50-Ohm Coaxial Cable (Type N)	RG214/U or equivalent
50-Ohm Termination	HP 909A Option 012
Transmission/Reflection Test Set	HP 8502A
Type-N Male Barrel	HP 1250-1475

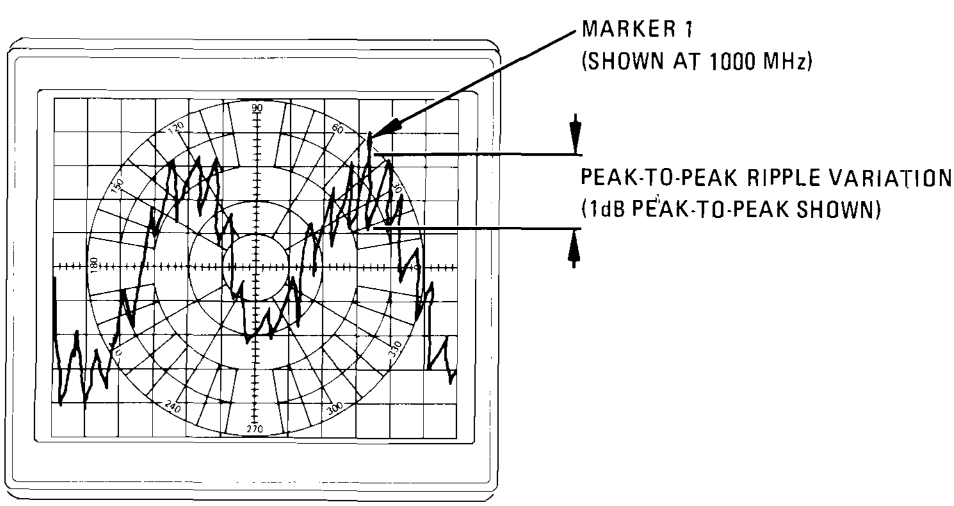


Figure A4-21. Typical Trace of Source Impedance Ripple

PERFORMANCE TESTS

A4-22. SOURCE IMPEDANCE TEST (Cont'd)

PROCEDURE:

a. On 8505A, set controls as follows:

On A1 Source/Converter:

OUTPUT LEVEL dBm	−10 dBm
OUTPUT LEVEL Vernier	0
INPUT LEVEL dBm MAX	−10

On A2 Frequency Control:

RANGE MHz	.5 — 1300
MODE	LIN EXP
WIDTH	START/STOP 1
SCAN TIME SEC	.1 − 0.1
SCAN TIME Vernier	Fully Counterclockwise
TRIGGER	AUTO
START FREQUENCY	100 MHz
STOP FREQUENCY	1300 MHz
MARKERS	1

On A3 Signal Processor:

Channel 1

INPUT	A
MODE	MAG
SCALE/DIV	0.5 dB

Channel 2

MODE	OFF

b. Connect equipment as shown in Figure A4-20. Set 8502A RF INPUT ATTENUATION to 0 dB.

NOTE

A single section of 2 to 20 feet of 50 ohm cable is required to avoid mismatch of connectors.

c. Press Channel 1 DISPLAY MKR then ZRO pushbuttons. The trace should be displayed on CRT.

d. Select point on trace near the top or bottom of trace where adjacent ripple cycles may be measured. Adjust Marker 1 to place the Marker 1 diamond on the area where the ripples are measured as shown in Figure A4-21. Read the MARKER 1 frequency from FREQ COUNTERdigital display.(EXAMPLE: 1000 MHz.) Note maximum ripple in this area. (EXAMPLE: 1 dB peak-to-peak.)

e. Use Table A4-1 to calculate the loss in the coaxial cable in the test setup and Figure A4-7 to determine the return loss and SWR that corresponds to the ripple measured in step d. The SWR should be ≤1.38 (≥16 dB RETURN LOSS).

PERFORMANCE TESTS

A4-22. SOURCE IMPEDANCE TEST (Cont'd)

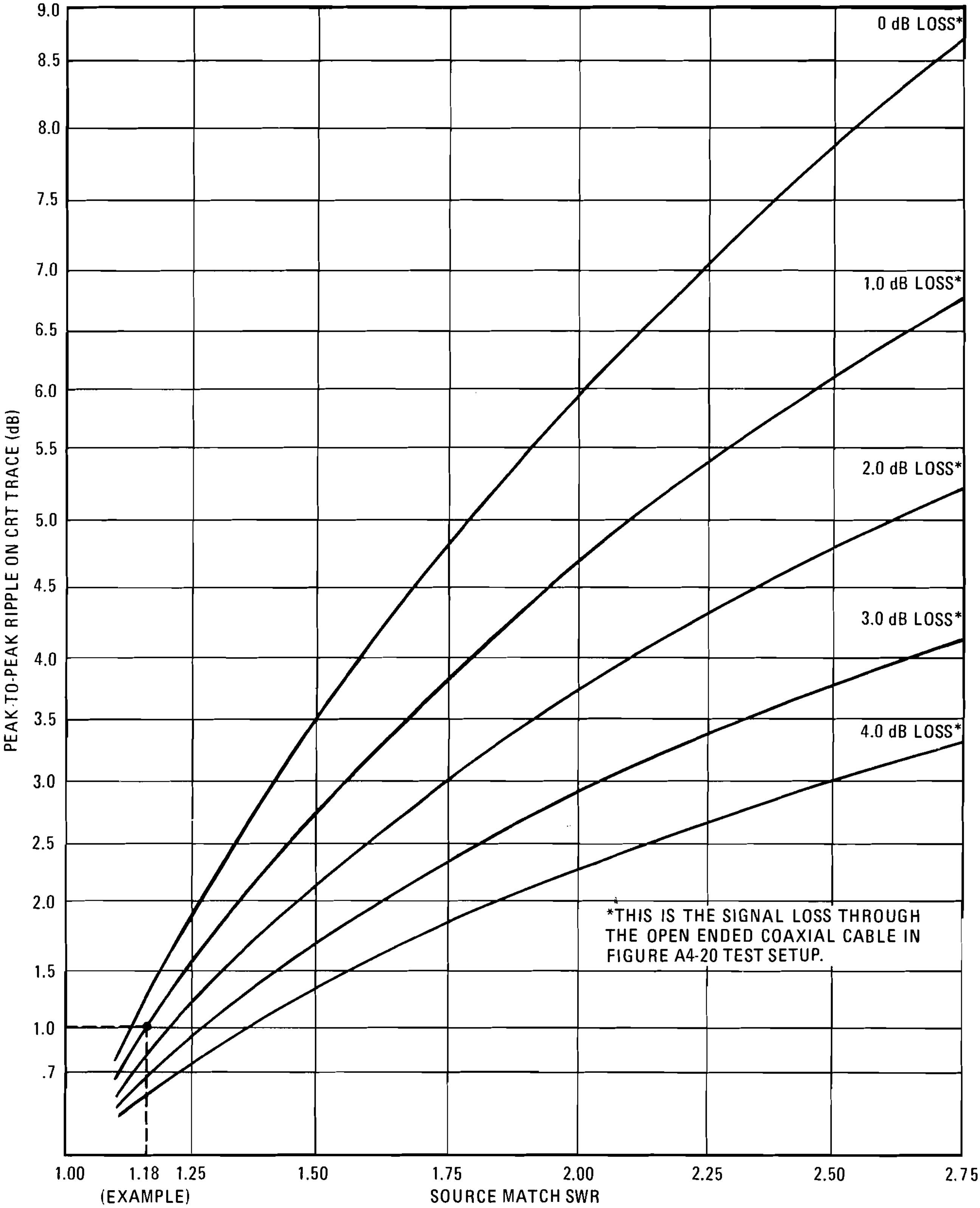


Figure A4-22. Graph to Convert Ripple on Trace to Source Match SWR

PERFORMANCE TESTS

A4-22. SOURCE IMPEDANCE TEST (Con t'd)

Table A4-1. Loss in Coaxial Cable

RG Cable Type	Loss in dB Per 100 Feet					
	0.1 GHz	0.2 GHz	0.4 GHz	0.6 GHz	1 GHz	3 GHz
58/U	2.4	3.6	5.2	6.6	8.8	16.7
98/U	2.3	3.4	5.2	6.5	9.0	17
55A/U	4.8	7.0	10.5	13.0	17	32
58A/U	6.2	9.2	14.0	17.5	23.5	45
58C/U	6.2	9.2	14.0	17.5	23.5	45
177/U	0.95	1.5	2.4	3.2	4.5	9.5
212/U	2.4	3.6	5.2	6.6	8.8	16.7
213/U	2.1	3.1	5.0	6.5	8.8	17.5
214/U	2.3	3.4	5.2	6.5	9.0*	17
215/U	2.1	3.1	5.0	6.5	8.8	16.7
217/U	1.5	2.3	3.5	4.4	6.0	11.7
218/U	0.95	1.5	2.4	3.2	4.5	9.5
219/U	0.95	1.5	2.4	3.2	4.5	9.5
220/U	0.69	1.12	1.85	–	3.6	7.7
221/U	0.69	1.12	1.85	–	3.6	7.7
223/U	4.8	7.0	10.5	13.0	17.0	32
224/U	1.5	2.3	3.5	4.4	6.0	11.7

* Example: 9 dB/100 ft. for RG214/U at 1 GHz. Therefore, 12 ft. = 1 dB loss.

EXAMPLE

(1) On Table A4-1, look under 1 GHz (1000 MHz) for Coaxial Cable type RG 214/U used in test setup. 100 ft. length has a loss of 9.0 dB. Therefore a 12 ft. length has a loss of approximately 1.0 dB.

(2) On Figure A4-22, select the 1.0 dB loss curve.

(3) The ripple shown in Figure A4-21 is 1 dB peak-to-peak. Therefore, Figure A4-22 shows SWR = 1.18 or Return Loss of 21.6 dB.

PERFORMANCE TESTS

A4-23. SPECTRAL PURITY TEST

SPECIFICATION:

Spectral Purity

Harmonics: ≥25 dB below main signal at +10 dBm output level

Sub-harmonic and Spurious Signals: Below −50 dBm at +10 dBm output level

Residual FM: ≤20 Hz rms on 0.5 — 13 MHz range in 1 kHz Bandwidth
≤200 Hz rms on 0.5 — 130 MHz range in 1 kHz Bandwidth
≤2,000 Hz rms on 0.5 — 1300 MHz range in 10 kHz Bandwidth

HARMONICS:

DESCRIPTION:

The CW RF output signal as well as harmonics and spurious signals are observed on the spectrum analyzer.

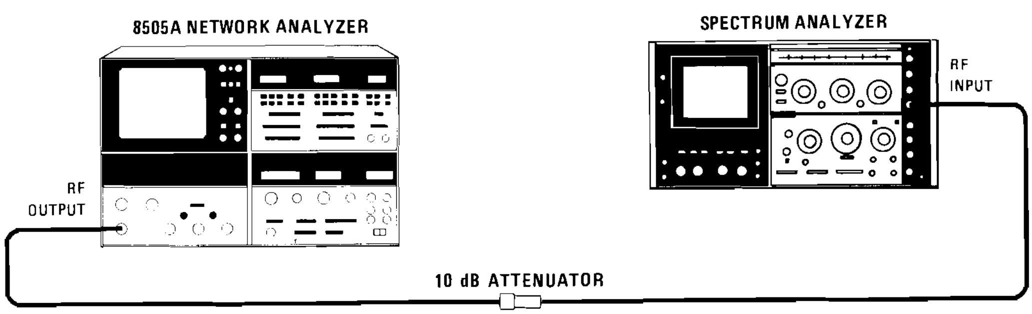


Figure A4-23. Harmonics and Spurious Signal Test Setup

EQUIPMENT:

Spectrum Analyzer .... HP 8553B/8555A/8552B/141T
10 dB Attenuator .... HP 8491A Option 010

PROCEDURE:

a. Set 8505A controls as follows:

On A1 Source/Converter
OUTPUT LEVEL dBm .... +10
OUTPUT LEVEL VERNIER 0

PERFORMANCE TESTS

A4-23. SPECTRAL PURITY TEST (Cont'd)

On A2 Frequency Control:

RANGE MHz	.5 — 1300
MODE	LIN FULL
TRIGGER	AUTO
SCAN TIME SEC	MANUAL

b. Connect equipment as shown in Figure A4-23. Allow equipment to warm up for a minimum of one hour.

c. Slowly sweep manually through .5 — 1300 MHz range and observe harmonics and spurious signals. Identify signal in question as harmonic or non-harmonic and measure the difference in dB between this signal level and the level of the fundamental. Harmonics should be >25 dB below the fundamental (<−15 dBm). Non-harmonic spurious signals should be below −50 dBm.

NOTE

The spectrum analyzer originates some mixing harmonics that may appear on the display. If a signal is in question, increase the spectrum analyzer input attenuation by 10 dB. Note if signal decreases in amplitude by 10 dB, then return the attenuator to the original position. If the signal in question comes from an external source, it will change by 10 dB. If the signal in question originates in the spectrum analyzer, the level will either change by greater or less than 10 dB or may not change at all.

RESIDUAL FM

DESCRIPTION:

The CW output of the 8505A is down-converted to 100 kHz by using a reference signal generator and a mixer. The down-converted signal (100 kHz) is discriminated and the output of the discriminator is amplified and filtered and then measured with an RMS voltmeter. The voltmeter reading in mVrms, is proportional to the frequency instability (residual FM) of the 8505A.

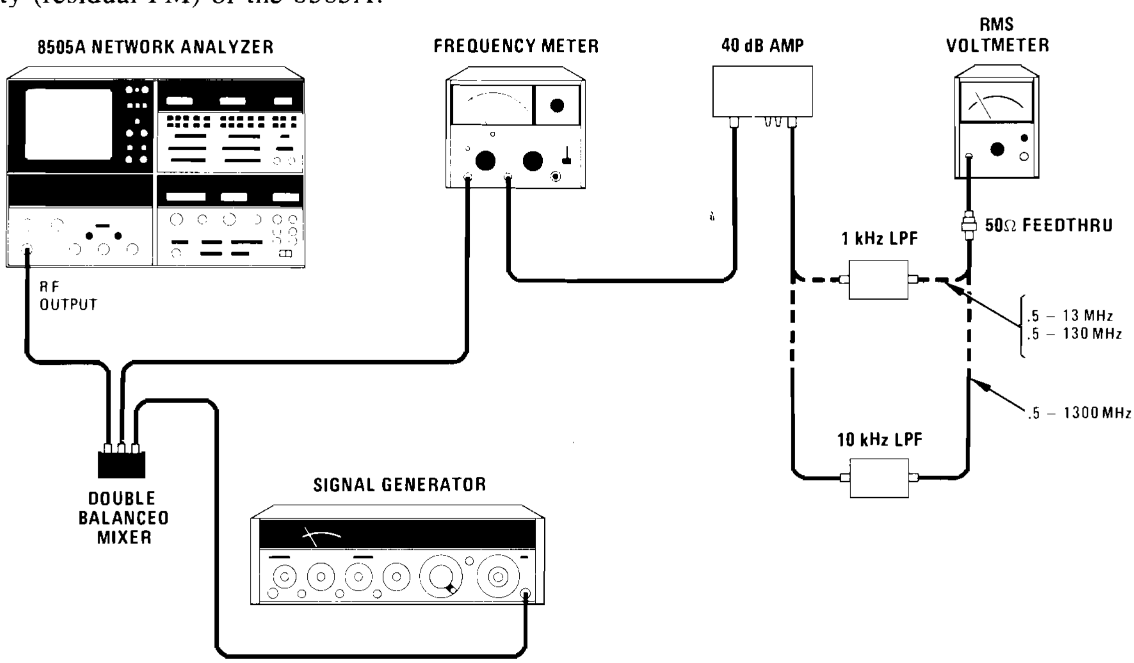


Figure A4-24. Residual FM Test Setup

PERFORMANCE TESTS

A4-23. SPECTRAL PURITY TEST (Cont'd)

EQUIPMENT:

Reference Signal Generator	HP 8640A/B
Balanced Mixer	HP 10514A
Frequency Meter	HP 5210A
12 kHz Filter from Filter Kit	HP 10531A
40 dB Low Noise Amplifier	HP 08640-60506
RMS Voltmeter	HP 3400A
1 kHz Low Pass Filter	HP 08505-60156
10 kHz Low Pass Filter	HP 08505-60155
50 Ohm Feedthrough Termination	HP 10100C

PROCEDURE:

d. Set controls as follows:

8505A

OUTPUT LEVEL dBm	+10
RANGE MHz	.5 — 13
MODE	LIN EXPAND
WIDTH	CW±ΔF
SCAN TIME SEC	100 — 10
CW FREQ	7.00 MHz
±ΔF FREQ	0.000
ΔF VERNIER	0
SCAN TIME SEC VERNIER	Fully clockwise
TRIGGER	AUTO

5210A:

SENSITIVITY	0.01 Volts
RANGE	100 kHz
METER	NORMAL

e. Connect equipment as shown in Figure A4-24 with the 1 kHz Low Pass Filter connected between the 40 dB Amplifier and the 3400A rms voltmeter. Set 3400A range to 10 mV.

Frequency Meter Calibration

f. Install internal shorting board into model 5210A Frequency Meter.

g. Set sensitivity (volts RMS) to CAL (100 kHz) and range to 100 kHz. The meter should display a full scale indication. If not, adjust screwdriver CAL (100 kHz) as necessary.

h. Adjust rear panel DISC GAIN CONTROL for —1 volt dc at DISC OUT jack of 5210A Frequency Meter.

i. Reset SENSITIVITY (volts RMS) to 0.01 Vrms.

j. Set range to 100 kHz. The DISC OUT is now calibrated for 100 kHz/volt or 100 Hz per millivolt.

PERFORMANCE TESTS

A4-23. SPECTRAL PURITY TEST (Cont'd)

Residual FM Test

k. Remove internal shorting board and install the 12 kHz Butterworth low pass filter in 5210A Frequency Meter.

l. Set 8640A/B Reference Signal Generator output to −10 dBm and frequency of 7.1 MHz. Fine tune frequency to obtain a full scale reading of 100 kHz on 5210A Frequency Meter.

m. Voltmeter indication should be less than 7.4 mVrms corresponding to residual FM of <20 Hz rms.

n. Set 8505A WIDTH to CW and fine tune frequency to obtain a full scale reading of 100 kHz on 5210A Frequency Meter. Repeat step j.

o. Change 8505A RANGE MHz to 0.5 — 130 and set WIDTH to CW±ΔF. Set CW Frequency to 70.0 MHz. Change 3400A rms Voltmeter range to 100 mV.

p. Change 8640A/B generator frequency to 70.1 MHz and fine tune to obtain a full scale reading of 100 kHz on 5210A Frequency Meter.

q. Voltmeter indication should be less than 74 mVrms corresponding to residual FM of <200 Hz rms.

r. Set 8505A WIDTH to CW and fine tune frequency to obtain a full scale reading of 100 kHz on 5210A Frequency Meter. Repeat step n.

s. Change 8505A RANGE MHz to 0.5 — 1300. Set WIDTH to CW±ΔF. Set CW frequency to 500 MHz.

t. Replace 1 kHz LPF with 10 kHz LPF as shown in Figure A4-24.

u. Set 5210A Frequency Meter range to 1 MHz.

v. Change 8640A/B generator frequency to 500.2 and fine tune to obtain a reading of 200 kHz on the 5210A Frequency Meter.

w. Voltmeter indication should be less than 88 mVrms corresponding to residual FM of ⩽ 2 kHz rms.

x. Set 8505A WIDTH to CW and fine tune frequency to obtain a reading of 200 kHz on the 5210A Frequency Meter. Repeat step w.

Table A4-2. Performance Test Records (1 of 4)

HEWLETT-PACKARD
Model 8505A Network Analyzer

Test Performed By: ______________________

Serial Number: ______________________

Date: ______________________

Para. No.	Description	Lower Limit	Measured Value	Upper Limit
A4-8	**Frequency Range & Accuracy Test**			
	j. START and STOP Frequency:			
	1300. MHz	1287 MHz	________	1313. MHz
	130. MHz	128.7 MHz	________	131.3 MHz
	13.0 MHz	12.87 MHz	________	13.13 MHz
	0700. MHz	687 MHz	________	713 MHz
	070.0 MHz	68.7 MHz	________	71.3 MHz
	07.00 MHz	6.87 MHz	________	7.13 MHz
	0010. MHz	1 MHz	________	23 MHz
	001.0 MHz	0.1 MHz	________	2.3 MHz
	01.00 MHz	0.87 MHz	________	1.13 MHz
A4-9	**CW Frequency Stability Test**			
	d. Frequency Change after 10 minutes	−2.3 kHz	________	+2.3 kHz
A4-10	**Power Output Leveling Test and Absolute Power Calibration**			
	c. Power Leveling: variation across band		________	±0.5 dB
	d. Output Level Vernier: 0—12 dB range	−3 dBm	________	−1 dBm
A4-11	**Power Output Range Test**			
	e. Accuracy at all settings of OUTPUT LEVEL Control		________	±1.5 dB
A4-12	**Magnitude Reference Offset and Marker Accuracy Test**			
	c. Rectangular Marker Zero	−0.01 dB	________	+0.01 dB
	e. Polar Marker Zero — Magnitude	−3 mm of Outside Circle	________	+3 mm of Outside Circle
	f. Polar Marker Zero — Phase	−1 degree	________	+1 degree
	j. Offset +190 dB & read marker	−184 dB	________	−196 dB
	n. Offset −190 dB & read marker	+184 dB	________	+196 dB
A4-13	**Receiver Noise Floor**			
	e. 0.5 to 2 MHz, "R" Port		________	−95 dBm
	f. 0.5 to 2 MHz, "A" Port		________	−95 dBm

Table A4-2. Performance Test Records (2 of 4)

Para. No.	Description	Lower Limit	Measured Value	Upper Limit
A4-13	**Receiver Noise Floor (cont'd)**			
	g. 0.5 to 2 MHz, "B" Port		______	−95 dBm
	h. 2 to 10 MHz, "B" Port		______	−100 dBm
	i. 2 to 10 MHz, "A" Port		______	−100 dBm
	j. 2 to 10 MHz, "R" Port		______	−100 dBm
	k. 10 to 1300 MHz, "R" Port		______	−110 dBm
	l. 10 to 1300 MHz, "A" Port		______	−110 dBm
	m. 10 to 1300 MHz, "B" Port		______	−110 dBm
A4-14	**Crosstalk Isolation**			
	d. Crosstalk between "R" and "A" Port	100 dB	______	
	e. Crosstalk between "R" and "B" Port	100 dB	______	
	f. Crosstalk between "A" and "R" Port	100 dB	______	
	g. Crosstalk between "A" and "B" Port	100 dB	______	
	h. Crosstalk between "B" and "R" Port	100 dB	______	
	i. Crosstalk between "B" and "A" Port	100 dB	______	
A4-15	**Magnitude, Phase and Group Delay Frequency Response**			
	c. Port "R" Frequency Response		______	3 dB
	h. Port "A" Frequency Response		______	3 dB
	i. Port "B" Frequency Response		______	3 dB
	m. A/R Ratio Measurement Magnitude Frequency Response		______	0.6 dB
	n. B/R Ratio Measurement Magnitude Frequency Response		______	0.6 dB
	r. B/R Phase Measurement Frequency Response 0.5 to 750 MHz		______	6 degrees
	s. B/R Phase Measurement Frequency Response 750 to 1300 MHz		______	10 degrees
	t. A/R Phase Measurement Frequency Response 0.5 to 750 MHz		______	6 degrees
	A/R Phase Measurement Frequency Response 750 to 1300 MHz		______	10 degrees
	w. A/R Group Delay Frequency Response		______	2 ns
	x. B/R Group Delay Frequency Response		______	2 ns
A4-16	**Magnitude Dynamic Accuracy Test**			
	c. Input "R" REF OFFSET: +20 dB	−0.2 dB	______	+0.2 dB
	+10 dB	−0.1 dB	______	+0.1 dB
	0 dB (Ref)	0 dB	______	0 dB
	−10 dB	−0.1 dB	______	+0.1 dB
	−20 dB	−0.2 dB	______	+0.2 dB
	−30 dB	−0.4 dB	______	+0.4 dB
	−40 dB	−0.6 dB	______	+0.6 dB
	−50 dB	−0.8 dB	______	+0.8 dB
	−60 dB	− 1 dB	______	+ 1 dB
	−70 dB	− 2 dB	______	+ 2 dB
	−80 dB	− 4 dB	______	+ 4 dB

Table A4-2. Performance Test Records (3 of 4)

Para. No.	Description	Lower Limit	Measured Value	Upper Limit
A4-16	**Magnitude Dynamic Accuracy Test (cont'd)**			
	d. Input "A" REF OFFSET:			
	+20 dB	−0.2 dB	______	+0.2 dB
	+10 dB	−0.1 dB	______	+0.1 dB
	0 dB (Reference)	0 dB	______	0 dB
	−10 dB	−0.1 dB	______	+0.1 dB
	−20 dB	−0.2 dB	______	+0.2 dB
	−30 dB	−0.4 dB	______	+0.4 dB
	−40 dB	−0.6 dB	______	+0.6 dB
	−50 dB	−0.8 dB	______	+0.8 dB
	−60 dB	− 1 dB	______	+ 1 dB
	−70 dB	− 2 dB	______	+ 2 dB
	−80 dB	− 4 dB	______	+ 4 dB
	e. Input "B" REF OFFSET:			
	+20 dB	−0.2 dB	______	+0.2 dB
	+10 dB	−0.1 dB	______	+0.1 dB
	0 dB (Reference)	0 dB	______	0 dB
	−10 dB	−0.1 dB	______	+0.1 dB
	−20 dB	−0.2 dB	______	+0.2 dB
	−30 dB	−0.4 dB	______	+0.4 dB
	−40 dB	−0.6 dB	______	+0.6 dB
	−50 dB	−0.8 dB	______	+0.8 dB
	−60 dB	− 1 dB	______	+ 1 dB
	−70 dB	− 2 dB	______	+ 2 dB
	−80 dB	− 4 dB	______	+ 4 dB
A4-17	**Phase Dynamic Range**			
	d. −10 to −50 dBm Range, CRT trace tolerance from reference line	−0.5 degree	______	+0.5 degree
	e. −50 to −70 dBm Range, CRT trace tolerance from reference line	−1 degree	______	+1 degree
	f. −70 to −90 dBm Range, CRT trace tolerance from reference line	−3 degrees	______	+3 degrees
A4-18	**Phase Reference Offset**			
	d. Reference Offset, CRT trace tolerance from reference line:			
	± 360 degrees	−2.1 degrees	______	+2.1 degrees
	± 720 degrees	−3.9 degrees	______	+3.9 degrees
	±1080 degrees	−5.7 degrees	______	+5.7 degrees
	±1440 degrees	−7.0 degrees	______	+7.5 degrees

Table A4-2. Performance Test Records (4 of 4)

Para. No.	Description	Lower Limit	Measured Value	Upper Limit
A4-19	**Phase Accuracy and Electrical Length Test**			
	Phase Accuracy Test:			
	f. +180 degree transistion	+182 degrees	______	+178 degrees
	g. −180 degree transition	−182 degrees	______	−178 degrees
	Electrical Length (Line Stretcher) Test:			
	l. 30 cm at 1000 MHz	+10 degrees	______	−10 degrees
		(370 degrees)	______	(350 degrees)
	m. 15 cm at 1000 MHz	185 degrees	______	175 degrees
	Linear Phase Range:			
	p. Maximum Positive Electrical Length	+1730 degrees	______	
	r. Maximum Negative Electrical Length	−1730 degrees	______	
	Linear Phase Accuracy:			
	u. Length in degrees added for two phase cycles	+700 degrees	______	+740 degrees
A4-20	**Group Delay Accuracy Test**			
	a. Group delay of "test cable" by calculation		______	
	e. Group delay by direct measurement	(1)	______	(2)
	(1) Lower Limit — same value as (a) above −(1 ns +3% of reading)			
	(2) Upper Limit — same value as (a) above +(1 ns +3% of reading)			
A4-21	**Input Impedance Test**			
	g. Return Loss of Port "A"	20 dB	______	
	h. Return Loss of Port "B"	20 dB	______	
	m. Return Loss of Port "R"	20 dB	______	
A4-22	**Source Impedance Test**			
	e. SWR of RF OUTPUT port		______	1.38 SWR
A4-23	**Spectral Purity Test**			
	c. Harmonics below fundamental at +10 dBm		______	−15 dBm
	Non-harmonic spurious signals with fundamental at +10 dBm		______	−50 dBm
	m. Residual FM at 7. MHz		______	20 Hz rms (7.4 mV rms on voltmeter).
	q. Residual FM at 70 MHz		______	200 Hz rms (74 mV rms on voltmeter)
	w. Residual FM at 500 MHz		______	2 kHz rms (88 mV rms on voltmeter)
	x. Residual FM in CW mode at 500 MHz		______	2 kHz rms (88 mVrms on voltmeter)

CHAPTER A
MODEL 8505A NETWORK ANALYZER

SECTION V
ADJUSTMENTS

A5-1. INTRODUCTION

A5-2. This section provides adjustment procedures for the Model 8505A Network Analyzer. These procedures should not be performed as a routine maintenance procedure but should be used (1) after replacement of a part or component, (2) when the performance test shows that the specifications of Table A1-1 cannot be met, or (3) when instructed to do so in the troubleshooting procedure. Table A5-1 lists the adjustment procedure and the function of each control.

WARNING

With the top cover removed, terminals are exposed that have ac voltages capable of causing death. The adjustments in this section should be performed only by a skilled person who knows the hazard involved.

NOTE

Before performing any adjustments, allow 1 hour warmup time for the instrument.

NOTE

Rear instrument feet must be removed before top and bottom covers can be removed.

A5-3. EQUIPMENT REQUIRED

A5-4. Table A1-5 lists the equipment required for the adjustment procedure. If the test equipment recommended is not available, other equipment may be used if its performance meets the "Critical Specifications" listed in the table.

A5-5. FACTORY SELECTED COMPONENTS

A5-6. Some adjustments within the instrument are done by selecting different values of components. These are included in Table A5-1 with the other adjustments. Factory selected components are identified on the schematic diagram with an asterisk (*).

A5-7. RELATED ADJUSTMENTS

A5-8. There are some circuits that require adjustment in a specific order. The procedure assumes that if a specific adjustment is made in the middle of the procedure, all adjustments before that one must be correct. If the sequence in the procedure is followed, a minimum of interaction between controls is present.

Table A5-1. Adjustments in Reference Designator Order (1 of 5)

Reference Designator	Name on Board	Function	Paragraph Number
A1A3R7	−12 dBm	RF POWER Vernier Calibration	A5-14
A1A3R15	0 dBm	RF POWER Vernier Calibration	A5-14
A1A4C8	PHASE	Phase Calibration in "R" Channel	A5-16
A1A4C10*	None	Selected Capacitor for phase calibration "R" Channel. Nominal Value 56 pF	A5-16
A1A4R6	MAGNITUDE ADJ	Adjusts gain of "R" Channel IF Amplifier	A5-15, A5-31
A1A5C8	PHASE	Phase Calibration in "A" Channel	A5-16
A1A5C10*	None	Selected Capacitor for phase calibration "A" Channel. Nominal Value 56 pF	A5-16
A1A5R6	MAGNITUDE ADJ	Adjusts gain of "A" Channel IF Amplifier	A5-15, A5-31
A1A6C8	PHASE	Phase Calibration in "B" Channel	A5-16
A1A6C10*	None	Selected Capacitor for phase calibration "B" Channel. Nominal Value 56 pF	A5-16
A1A6R6	MAGNITUDE ADJ	Adjusts gain of "B" Channel IF Amplifier	A5-15, A5-31
A1A15A1C1	9.9 TUNE	Adjusts 9.9 MHz Oscillator Frequency	A5-11
A1A15A1R11	Wn	Reduces noise sidebands on 4.2099 GHz signal	A5-11
A1A15A1R25	BAL	Nulls 9.9 MHz signal	A5-11
A1A15A1R28	TUNE	Adjusts for +8.0 Vdc output	A5-11
A1A15A1R32	MOD	Adjusts Modulator Drive to A1A15A5	A5-11
A1A15A2R7	Wn	Reduces noise sidebands on 4.210 GHz signal	A5-12
A1A15A2R13	TUNE	Adjusts for +8.0 Vdc output	A5-12
A1A15A2R15	BAL	Nulls 10.0 MHz signal	A5-12
A1A15A3C18	A	Peaks 100 MHz drive to A1A15A5	A5-13
A1A15A3C24	B	Peaks 100 MHz drive to A1A15A5	A5-13
A1A15A4C18	A	Peaks 100 MHz drive to A1A15A6	A5-13
A1A15A4C24	B	Peaks 100 MHz drive to A1A15A6	A5-13
A2A1A1R13	FREQUENCY CAL	Adjusts frequency of YIG Oscillator	A5-20
A2A1A2R5	ILLUMINATOR ADJ	Adjusts intensity of DS1 on RPG	Factory Adj.

Table A5-1. Adjustments in Reference Designator Order (2 of 5)

Reference Designator	Name on Board	Function	Paragraph Number
A2A1A3R5	ILLUMINATOR ADJ	Adjusts intensity of DS1 on RPG	Factory Adj.
A2A4R14	ΔF1	Adjusts ±ΔF high end	A5-18
A2A4R16	ΔF2	Adjusts ±ΔF low end	A5-18
A2A4R24	SYM 2	Adjusts high end of 1300 MHz band	A5-18
A2A4R25	SYM 1	Adjusts high end of 1300 MHz band	A5-18
A2A4R40	GAIN	Summing Amp Gain	A5-18
A2A7R49	+13V	Adjusts +13V Supply	A5-17, A5-18
A2A7R61	SWP ADJ	Sweep Adjust	A5-18
A2A8R58	EXP GAIN	Adjusts gain of expotential circuit	A5-19
A2A8R75	EXP OFFSET A	Adjusts EXP waveform	A5-19
A2A8R79	EXP OFFSET B	Adjusts top of EXP waveform for offset	A5-19
A2A9R57	FREQ ADJ LO	Adjusts low frequency limit	A5-21
A2A9R68	FREQ ADJ HI	Adjusts high frequency limit	A5-21
A2A11R17	MAIN DRIVER (1300 MHz)	Drive to Tuning Current Source Adjust at High-frequency end of band	A5-20
A2A11R22*	E1/E2	Selected Value for range. Nominal Value 19.6K	A5-20
A2A11R40*	E3/E4	Selected Value for range. Nominal Value 10K	A5-20
A2A12C10	100 MHZ ADJ	Tunes 100 MHz Osc. frequency	A5-10
A2A13R8	0 dB ADJ	Voltage Ramp Gain	A5-37
A2A13R10	−12 dB ADJ	Voltage Ramp Gain	A5-37
A2A15R12	"99" ADJ (right)	Adjusts marker at "99" and right edge	A5-38
A2A15R22	"0" ADJ (left)	Adjusts marker at "0" and left edge	A5-38
A2A20R23	20V ADJ	Adjusts +20V supply output	A5-9
A3A5R27	P OFS 2	Phase Offset Channel 2	A5-23
A3A5R28	OFS 2	Channel 2 Magnitude Offset	A5-23
A3A5R29	OFS 1	Channel 1 Magnitude Offset	A5-23
A3A5R45	BAL	+ Balance	A5-23
A3A5R48	SCL	Scale	A5-23
A3A5R70	LS	Line Stretcher Offset	A5-23

Table A5-1. Adjustments in Reference Designator Order (3 of 5)

Reference Designator	Name on Board	Function	Paragraph Number
A3A6R7	RATIO OFFS	Ratio Offset	A5-24
A3A6R13	CH 1 OFFS	Channel 1 Offset	A5-24
A3A6R14	CH 2 OFFS	Channel 2 Offset	A5-24
A3A7R8	CH 1	Channel 1 Offset	A5-26
A3A7R9	CH 2	Channel 2 Offset	A5-26
A3A8R10	IF BAL	IF Reference Balance, smallest dot	A5-34
A3A8R18	MAG BAL	Magnitude Balance, smallest dot	A5-34
A3A8R19	X-Y GAIN	Gain Balance	A5-34
A3A8R40	Y-BAL	Y-Axis Balance	A5-34
A3A8R44	X-BAL	X-Axis Balance	A5-34
A3A8R55	QUAD	Round Trace, quadrature balance	A5-34
A3A8R80	"C"	Linear Scaling	A5-34
A3A8R82	"B"	Full Scale	A5-34
A3A8R88	"A"	Expotential scale, Outer Circle Calibration	A5-34
A3A8R93	X OFFS	Centers X output at zero	A5-34
A3A8R95	Y OFFS	Centers Y output at zero	A5-34
A3A9L10	89 KHz NULL	Nulls 89 kHz Harmonic	A5-33
A3A9R16	"C"	Offset Calibration	A5-33
A3A9R26	"E"	– Clamp max, negative line stretcher limit	A5-33
A3A9R27	"D"	+ Clamp max, positive line stretcher limit	A5-33
A3A9R29	"B"	Offset	A5-33
A3A9R42	"A"	Frequency Adjustment	A5-33
A3A10C17*	None	Select for min. 793 kHz. Nominal Value 75 pF	A5-33
A3A10L4	100 KHz	100 kHz Peak	A5-33
A3A10L5	992 KHz	992 kHz Trap	A5-33
A3A10R8	BAL	Balanced Mod Balance Adj	A5-33
A3A10R45	ϕTRIM	Phase Trim	A5-33
A3A11R12*	None	Select resistor for course adjustment for 100 kHz Clock. Nominal Value 21.5 K	A5-35
A3A11R13	CK	Clock Frequency	A5-35
A3A11R26	BAL	Balance	A5-35

Table A5-1. Adjustments in Reference Designator Order (4 of 5)

Reference Designator	Name on Board	Function	Paragraph Number
A3A11R43	G	Gain	A5-35
A3A11R74	T	Delay Offset	A5-35
A3A11R75	M	Modulation Offset	A5-35
A3A11R79	F	Offset	A5-35
A3A12L7	Rφ	Zero phase difference, Reference	A5-32
A3A12L8	Tφ	180 degree phase difference, Test	A5-32
A3A12L11	LSφ	Line stretcher zero phase	A5-32
A3A12R19	REF BAL 1	Nulls 200 kHz 2nd Harmonic in Reference	A5-32
A3A12R20	TEST BAL 1	Nulls 200 kHz 2nd Harmonic in Test	A5-32
A3A12R31	REF BAL 2	Nulls 200 kHz 2nd Harmonic in Reference	A5-32
A3A12R32	TEST BAL 2	Nulls 200 kHz 2nd Harmonic in Test	A5-32
A3A12R50	SCL	Scale	A5-32
A3A12R54	OFF	+0.9 Vdc to U7 Phase Det	A5-32
A3A13C26	100 KHz TRIM	Adjusts for 100 kHz	A5-30
A3A13L3	PHASE	Adjusts phase of 100 kHz signal	A5-30
A3A13L4	B	Low end peaking	A5-30
A3A13R54	AMP	Amplitude	A5-30
A3A13R71	A	Rectifier feedback	A5-30
A3A13R91	SCL	Scale	A5-30, A5-31
A3A13R96	I OFF	Initial offset	A5-30
A3A13R99	"Y"	Gain offset (no change between −10 and −30)	A5-30
A3A14C26	100 KHz TRIM	Adjusts for 100 kHz	A5-30
A3A14L3	PHASE	Adjusts phase of 100 kHz Signal	A5-30
A3A14L4	B	Low end peaking	A5-30
A3A14R54	AMP	Amplitude	A5-30
A3A14R71	A	Rectifier feedback	A5-30
A3A14R91	SCL	Scale	A5-30, A5-31
A3A14R96	I OFF	Initial offset	A5-30
A3A14R99	"Y"	Gain offset (no change between −10 and −30)	A5-30

Table A5-1. Adjustments in Reference Designator Order (5 of 5)

Reference Designator	Name on Board	Function	Paragraph Number
A3A15R1	SWP WIDTH	X Sweep Width	A5-27
A3A15R8	INT	Intensity Limit	A5-27
A3A15R31	CH 2 Y	Channel 2 Y Gain	A5-27
A3A15R33	CH 1 Y	Channel 1 Y Gain	A5-27
A3A17R10	IN OFS	Input Offset (Marker)	A5-25
A3A17R30	A/D OFS	Analog-to-Digital Offset	A5-25
A3A17R31	SYM	Symmetry	A5-25
A3A17R41	SCL	Scale	A5-25
A3A25R8	X POSN	Adjust position of trace in Horizontal direction	Front panel control
A3A25R9	TRACE ALIGN	Adjusts alignment of trace to CRT graticule	Front panel control
A3A26R14	FOCUS LIM	Limit of Front Panel Focus Control	A5-36
A3A27C21	HF ADJ 2	High Frequency Adjust 2	A5-36
A3A27R12	H V ADJ	High Voltage Adjust	A5-36
A3A27R40	INT LIM	Intensity Limit	A5-36
A3A27R41	F G GRID	Flood Gun Grid	A5-36
A3A27R42	ASTIG	Astigmatism Adjust	A5-36
A3A27R45	H F ADJ 1	High Frequency Adjust 1	A5-36
A3A27R46	ORTH	Orthogonal Adjust	A5-36
A3A27R51	PATTERN	Trace Pattern	A5-36
A3A28R15	POS	Position	A5-28
A3A28R27	GAIN	Deflection Amp. Gain	A5-28
A3A28R29	HF ADJ	High Frequency Damping	A5-28
A3A29R15	POS	Position	A5-29
A3A29R27	GAIN	Deflection Amp. Gain	A5-29
A3A29R29	H F ADJ	High Frequency Damping	A5-29
A3A30R1*	None	Scale Illumination. Nominal Value 6.8 ohms	A5-36

*Factory Selected Component.

ADJUSTMENTS

A5-9. A2A20 POSITIVE VOLTAGE REGULATOR AND A2A21 NEGATIVE VOLTAGE REGULATOR

EQUIPMENT:

Digital Voltmeter (DVM) .... HP 3490A

a. Connect digital voltmeter (DVM) to A2A20TP6.

NOTE

If +20V supply is within the tolerance listed, do not make adjustment, as this will affect instrument calibration.

b. Adjust +20V (A2A20R23) for +20.00 Vdc ±0.01 Vdc. (See Figure A5-1.)

c. Check remaining power supply voltages as listed in Table A5-2.

Table A5-2. Power Supply Voltages

Test Point	Voltage	Tolerance (Vdc)	Ripple (mV p-p)
+20	+20.00	±0.01	4
+15	+15.00	±0.75	10
+5A	+ 5.00	±0.25	10
+5B	+ 5.00	±0.25	10
−10	−10.00	±0.25	4
−12.6	−12.60	+0.3/−0.9	10
−18	−18.00	±0.90	10
−40	−40.00	±0.50	10

A5-10. A2A12 10/100 MHz REFERENCE OSCILLATOR

EQUIPMENT:

Frequency Counter .... HP 5340A
Spectrum Analyzer .... HP 141T/8552/8555A

a. Disconnect cable from A2A12J1 100 MHz output (Figure A5-2) and connect a frequency counter to J1. The counter should indicate 100 MHz ±100 Hz. If not, adjust "100 MHz ADJ" trimmer A2A12C10 for correct frequency. Use a non-metallic alignment tool.

ADJUSTMENTS

A5-10. A2A12 10/100 MHz REFERENCE OSCILLATOR (Cont'd)

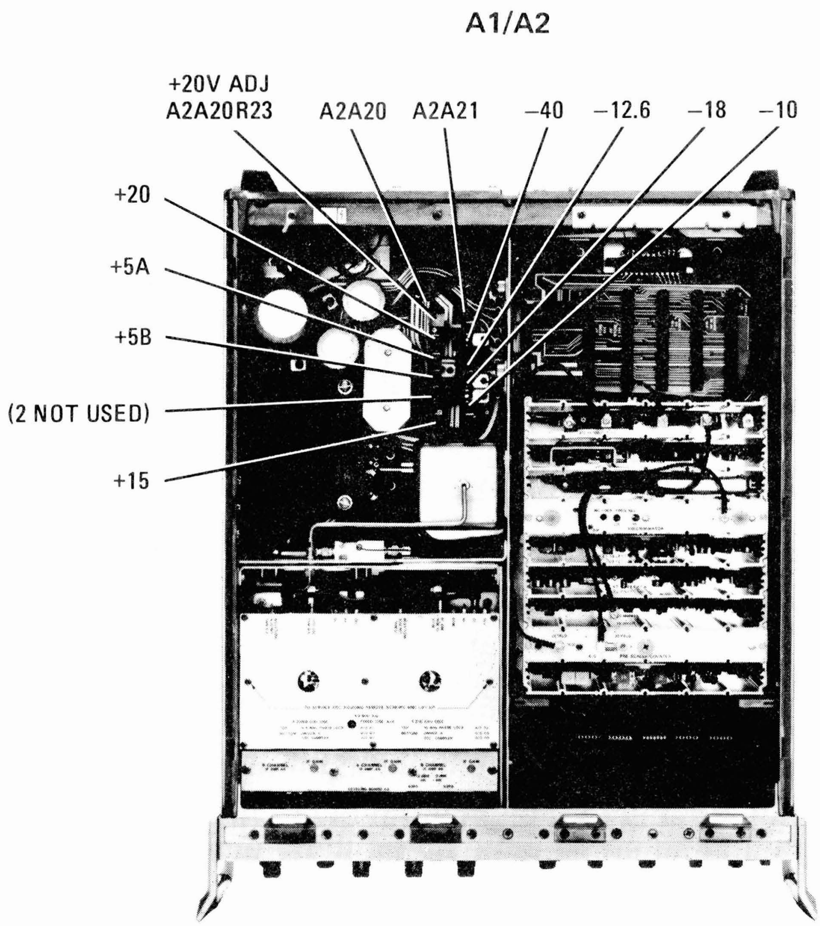


Figure A5-1. A2A20 and A2A21 Power Supplies

b. Connect counter to A2A12J2. The counter should indicate 10 MHz ±10 Hz.

c. Check 100 MHz signal level at A2A12J1 with Spectrum Analyzer. It should be approximately +6 dBm.

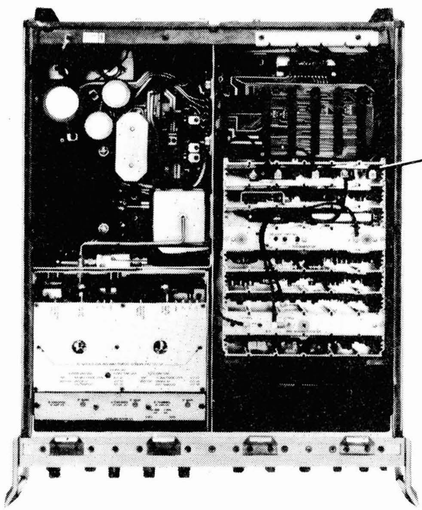
d. Check 10 MHz signal level at A2A12J2. It should be approximately +4 dBm.

e. Reconnect cables to A2A12J1 and J2.

ADJUSTMENTS

A5-10. A2A12 10/100 MHz REFERENCE OSCILLATOR (Cont'd)

A1/A2



A2A12

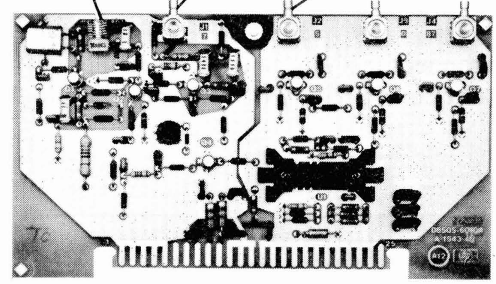


Figure A5-2. A2A12 10/100 MHz Reference Oscillator Adjustment Locations

A5-11. A1A15A1 9.9 MHz PHASE LOCK BOARD

EQUIPMENT:

Frequency Counter	HP 5340A
Digital Voltmeter (DVM)	HP 3490A
Oscilloscope w/10:1 Probe	HP 180/1801/1820
Spectrum Analyzer	HP 141/8552/8555
Power Meter	435A/8482A

a. Connect a frequency counter to A15J2 (Figure A5-3). Adjust "9.9 TUNE" A1A15A1C1 for 9.9000 MHz ±10 Hz (with cover on A1A15A1).

b. Remove cover from A1A15A1 and A2. Connect DVM to TP3 and adjust "BAL" A1A15A1R25 for 1.8 Vdc.

c. Connect jumper from TP2 to ground to disable search oscillator.

d. Connect DVM to test point Vc (TP4). Adjust "TUNE" R28 for +8.0 Vdc ±0.1 Vdc on DVM. Disconnect DVM.

e. Connect Oscilloscope 10:1 probe to TP1. Adjust "BAL" A1A15A1R25 for minimum signal amplitude.

f. Remove jumper from TP2.

ADJUSTMENTS

A5-11. A1A15A1 9.9 MHz PHASE LOCK BOARD (Cont'd)

g. On A2 Frequency Control, set RANGE MHz switch to .5 – 1300. At bottom of A1 Source/Converter. disconnect cable W9 from A9J1. Connect HP Model 8555A Spectrum Analyzer to the end of cable W9. "4.2099 GHz" output. Set Spectrum Analyzer for 3 kHz bandwidth. Adjust "Wn" A1A15A1R11 control for the least peaking of the noise sidebands (See Figure A5-4.)

h. Remove black coax cable from A1A9J1 and connect power meter to cable. Adjust "MOD" A1A15A1R32 for −12 dBm ±1 dB.

i. Disconnect test equipment. Reconnect W9 to A9J1. The "9.9 MHz LOCK" fault light on A1 front panel should be off indicating proper phase lock.

A5-12. A1A15A2 10 MHz PHASE LOCK

EQUIPMENT:

Digital Voltmeter (DVM)	HP 3490A
Oscilloscope w/10:1 probe	HP 180/1801/1820
Spectrum Analyzer	HP 141/8552/8555A

a. On A1A15A2, connect DVM to TP3 and adjust "BAL" R15 for +1.8 Vdc. (See Figure A5-3.)

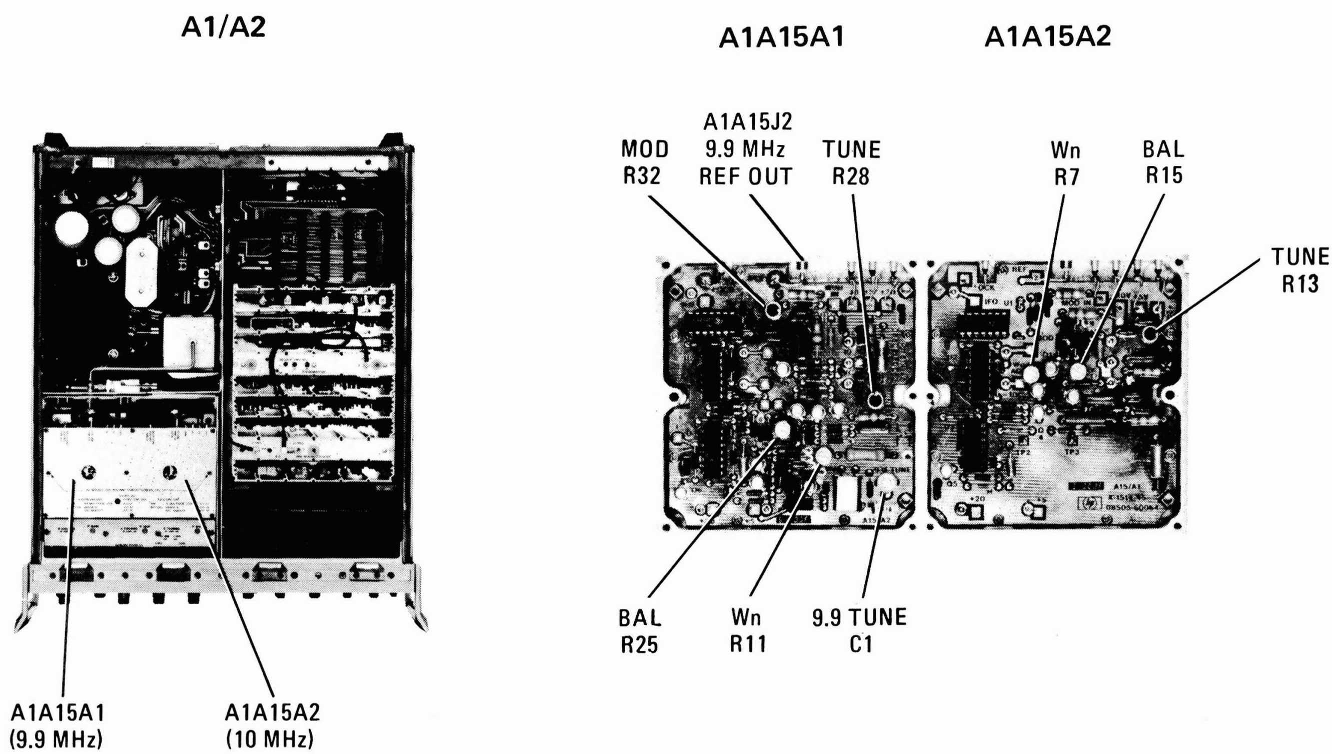


Figure A5-3. A1A15A1/A2 Adjustment Locations

ADJUSTMENTS

A5-12. A1A15A2 10 MHz PHASE LOCK (Cont'd)

b. Connect jumper from TP2 to ground to disable search.

c. Connect DVM to Test Point VC. Adjust "TUNE" R13 for +8.0 Vdc ±0.1 Vdc on DVM. Disconnect DVM.

d. Connect Oscilloscope 10:1 probe to TP1. Adjust "BAL" R15 for minimum signal amplitude.

e. Remove jumper from TP2.

f. At bottom of A1 Source/Converter, disconnect cable W8 from A11J1. Connect HP Model 8555A Spectrum Analyzer to the end of cable W8, "4.210 GHz" output. Set Spectrum Analyzer for 3 kHz bandwidth. Adjust "Wn" R7 control for the least peaking of noise sidebands. (See Figure A5-4.)

g. Disconnect test equipment and reinstall cover on A15A1 and A2. Reconnect W8 to A11J1. The "10 LOCK" fault light on A1 front panel should be off indicating proper phase lock.

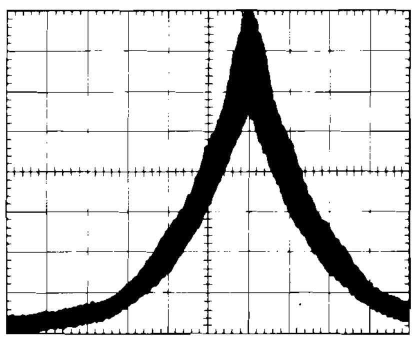


Figure A5-4. 4.2099 and 4.210 GHz Waveform on Spectrum Analyzer

A5-13. A1A15A3 AND A1A15A4 IF DRIVER BOARD

NOTE

Do NOT perform this adjustment unless repairs have been made to A1A15A3 or A4.

EQUIPMENT:

Spectrum Analyzer . . . . HP 141/8552/8553
Attenuator . . . . HP 8496A
Adapter, Snap-on Jack-to-Type N Jack . . . . HP 1250-0671
Adapter, Snap-on Plug-to-Type N Male . . . . HP 1250-0673
Adapter, Type N Male-to-Type N Male . . . . HP 1250-0778

a. Disconnect cable from A2A12J1 and insert an external attenuator between A2A12J1 and cable. Set attenuator to 40 dB.

ADJUSTMENTS

A5-13. A1A15A3 AND A1A15A4 IF DRIVER BOARD (Cont'd)

b. Remove cover from A1A15A3.

c. Connect Spectrum Analyzer to 100 MHz output at test point "DRI" on A1A15A3. (See Figure A5-5.) Adjust "A" A3C18 and "B" A3C24 for highest amplitude 100 MHz signal. Replace cover.

d. Remove cover from A1A15A4.

e. Connect Spectrum Analyzer to 100 MHz output at test point "DRI" on A1A15A4. Adjust "A" A4C18 and "B" A4C24 for highest amplitude 100 MHz signal. Replace cover.

f. Remove attenuator and reconnect cable to A2A12J1.

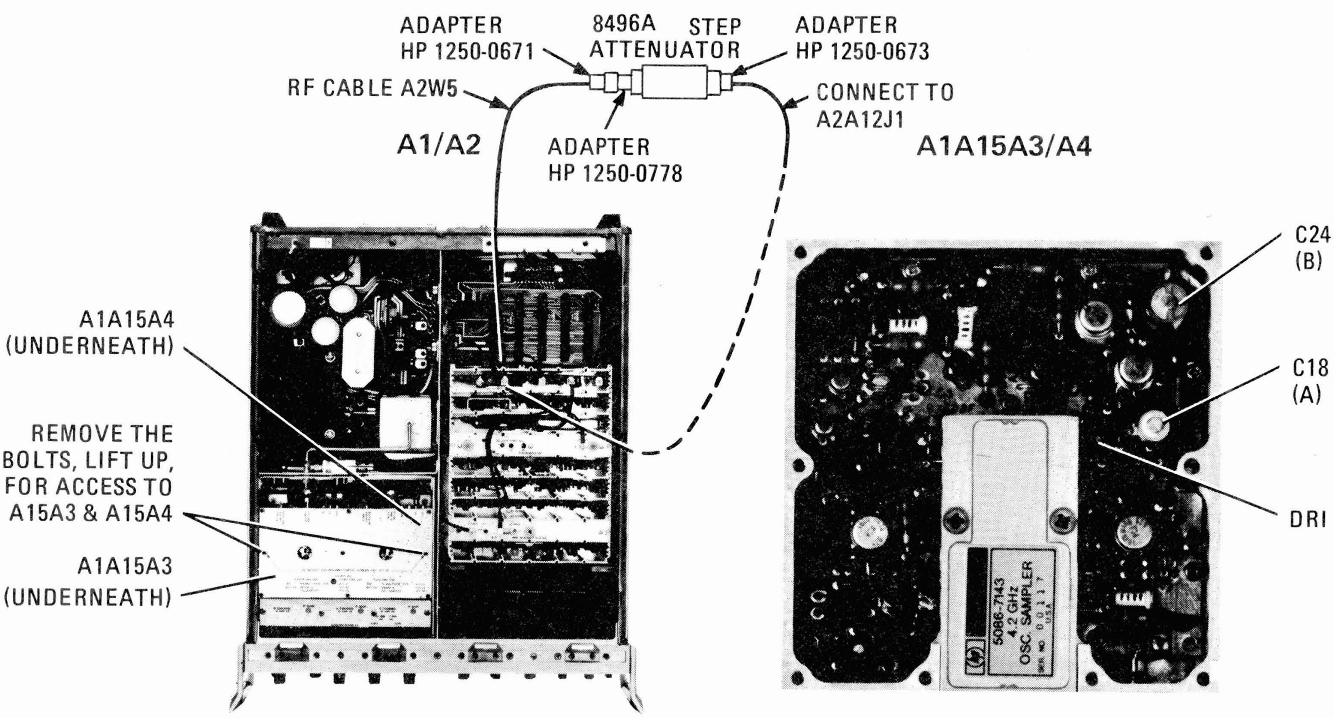


Figure A5-5. A1A15A3/A4 IF Driver Adjustment Locations

A5-14. A1A3 ALC AND ATTENUATOR DRIVER (RF POWER OUTPUT ADJUSTMENT)

EQUIPMENT:

Power Meter .... HP 435A/8482A
10 dB Attenuator .... HP 8491A Opt. 010

a. Connect power meter to RF OUTPUT connector using a 10 dB attenuator.

b. On A1 Source/Converter, set OUTPUT LEVEL dBm switch to +10 dBm and set OUTPUT LEVEL Vernier to 0 dB. On A2 Frequency Control, set RANGE MHz switch to .5—130, set WIDTH switch to CW, and set CW FREQUENCY to 30 MHz.

ADJUSTMENTS

A5-14. A1A3 ALC AND ATTENUATOR DRIVER (RF POWER OUTPUT ADJUSTMENT) (Cont'd)

c. Adjust 0 dB control A1A3R15 (Figure A5-6) for 0 dBm indication on power meter.

d. Adjust OUTPUT LEVEL Vernier to −12 dB. Adjust −12 dB control A1A3R7 for −12 dBm ±1 dBm indication on power meter.

A1/A2

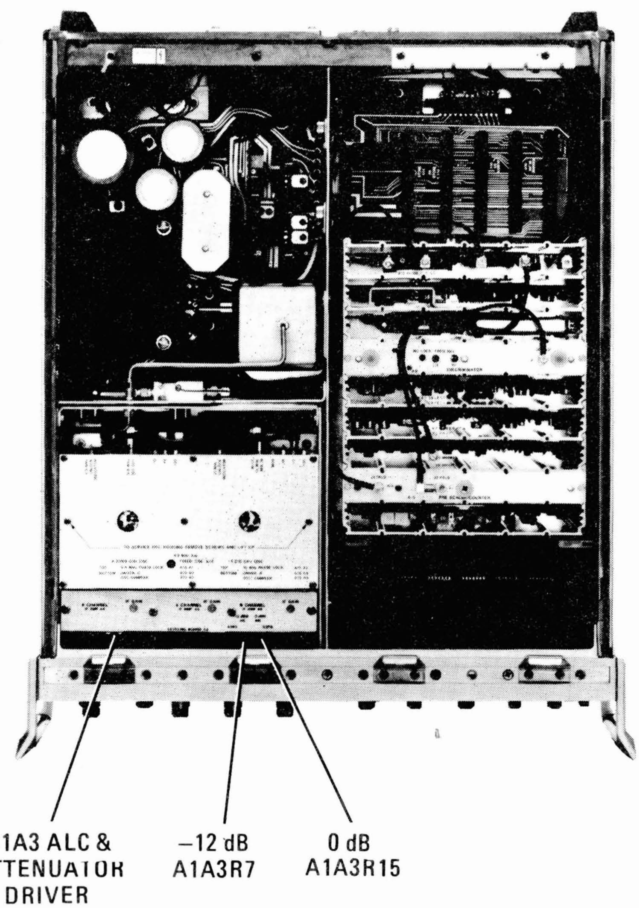


Figure A5-6. Power Output Adjustment Controls

ADJUSTMENTS

A5-15. A1A4, A1A5, AND A1A6 RECEIVER IF AMPLIFIERS

a. Connect equipment as shown in Figure A5-7 with RF OUTPUT connected to R INPUT. Connect AC Digital Voltmeter (DVM) to pin 9 of XA4 as shown in Figure A5-8.

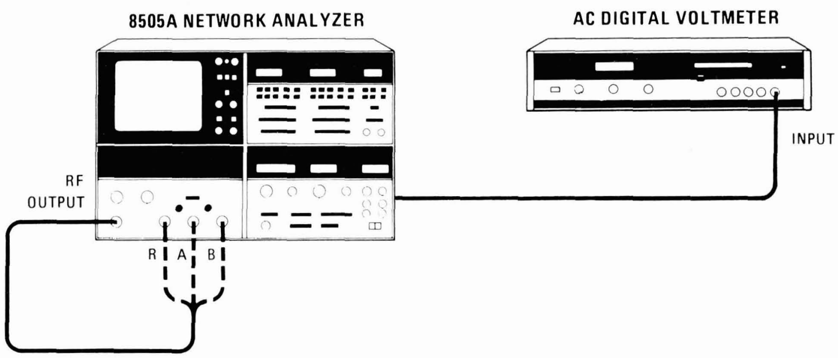


Figure A5-7. Receiver Output Test Setup

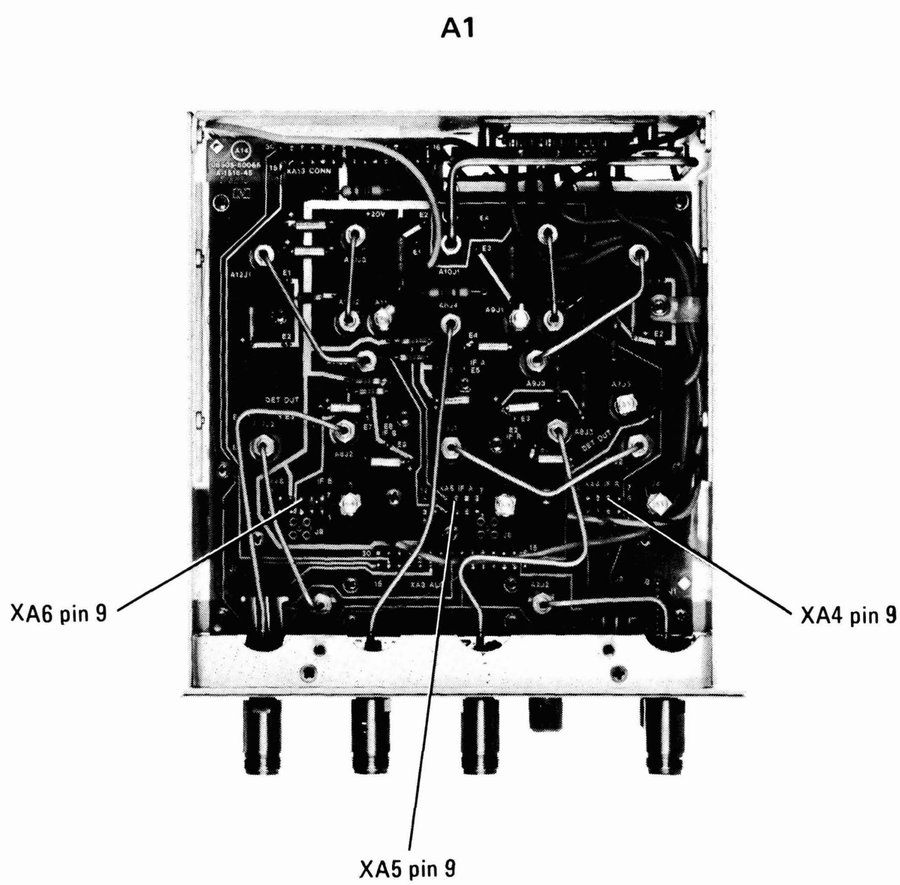


Figure A5-8. IF Amplifier Signal Test Points on A1A14 Mother Board.

ADJUSTMENTS

A5-15. A1A4, A1A5, AND A1A6 RECEIVER IF AMPLIFIERS (Cont'd)

b. On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL Vernier	0
INPUT LEVEL dBm MAX	−10

On A2 Frequency Control

RANGE MHz :	.5 — 130
WIDTH	CW
CW FREQUENCY	30 MHz

c. Adjust MAGNITUDE ADJ A1A4R6 on "R" Channel IF amplifier A4 (Figure A5-9) for a DVM indication of 0.35 VRMS ±0.02 VRMS.

d. Disconnect coaxial cable from the front panel R INPUT and connect it to A INPUT. Disconnect the DVM from Pin 9 of XA4 and connect it to Pin 9 of XA5 (Figure A5-8). Adjust MAGNITUDE ADJ A1A5R6 on A Channel IF amplifier A5 (Figure A5-9) for a DVM indication of 0.35 VRMS ±0.02 VRMS.

A1/A2

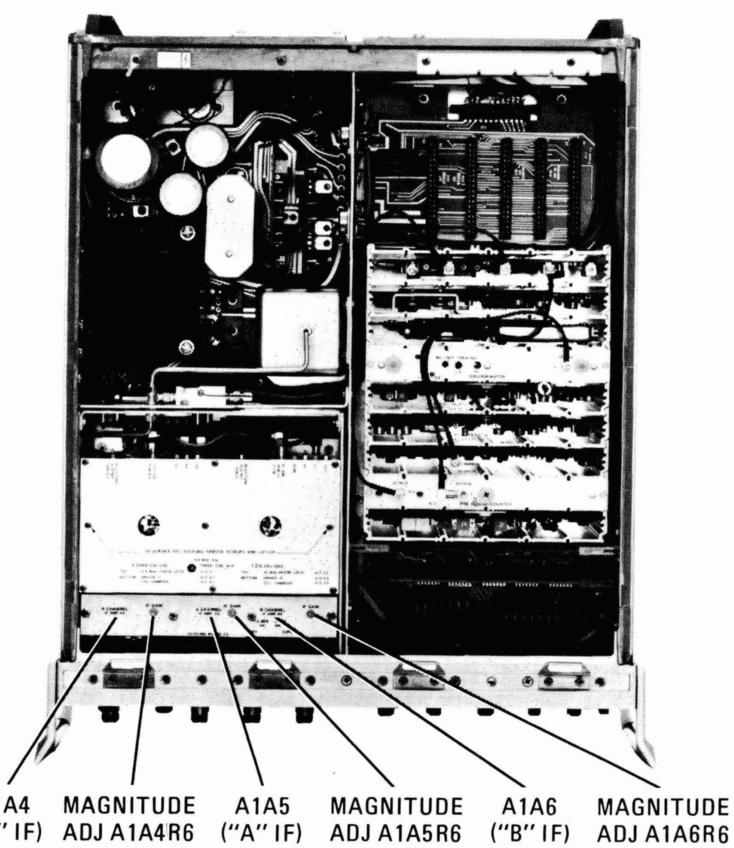


Figure A5-9. IF Amplifier A1A4/A5/A6 Adjustment Locations

ADJUSTMENTS

A5-15. A1A4, A1A5, AND A1A6 RECEIVER IF AMPLIFIERS (Cont'd)

e. Disconnect cable from the front panel A INPUT and connect it to B INPUT. Disconnect the DVM from Pin 9 of XA5 and connect it to Pin 9 of XA6 (Figure A5-8). Adjust MAGNITUDE ADJ A1A6R6 on B Channel IF amplifier A6 (Figure A-9) for a DVM indication of 0.35 VRMS ±0.02 VRMS.

NOTE

The preceding adjustments set the IF Amplifiers to produce the correct drive for the magnitude detector adjustments. A final "fine tuning" of the IF Amplifiers for absolute power calibration is done in Paragraph A5-31.

A5-16. A1A4, A1A5 AND A1A6 PHASE ADJUSTMENTS

NOTE

Do not make phase adjustment of A1A4, A1A5, or A1A6 unless you are replacing one of these boards. The following phase adjustment is to remove $\Delta\phi$ in the filter on the board and is NOT an RF adjustment.

EQUIPMENT:

Power Splitter .... HP 11850A
RF Cable Kit .... HP 11851A

a. On 8505A, set controls as follows:

On A1 Source/Converter
OUTPUT LEVEL dBm .... −10 dBm
OUTPUT LEVEL Vernier .... 0 dB
INPUT LEVEL dBm MAX .... −10

On A2 Frequency Control
RANGE MHz .... .5 — 13
MODE .... LIN EXPAND
WIDTH .... CW
SCAN TIME SEC .... .1 — .01
TRIGGER .... AUTO
CW FREQUENCY .... 2 MHz

On A3 Signal Processor
Channel 1
INPUT .... A/R
MODE .... PHASE
SCALE/DIV .... 1 Deg

Channel 2
MODE .... OFF

Electrical Length
MODE .... OFF

ADJUSTMENTS

A5-16. A1A4, A1A5 AND A1A6 PHASE ADJUSTMENTS (Cont'd)

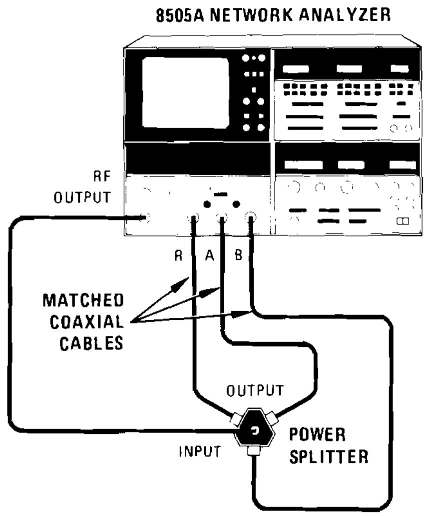


Figure A5-10. Test Setup for Phase Adjustment of A1A4, A1A5, and A1A6.

b. Connect equipment as shown in Figure A5-10.

c. Temporarily tag A1A4 as "1", A1A5 as "2" and A1A6 as "3".

d. Press Channel 1 DISPLAY REF, then CLR until REL light goes out (if lit).

e. Press DISPLAY MKR and note MKR reading.

f. Set Channel 1 INPUT switch to B/R and note MKR reading.

g. Using the readings noted in steps e and f, decide which of the following measurement combinations your instrument has:

(1) If both A/R and B/R measurements are positive, determine which is more positive. If A/R is greater than B/R, the "2" board should be installed in A4 position. If B/R is greater than A/R, the "3" board should be installed in A4 position.

(2) If both A/R and B/R measurements are negative, leave the boards where they are installed.

(3) If A/R is positive and B/R is negative, install the "2" board in A4 position.

(4) If B/R is positive and A/R is negative, install "3" board in A4 position.

NOTE

Whichever board is selected to be "A4" will not require A1A4C8 and A1A4C10 to be adjusted.

h. Set Channel 1 INPUT switch to A/R. (The measurement should be negative.) Adjust A1A5C8 for zero degree ±0.5 degree indication on MKR digital readout. If that reading cannot be obtained, select the value of A1A5C10 that will bring A1A5C8 within range of zero degree.

i. Set Channel 1 INPUT switch to B/R. (The measurement should be negative.) Adjust A1A6C8 for zero degrees ±0.5 degree indication on MKR digital readout. If that reading cannot be obtained, select the value of A1A6C10 that will bring A1A6C8 within range of zero degrees.

j. Recheck Magnitude adjustment in paragraph A5-15 if A1A4/A5/A6 boards are now in a different position.

ADJUSTMENTS

A5-17. A2A4 SCALING ADJUSTMENT AND A2A7 SWEEP GENERATOR +13V SUPPLY

EQUIPMENT:

Digital Voltmeter (DVM) .... HP 3490A

NOTE

If +13V supply is within the tolerance listed, do not make adjustment.

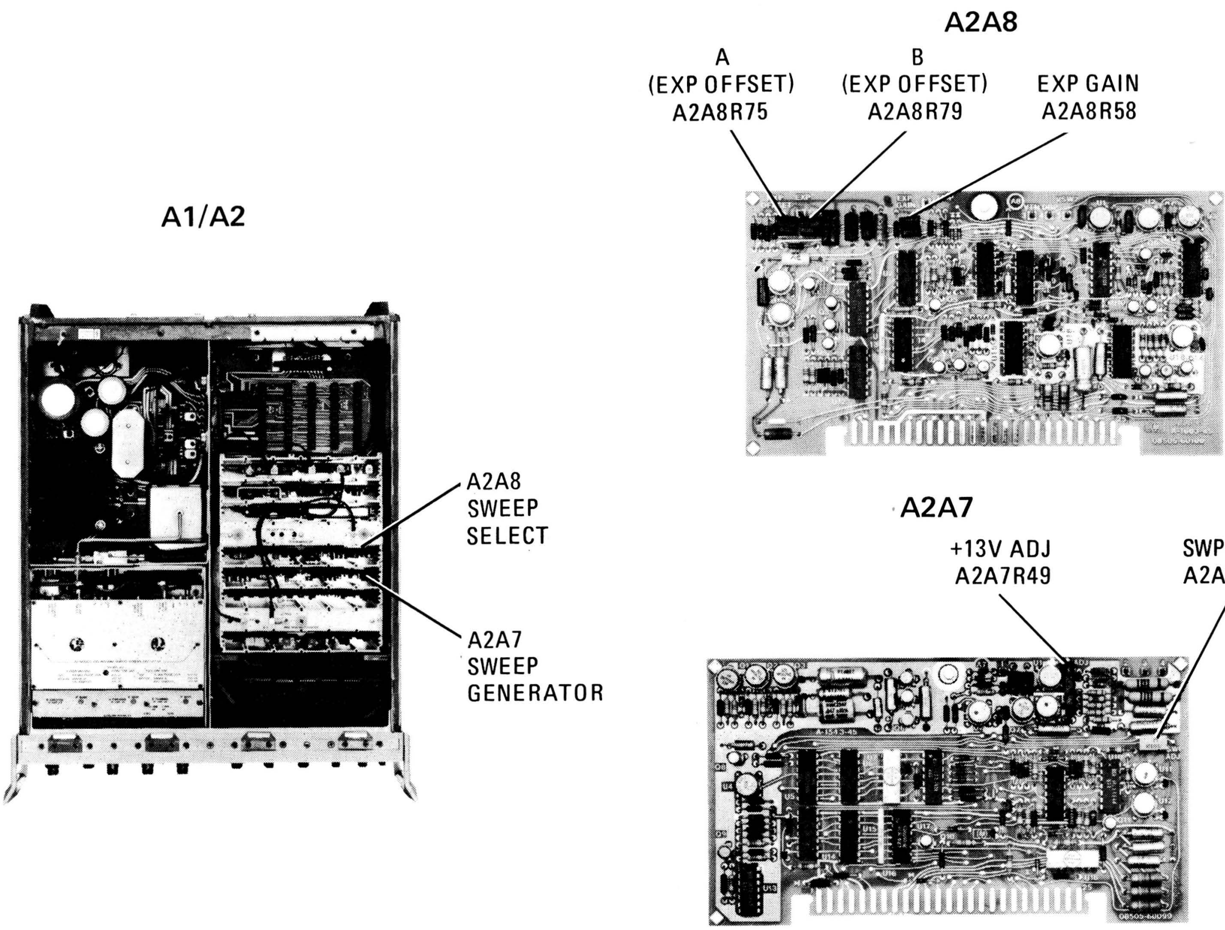


Figure A5-11. +13V Power Supply and Sweep Select Adjustment Locations

ADJUSTMENTS

A5-17. A2A4 SCALING ADJUSTMENT AND A2A7 SWEEP GENERATOR +13V SUPPLY (Cont'd)

a. Connect DVM to A2A4TP4 and indication should be +13.000 Vdc +0.005, −0.000 Vdc. (If indication is out of tolerance, adjust "+13 V ADJ" A2A7R49 in +13 Volt power supply (Figure A5-11) to obtain the correct voltage.)

b. Set 8505A controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL Vernier	0
INPUT LEVEL dBm MAX	−10

On A2 Frequency Control

RANGE MHz	.5 — 1300
MODE	LIN EXPAND
WIDTH	CW ±ΔF
SCAN TIME SEC	0.1 – 1

On A3 Signal Processor

Channel 1

INPUT	R
MODE	MAG
SCALE/DIV	10 dB

Channel 2

MODE	OFF

Display Section

BANDWIDTH kHz	10

c. Connect A2A7TP2 to ground. Connect DVM to A2A4TP1. Adjust "SWP ADJ" A2A7R61 for +13.000 Vdc +0.005, −0.000 Vdc. Remove ground clip.

d. On frequency Control, set CW FREQUENCY to 1300 MHz and CW ± ΔF to 000.0 MHz. Set both FREQUENCY VERNIER controls fully counterclockwise. Connect DVM to A2A4TP3 and adjust "GAIN" control A2A4R40 for – 13.000 Vdc ±0.002 Vdc (Figure A5-12).

e. On A2 Frequency Control, set WIDTH to START/STOP 1. Set START and STOP FREQUENCY controls to 1200 MHz and FREQUENCY VERNIER controls to 0.

f. On A2A7, connect jumper from A2A7TP2 to ground (Figure A5-12). Adjust "SYM 1 (START/STOP)" control A2A4R25 (Figure A5-12) for −12.000 Vdc ±0.002 Vdc.

g. Remove jumper from A2A7TP2 and place jumper between A2A7TP3 and ground. Adjust "SYM 2 (START/STOP)" control A2A4R24 for −12.000 Vdc ±0.002 Vdc indication on DVM.

h. Repeat steps f and g until both steps are within the specified limits without adjustment.

i. Connect jumper from A2A7TP3 to ground. On A2 Frequency Control, set WIDTH to CW±ΔF. Set CW FREQUENCY MHz to 1000 MHz and set ±ΔF FREQUENCY to 000.0 MHz. Set both VERNIERS to 0.

ADJUSTMENTS

A5-17. A2A4 SCALING ADJUSTMENT AND A2A7 SWEEP GENERATOR +13V SUPPLY (Cont'd)

j. Set FREQUENCY MHz and VERNIER so that DVM indicates −10.000 Vdc ±0.001 Vdc.

k. Tune ±ΔF to 130.0 MHz. Connect jumper between A2A7TP2 and ground. Adjust "ΔF2" A2A4R16 for −11.300 Vdc ±0.002 Vdc.

l. Disconnect jumper from A2A7TP2 and connect it between A2A7TP3 and ground. Adjust "ΔF1" A2A4R14 for −8.700 Vdc ±0.002 Vdc.

m. Repeat steps k and l until both steps are within the specified limits without readjusting controls.

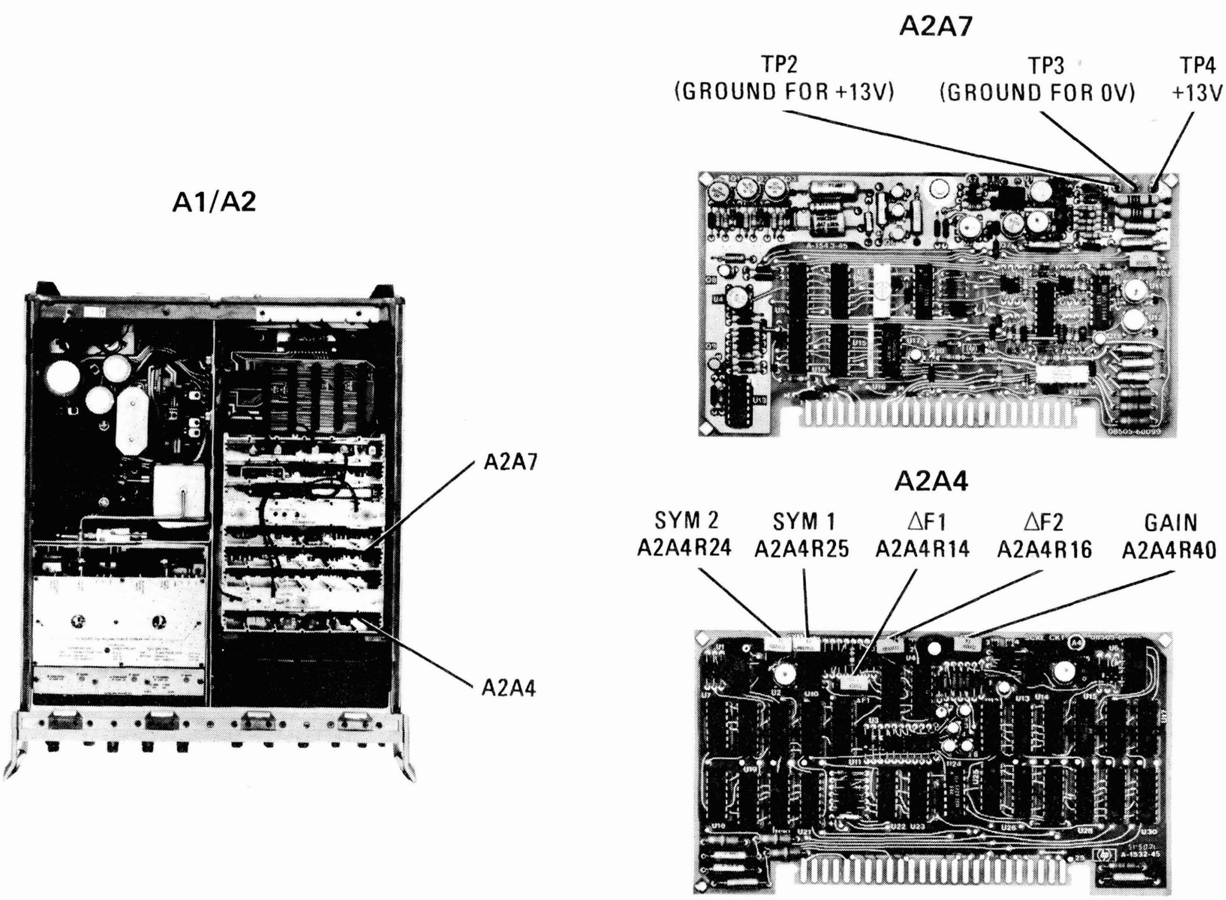


Figure A5-12. A2A4 Scaling Circuit and Sweep Control Test Points on A2A7

ADJUSTMENTS

A5-18. A2A8 SWEEP SELECT BOARD (LOG SWEEP ADJUSTMENT)

a. On 8505A A2 Frequency Control, set RANGE MHz switch to LOG 1-10, MODE switch to LOG FULL, WIDTH to START/STOP 1, SCAN TIME SEC to .1 — .01, and TRIGGER switch to AUTO.

NOTE

Grounding Test Points 2 and 3 in the following procedures should be done only briefly during the adjustment, then the ground should be disconnected. This will prevent errors due to differential heating of the circuits.

NOTE

The high end of the range (−10 Vdc) is most sensitive to the "EXP GAIN" control in the 1 — 1000 MHz Range and the low end of the range is most sensitive to the "OFFS A" control in the 1 — 10 MHz range.

b. Connect DVM to LOG Test Point A2A8TP1. On A2A7 Sweep Generator board, connect A2A7TP3 to ground to select zero volts on VSW1 line into A8, pin 14. Adjust "EXP OFFSET A" control A2A8R75 for −1.000 Vdc ±0.2 Vdc on DVM. Disconnect ground from A2A7TP3 (Figure A5-11).

c. Set RANGE MHz to LOG 1 — 1000 Range. On A2A7 Sweep Generator Board, connect A2A7TP2 to ground to select +13 Vdc on VSW1 line. Adjust "EXP GAIN" control A2A8R58 for −10.000 Vdc ±0.200 Vdc on DVM. Disconnect ground from A2A7TP2.

d. On A2 Frequency Control, set RANGE MHz switch to 1 — 10 position. Connect A2A7TP2 to ground to select +13 volts on VSW1 line. Adjust "EXP OFFSET A" control A2A8R75 for −10.0 Vdc ±0.2 Vdc on DVM. Disconnect ground from A2A7TP2.

e. Set RANGE MHz to LOG 1 — 1000 Range. Connect A2A7TP2 to ground to select +13 Vdc on VSW1 line. Adjust "EXP GAIN" A2A8R58 for −10.0 Vdc ±0.2 Vdc. Repeat steps b through e.

f. Set A2 Frequency Control RANGE MHz switch to 1 — 1000 MHz. Ground A2A7 TP3 to select low end of band. Adjust "EXP OFFSET B" control A2A8R79 for −0.01 Vdc ±0.002 Vdc.

g. Recheck the low and high end of each band to verify that they are all within specifications listed in Table A5-3.

Table A5-3. A2A8 Adjustment Tolerance

Frequency Range	Low End (±20%) (Short A7TP3 to Ground)	High End (±2%) (Short A7TP2 to Ground)
LOG 1-10 MHz	−1.00 Vdc ±0.20 Vdc	−10.00 Vdc ± 0.20 Vdc
LOG 1-100 MHz	−0.100 Vdc ±0.020 Vdc	−10.00 Vdc ± 0.20 Vdc
LOG 1-1000 MHz	−0.01 Vdc ±0.002 Vdc	−10.00 Vdc ± 0.20 Vdc

ADJUSTMENTS

A5-19. A2A11 MAIN DRIVER

EQUIPMENT:

Counter .... HP 5340A

a. Set 8505A A2 Frequency Control as follows:

RANGE MHz	.5 — 1300 MHz
MODE	LIN EXPAND
WIDTH	CW $\pm\Delta F$
SCAN TIME SEC	100 — 10
SCAN TIME SEC Vernier	Fully Clockwise
TRIGGER	AUTO

On A1 Source/Converter, set OUTPUT LEVEL dBm to −10.

b. Connect equipment as shown in Figure A5-13. Connect counter to 8505A RF Output Connector.

c. Set CW FREQUENCY to 0010. MHz and CW VERNIER to 0. Set $\pm\Delta F$ FREQUENCY to 000.0 and $\pm\Delta F$ VERNIER to 0. Remove plastic window from the front of the Frequency Control panel (See Figure A5-15) and adjust FREQUENCY CALIBRATE screwdriver adjustment for 10.00 MHz on external frequency counter.

d. Set CW FREQUENCY to 1300 MHz and CW VERNIER to 0. Adjust "FREQ ADJ" A2A11 R17 for 1300.0 MHz (Figure A5-14).

NOTE

If either low frequency adjustment or high frequency adjustment runs out of range, proceed as follows:

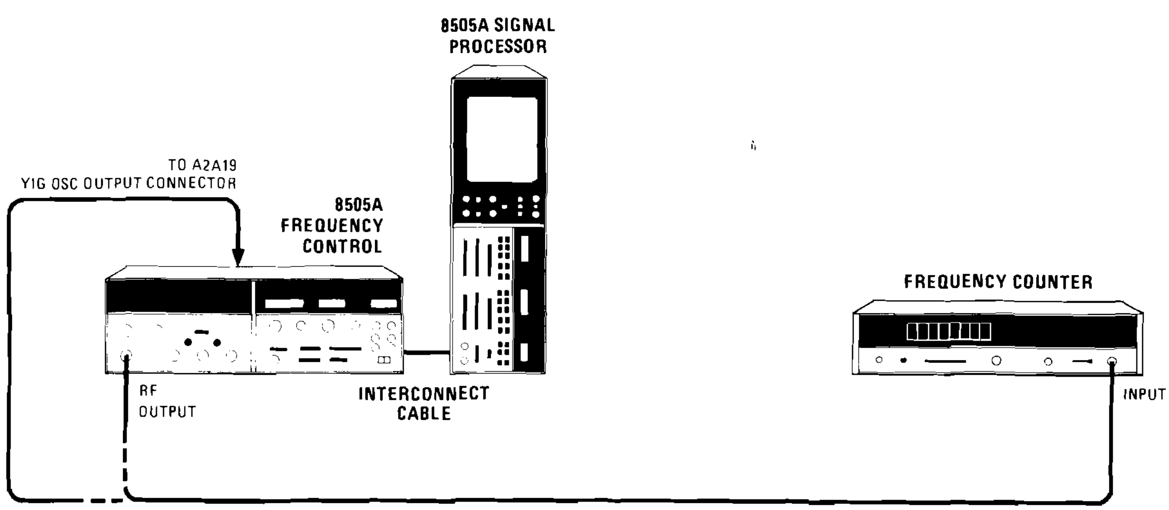


Figure A5-13. A2A11 Main Driver Test Setup

ADJUSTMENTS

A5-19. A2A11 MAIN DRIVER (Cont'd)

e. At front panel, set FREQUENCY CALIBRATE screwdriver adjust potentiometer A2A1A1R13 to midrange. On Main Driver board A2A11, set FREQ ADJ potentiometer A2A11R17 to midrange and place Main Driver board A2A11 on an extender.

f. Remove RF cable from top of YTO assembly A2A19 and connect frequency counter directly to output connector of YTO. See Figure A5-14.

g. If low frequency adjustment runs out of range, proceed with step h. If only the high frequency adjustment runs out of range, proceed to step l.

h. Remove factory selected resistor (A2A11R40) from between standoffs E3 and E4 on Main Driver board A2A11. See Figure A5-14.

i. At front panel, set RANGE MHz to .5 – 1300 MHz, CW FREQUENCY to 0000 MHz, and ±ΔF to 000.0 MHz.

j. Note YTO frequency indication on external frequency counter and record it.

Frequency = _______________ MHz

k. From right side of Table A5-4, select appropriate resistor value using frequency noted in step j. Install resistor between standoffs E3 and E4. Set low end frequency by performing adjustment in step c and then proceed to step l.

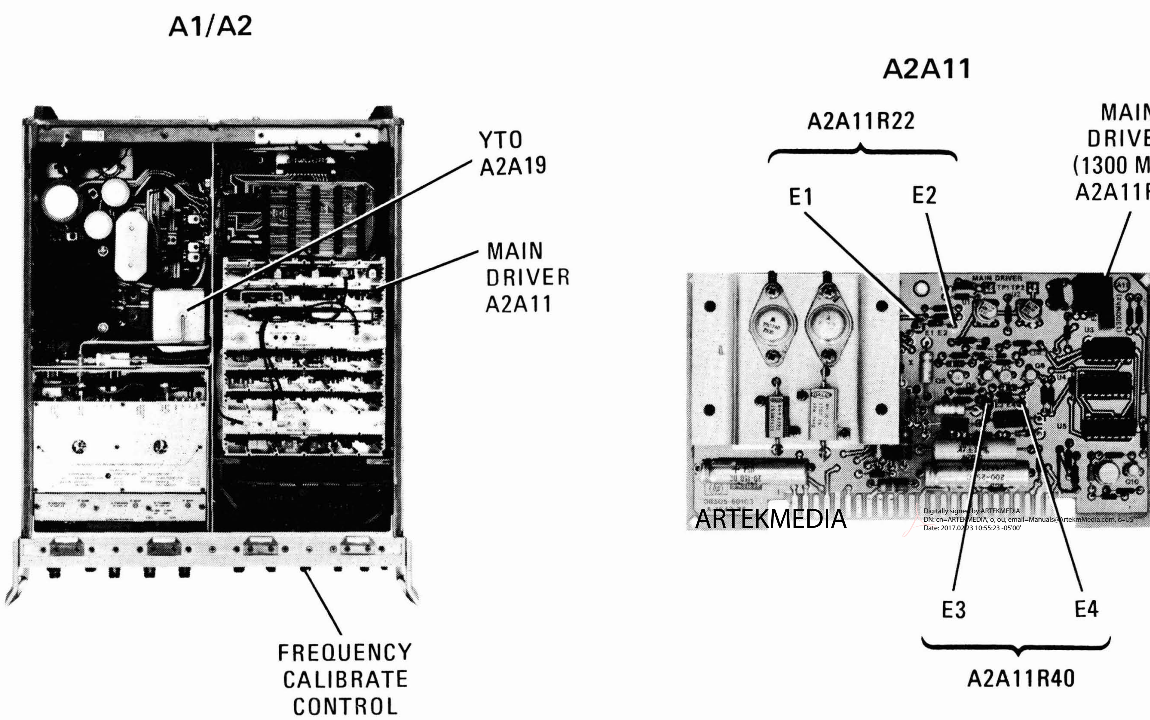


Figure A5-14. A2A11 Main Driver Adjustment Location

ADJUSTMENTS

A5-19. A2A11 MAIN DRIVER (Cont'd)

l. Remove factory selected resistor (A2A11R22) from between standoffs E1 and E2 on Main Driver board A2A11. See Figure A5-14.

m. At front panel, set RANGE MHz to .5 – 1300 MHz, CW FREQUENCY to 1300 MHz, and ±ΔF to 000.0 MHz.

n. Note YTO frequency indication on external frequency counter and record it.

Frequency = ________________ MHz

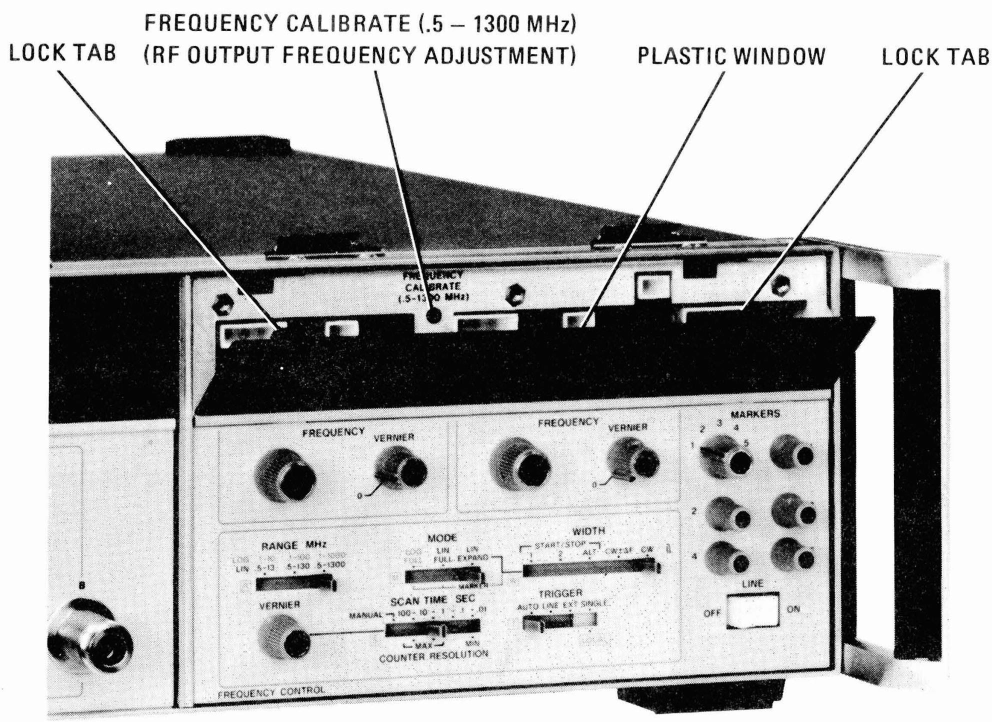
o. From left side of Table A5-4, select appropriate resistor value using frequency noted in step n. Install resistor between standoffs E1 and E2.

p. Remove extender and plug Main Driver board A2A11 into its receptacle.

q. Disconnect external frequency counter from output connector on top of YTO assembly A2A19 and reconnect RF cable that was removed in step f.

r. Repeat steps c and d.

s. Reinstall plastic window (Figure A5-15) in front panel of Frequency Control Assembly.



1. MOVE LOCK TABS TO LEFT ABOUT 1/2 INCH UNTIL THEY UNLATCH WINDOW.
2. REMOVE WINDOW BY PULLING OUT ON LOCK TAB.

Figure A5-15. Removal of Plastic Front Panel Window and Location of Front Panel FREQUENCY CAL control.

ADJUSTMENTS

A5-19. A2A11 MAIN DRIVER (Cont'd)

Table A5-4. Table for Selecting Resistors on A2A11 Main Driver

If YIG Osc. Frequency is Between	Then Use for A2A11R22 (E1 and E2)	HP Part Number	If YIG Osc. Frequency is Between	Then Use for A2A11R40 (E3 and E4)	HP Part Number
5.4446 GHz			4.5676 GHz		
	8.25k	0757-0441		8.25k	0757-0441
5.4498 GHz			4.5416 GHz		
	9.09k	0757-0288		9.09k	0757-0288
5.455 GHz			4.5167 GHz		
	10.0k	0757-0442		10.0k	0757-0442
5.4598 GHz			4.4889 GHz		
	11.0k	0757-0443		11.0k	0757-0443
5.4643 GHz			4.4636 GHz		
	12.1k	0757-0444		12.1k	0757-0444
5.4683 GHz			4.4406 GHz		
	13.3k	0757-0289		13.3k	0757-0289
5.472 GHz			4.4193 GHz		
	14.7k	0698-3156		14.7k	0698-3156
5.4755 GHz			4.3999 GHz		
	16.2k	0757-0447		16.2k	0757-0447
5.4785 GHz			4.3824 GHz		
	17.8k	0698-3136		17.8k	0698-3136
5.4814 GHz			4.3668 GHz		
	19.6k	0698-3157		19.6k	0698-3157
5.4839 GHz			4.3527 GHz		
	21.5k	0757-0199		21.5k	0757-0199
5.4862 GHz			4.3398 GHz		
	23.7k	0698-3158		23.7k	0698-3158
5.4884 GHz			4.3228 GHz		
	26.1k	0698-3159		28.7k	0698-3449
5.4903 GHz			4.3032 GHz		
	28.7k	0698-3449		34.8k	0757-0123
5.4928 GHz			4.2869 GHz		
	34.8k	0757-0123		42.2k	0698-3450
5.4958 GHz			4.2736 GHz		
	42.2k	0698-3450		51.1k	0757-0458
5.4983 GHz			4.2604 GHz		
	51.1k	0757-0458		68.1k	0757-0461
5.5003 GHz			4.2479 GHz		
	61.9k	0757-0460		90.9k	0757-0464
5.502 GHz			4.2386 GHz		
	75.0k	0757-0462		121k	0757-0467
5.5034 GHz			4.2324 GHz		
	90.9k	0757-0464		147k	0698-3452
5.5048 GHz			4.2204 GHz		
	121k	0757-0467			
5.5058 GHz					
	147k	0698-3452			
5.508 GHz					

ADJUSTMENTS

A5-20. A2A9 DISCRIMINATOR

a. On A2 Frequency Control, set controls as follows:

RANGE MHz	.5 — 130 MHz
MODE	LIN EXPAND
WIDTH	CW ±ΔF
SCAN TIME SEC	10 — 1
SCAN TIME SEC Vernier	Fully Clockwise
TRIGGER	AUTO
MARKERS	1

b. Set CW FREQUENCY VERNIER to 0, set CW FREQUENCY to 100.0 MHz, and set ±ΔF FREQUENCY to 00.00.

NOTE

In some measurements, the FREQUENCY COUNTER MHz OVERFLOW light should be lit, indicating that the counter is reading the frequency with high resolution but is not displaying the most significant digits of the measured frequency. These most significant digits are shown in parentheses in the following text.

c. Adjust "FREQ ADJ HI" control A2A9R68 for (10) 0.000 MHz ±0.2 MHz indication on FREQ COUNTER digital readout (See Figure A5-16).

A1/A2

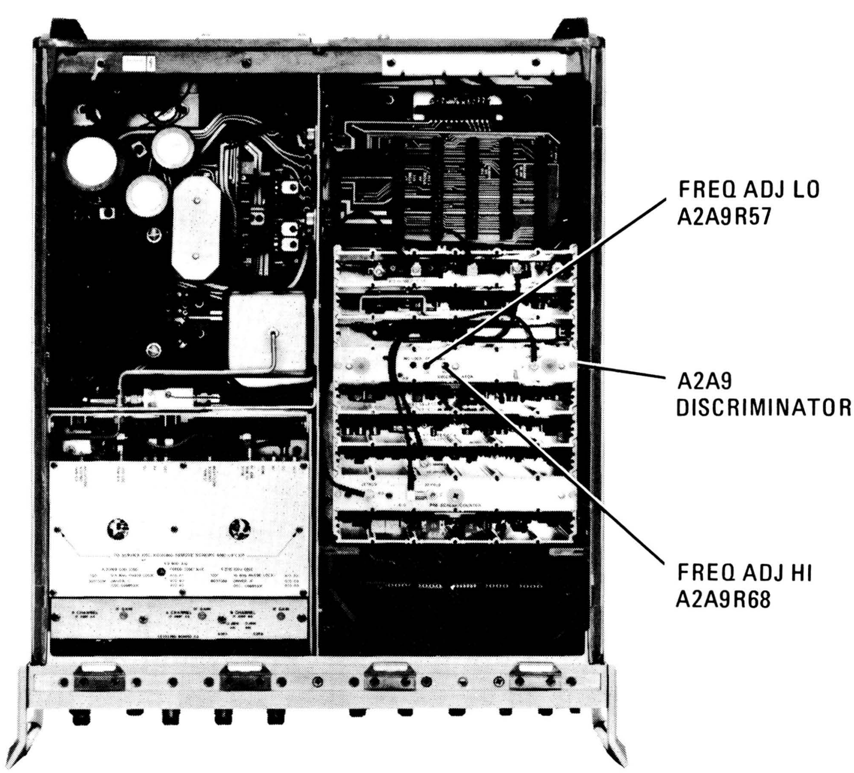


Figure A5-16. A2A9 Discriminator Adjustment Locations

ADJUSTMENTS

A5-20. A2A9 DISCRIMINATOR (Cont'd)

d. Set CW FREQUENCY to 005.0 MHz. Adjust "FREQ ADJ LO" control A2A9R57 for 5.000 MHz± 0.010 MHz indication on FREQ COUNTER digital readout.

e. Repeat steps b through d until both frequencies are within tolerance without further adjustment.

f. Set CW FREQUENCY to 020.0 MHz. Adjust "FREQ ADJ HI" control A2A9R68 for (2) 0.000 MHz ±0.2 MHz indication on FREQ COUNTER digital readout.

NOTE

The overall accuracy of the discriminator will be improved even though it will raise the 100 MHz reading slightly.

A5-21. A3A24 POWER SUPPLY

EQUIPMENT:

Digital Voltmeter (DVM) .... HP 3490A

a. Connect DVM to test points on A3A24 as listed in Table *A5-5.*

Table A5-5. *Power Supply Voltages*

Test Point	Voltage	Tolerance (Vdc)	Ripple (mV p-p)
+ 5	+ 5.00	± .25	10
+ 15	+ 15.00	± .75	10
− 15	− 15.00	± .75	10
+100	+100.00	±5.00	50

ADJUSTMENTS

A5-22. A3A5 PROCESSOR DIGITAL-TO-ANALOG CONVERTER

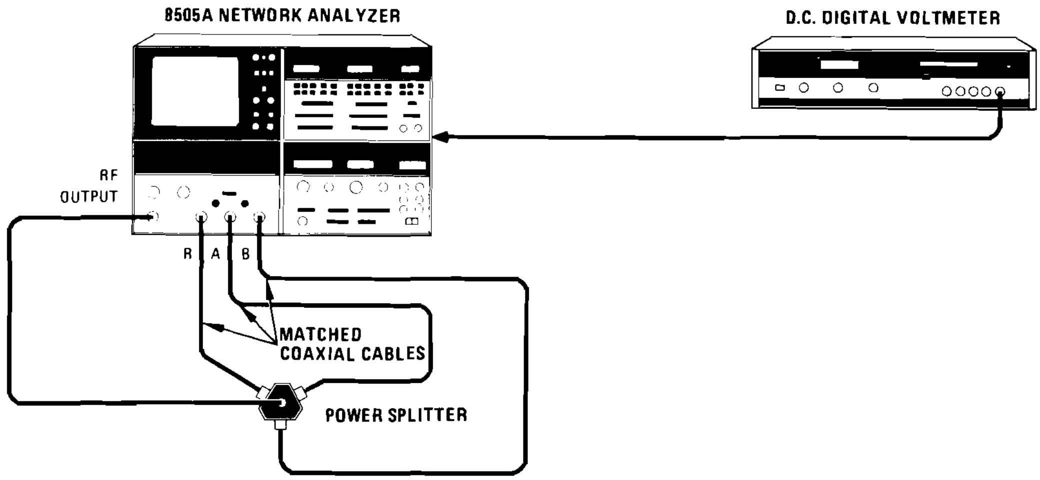


Figure A5-17. A3A5 D/A Converter Adjustment Test Setup

EQUIPMENT:

3-Way Power Splitter	HP 11850A
DC Digital Voltmeter (DVM)	HP 3490A
Matched Coaxial Cable Kit	HP 11851A

PROCEDURE:

NOTE

Ground return for all DVM measurements should be A3A5TP3.

a. Set 8505A controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL Vernier	0
MAXIMUM INPUT dBm	−10

On A2 Frequency Control

FREQUENCY RANGE MHz	.5 — 130
MODE	LIN EXPAND
WIDTH	CW ±ΔF
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO
CW FREQUENCY	30 MHz
ΔF FREQUENCY	00.00

ADJUSTMENTS

A5-22. A3A5 PROCESSOR DIGITAL-TO-ANALOG CONVERTER (Cont'd)

On A3 Signal Processor
Channel 1
INPUT .... A/R
MODE .... MAG
SCALE/DIV .... 10 dB

Channel 2
INPUT .... A/R
MODE .... OFF
SCALE/DIV .... 10 dB

Electrical Length
MODE .... OFF

b. Connect equipment as shown in Figure A5-17.

c. On A3 Processor, press Channel 1 DISPLAY REF then CLR pushbutton until REL light goes off (if lit).

d. Connect Digital Voltmeter (DVM) to A3A5TP4 and ground to A3A5TP3 and adjust "OFS 1" (Channel 1 offset) control A3A5R29 for 0.000 Vdc ±0.001 Vdc. (See Figure A5-18.)

e. Press Channel 1 REF OFFSET switches for +100.0 dB offset at digital display. Adjust "SCL" (scale) control A3A5R48 for −5.000 Vdc ± 1 mVdc.

f. Press Channel 1 REF OFFSET switches for −100.0 dB offset at digital display. Adjust "BAL" (+ balance) control A3A5R45 for +5.000 Vdc ± 1 mVdc. Press Channel 1 DISPLAY CLR pushbutton until REL light goes out (if lit). Set Channel 1 MODE switch to OFF.

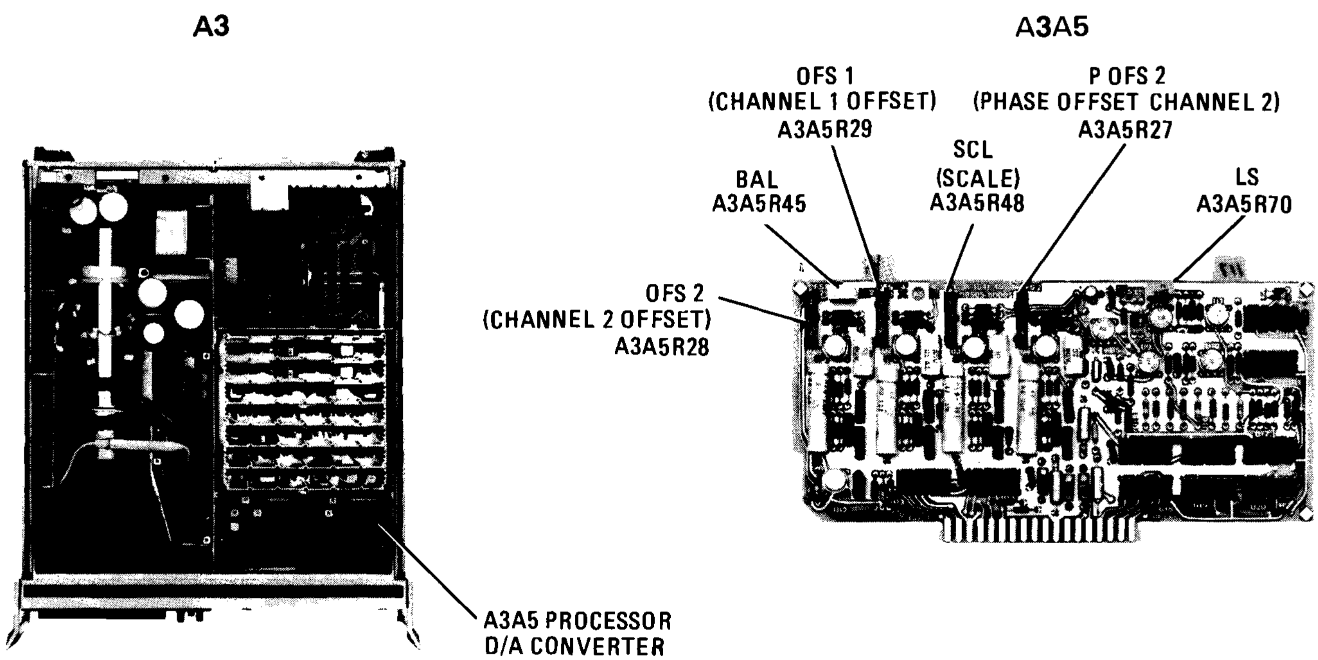


Figure A5-18. A3A5 Processor Digital-To-Analog Converter Adjustment Locations

ADJUSTMENTS

A5-22. A3A5 PROCESSOR DIGITAL-TO-ANALOG CONVERTER (Cont'd)

g. Set Channel 2 MODE switch to MAG. Press Channel 2 DISPLAY REF then CLR until REL light goes out (if lit). Connect DVM to A3A5TP2. Adjust "OFS 2" (Channel 2 offset) control A3A5R28 for 0.000 Vdc ±0.001 Vdc.

h. Set Channel 2 MODE switch to OFF and set Channel 1 MODE switch to PHASE. Press Channel 1 DISPLAY REF then CLR until REL light goes out (if lit).

i. Connect DVM to A3A5TP5 and record DVM reading of offset.

j. Set Channel 1 MODE switch to OFF and set Channel 2 MODE switch to PHASE. Press Channel 2 DISPLAY REF then CLR Until REL light goes out (if lit). Adjust "P OFS 2" (Channel 2 phase offset) control A3A5R27 for DVM reading the same as the offset recorded in step i above ±0.001 Vdc.

k. Set Channel 1 MODE to PHASE, and SCALE/DIV to 5 degrees. Set Channel 2 MODE to OFF.

l. Press DISPLAY MKR then ZRO to bring CRT trace to center graticule line.

m. Set ELECTRICAL LENGTH INPUT to A and MODE to PHASE x 10°/SCAN. Press ELECTRICAL LENGTH DISPLAY CLR pushbutton until REL light goes out (if lit).

n. Offset electrical length from +00 to −01 and adjust "LS" offset control A3A5R70 so that beginning of CRT trace does not move (left hand edge of CRT trace pivots about Reference Line).

A5-23. A3A6 INPUT MULTIPLEX

NOTE

Ground return for all DVM measurements should be A3A5TP3.

EQUIPMENT:

DC Digital Voltmeter (DVM) .... HP 3490A
Extender board (18 pin) .... HP 08505-60042

PROCEDURE:

a. Set Channel 1 MODE to MAG and INPUT to R; set Channel 2 MODE to OFF.

b. Put A3A6 on an extender board. Remove the two magnitude detectors, A3A13 and A3A14 from instrument. (Note the position of each detector before removing it from instrument so that it can be reinstalled in the same place.)

c. Short test points A3A4TP9 and A3A4TP10 to ground. (This selects "Test Mode" and grounds the inputs to A3A6U2 and A3A6U4.) Ground A3A6TP2 and TP4. Set A3 Signal Processor Channel 1 and 2 INPUT switches to "R".

d. Connect DVM to A6TP1 and adjust "CH 1 OFFSET" control A3A6R13 (Figure A5-19) for 0.000 Vdc ±0.001 Vdc.

ADJUSTMENTS

A5-23. A3A6 INPUT MULTIPLEX (Cont'd)

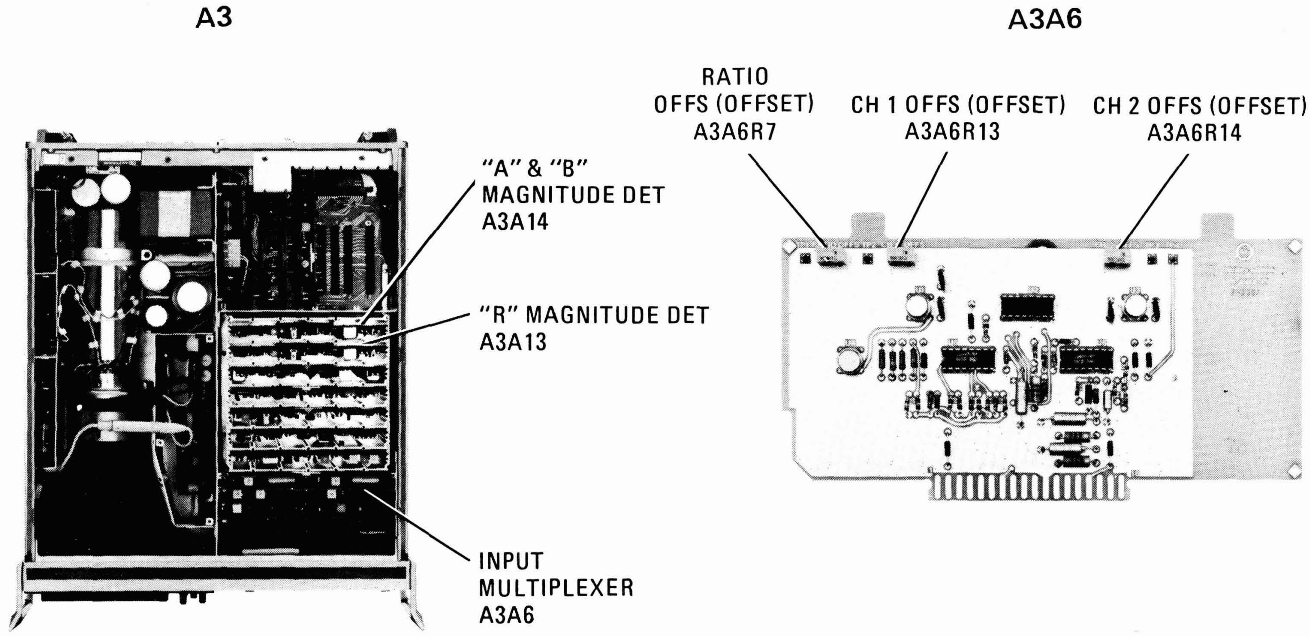


Figure A5-19. A3A6 Adjustment Locations

e. Connect DVM to A6TP3 and adjust "CH 2 OFFSET" control A3A6R14 for 0.000 Vdc ±0.001 Vdc.

f. Remove ground from A3A6TP2 and TP4 and ground A3A6 pins 21 and 23.

g. Connect DVM to pin 22 on A3A6 and adjust "RATIO OFFSET" control A3A6R7 for 0.000 Vdc ±0.001 Vdc. Disconnect DVM and remove ground from A3A6 pins 21 and 23.

h. Remove extender board and reinstall A3A6. Reinstall A3A13 and A3A14 magnitude detectors. Remove ground from A3A4TP9 and A3A4TP10, except if next paragraph is performed.

A5-24. A3A17 MARKER 1

EQUIPMENT:

Digital Voltmeter (DVM) .... HP 3490A

PROCEDURE:

a. Connect A3A4TP9 and A3A4TP10 to ground to put Processor in "TEST" mode.

ADJUSTMENTS

A5-24. A3A17 MARKER 1 (Cont'd)

b. Set the 8505A controls as follows:

On A2 Frequency Control

RANGE MHz	0.5 — 1300
MODE	LIN EXPAND
WIDTH	CW
SCAN TIME SEC	0.1 — .01
TRIGGER	AUTO
MARKERS	1

On A3 Signal Processor

Channel 1

INPUT	R
MODE	MAG
SCALE/DIV	20 dB

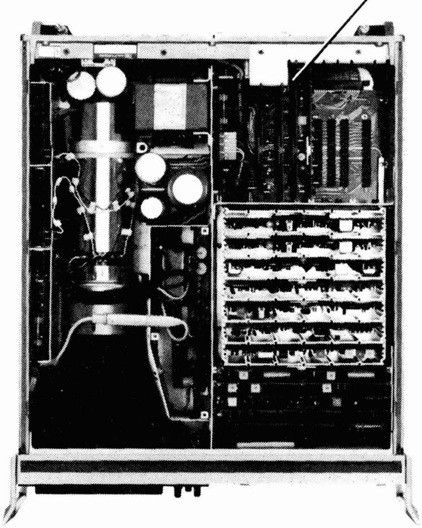
Channel 2

MODE	OFF

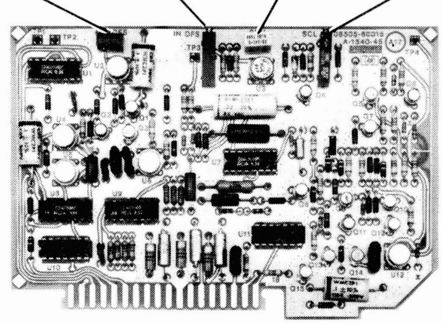
c. On A3 Signal Processor, press DISPLAY REF, then CLR until REL light goes off (if lit) to clear offset memory.

d. Connect DVM to A3A17TP2 (Figure A5-20) and note DVM reading. Set Channel 1 SCALE/DIV to .1 dB and adjust "IN OFS" (input offset) control A3A17R10 for the same DVM reading noted above ±1 mV. Repeat setting Channel 1 SCALE/DIV switch between 20 and 0.1 dB position until no further adjustment of A3A17R10 is necessary.

A3



A3A17



A5-20. A3A17 Marker Test Points and Adjustments

ADJUSTMENTS

A5-24. A3A17 MARKER 1 (Cont'd)

e. Set Channel 1 SCALE/DIV switch to .1 dB position. Press A3 Signal Processor Channel 1 DISPLAY MKR pushbutton. Adjust "A/D OFS" (A/D offset) control A3A17R30 for an indication of 0.00 dB on the front panel Channel 1 MARKER readout.

f. Set Channel 1 SCALE/DIV switch to 20 dB position. (Channel 1 MARKER readout should still be 00.0 dB.) Press Channel 1 DISPLAY REF pushbutton. Press Channel 1 REF OFFSET switches to select +100 dB of offset.

g. Press Channel 1 DISPLAY MKR and indication should be −100.0 dB ±0.1 dB. If not, adjust "SCL" (scale) control A3A17R41 for −100.0 dB ±0.1 dB.

h. Press Channel 1 DISPLAY REF pushbutton. Press Channel 1 REF OFFSET switches to select −100 dB of offset.

i. Press Channel 1 DISPLAY MKR and indication should be +100.0 dB ±0.1 dB. If not, adjust "SYM" (symmetry) control A3A17R31 for +100.0 dB ±0.1 dB.

j. Repeat steps f through i until no further adjustment is necessary.

k. Remove ground from A3A4TP9 and A3A4TP10 except if next paragraph is performed.

A5-25. A3A7 RESOLUTION CONTROL

EQUIPMENT:

Digital Voltmeter .... HP 3490A
3-Way Power Splitter .... HP 11850A
Matched Coaxial Cable Kit .... HP 11851A

PROCEDURE:

a. On 8505A, set controls as follows:

OUTPUT LEVEL dBm .... −10
OUTPUT LEVEL Vernier 0
INPUT LEVEL dBm MAX .... −10
TRIGGER .... EXT

Channel 1
INPUT .... R
MODE .... MAG
SCALE/DIV .... 20 dB

Channel 2
INPUT .... R
MODE .... MAG
SCALE/DIV .... 20 dB

ADJUSTMENTS

A5-25. A3A7 RESOLUTION CONTROL (Cont'd)

b. Connect equipment as shown in Figure A5-17.

c. On A3A4, ground test points A3A4TP9 and A3A4TP10. On A3A6, ground test points A3A6TP2 and A3A6TP4. Connect DVM between A3A6TP1 and ground, then A3A6TP3 and ground. DVM should indicate $\leqslant$ 1 mVdc at both test points. If it does not, refer to paragraph A5-23 and adjust A3A6 in accordance with procedures a through h.

d. Connect DVM to A3A7TP1. (See Figure A5-21.)

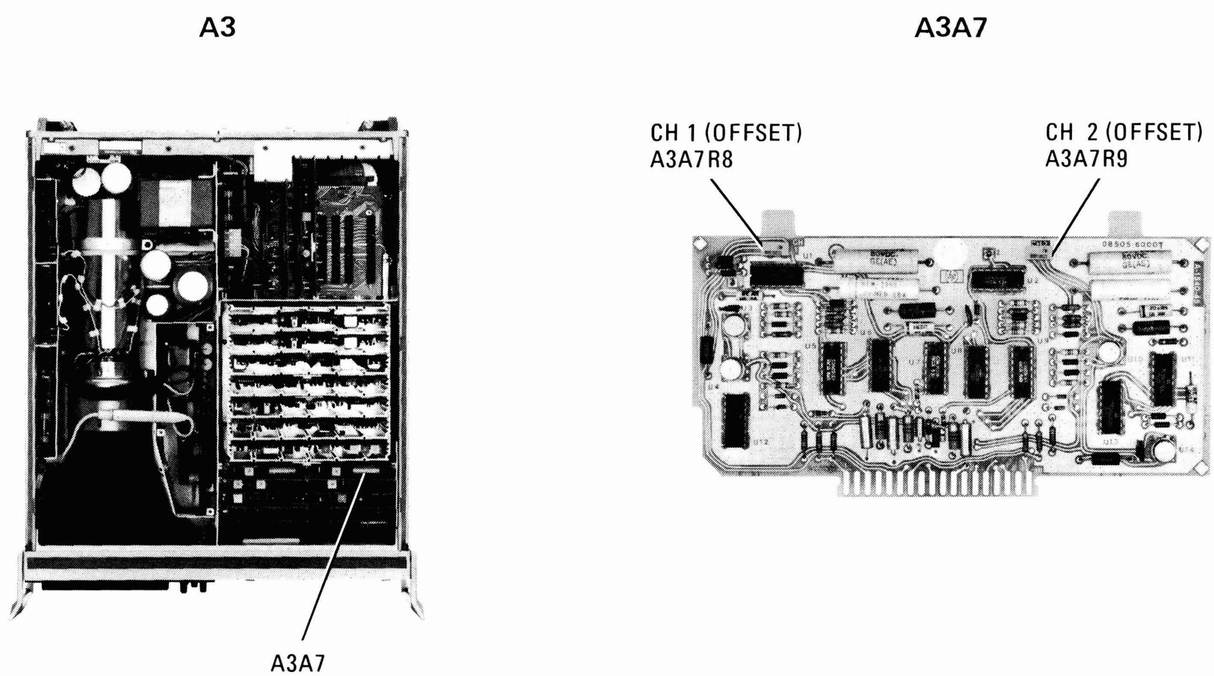


Figure A5-21. A3A7 Resolution Control Adjustment Locations

ADJUSTMENTS

A5-25. A3A7 RESOLUTION CONTROL (Cont'd)

e. Set Channel 2 MODE to OFF.

f. Press Channel 1 DISPLAY REF then CLR pushbuttons until REL light goes out (if lit) to clear Channel 1 offsets.

g. Note DVM indication.

h. Set SCALE/DIV to .1 dB and adjust "CH 1" offset control A3A7R8 for the same DVM indication that was noted in step g.

i. Repeat steps g and h until no further adjustment is required.

j. Connect DVM to A3A7TP2.

k. Set Channel 1 MODE to OFF and Channel 2 MODE to MAG.

l. Press Channel 2 DISPLAY REF then CLR pushbuttons until REL light goes out (if lit) to clear Channel 2 offsets.

m. Note DVM indication.

n. Set SCALE/DIV to .1 dB and adjust "CH 2" offset control A3A7R9 for the same DVM indication that was noted in step m.

o. Repeat steps m and n until no further adjustment is required.

p. Remove grounding jumpers from test points on boards A3A4 and A3A6.

A5-26. A3A15 ANALOG DISPLAY MULTIPLEX

EQUIPMENT:

Digital Voltmeter (DVM) .... HP 3490A

PROCEDURE:

a. On 8505A, set controls as follows:

On A1 Source/Converter
OUTPUT LEVEL dBm .... −10
OUTPUT LEVEL VERNIER 0
INPUT LEVEL dBm MAX .... −10

On A2 Frequency Control
RANGE MHz .... .5 — 130
MODE .... LIN EXPAND
WIDTH .... CW
CW FREQUENCY .... 30 MHz
TRIGGER .... AUTO

ADJUSTMENTS

A5-26. A3A15 ANALOG DISPLAY MULTIPLEX (Cont'd)

On A3 Signal Processor

Channel 1
INPUT . . . . R
MODE . . . . MAG
SCALE/DIV . . . . 5 dB

Channel 2
INPUT . . . . R
MODE . . . . MAG
SCALE/DIV . . . . 5 dB

Electrical Length
MODE . . . . OFF

Display Section
BANDWIDTH KHz 10

b. Connect equipment as shown in Figure A5-22.

Y-Deflection

c. On DISPLAY panel, press REF LINE POSN switch and place Channel 1 and Channel 2 traces on CRT center graticule line. Release switch.

d. Set Channel 2 MODE to OFF.

e. Press Channel 1 DISPLAY REF then CLR pushbuttons until REL light goes out (if lit).

f. Connect DVM to A3A15TP2. Refer to Figure A5-23.

g. Set voltage at A3A15TP2 to -0.500 Vdc ± 0.001 Vdc with OUTPUT LEVEL dBm VERNIER.

h. Add +10 dB of offset with REF OFFSET pushbuttons. Voltage at A3A15TP2 should have changed 500 mVdc ± 10 mVdc. If not, adjust "CH 1 Y" control A3A15R33 until 10 dB of offset produces a 500 mV change.

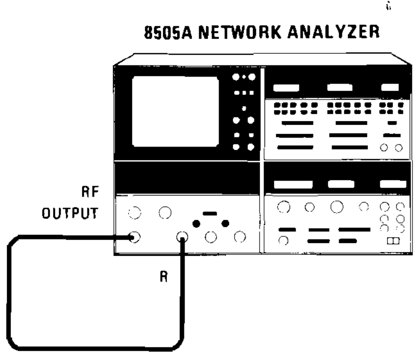


Figure A5-22. Display Multiplex and Deflection Amplifiers Test Setup

ADJUSTMENTS

A5-26. A3A15 ANALOG DISPLAY MULTIPLEX (Cont'd)

i. Repeat steps g and h until no further adjustment is necessary.

j. Set Channel 1 MODE to OFF and Channel 2 MODE to MAG.

k. Press Channel 2 DISPLAY REF then CLR pushbuttons until REL light goes out (if lit).

l. Connect DVM to A3A15TP3.

m. Set voltage at A3A15TP3 to −0.500 Vdc ±0.001 Vdc with OUTPUT LEVEL dBm VERNIER.

n. Add +10 dB of offset with REF OFFSET pushbuttons. Voltage at A3A15TP3 should have changed 500 mVdc ±10 mVdc. If not, adjust "CH 2 Y" control A3A15R31 until 10 dB of offset produces a 500 mV change.

o. Repeat steps m and n until no further adjustment is necessary.

p. Press Channel 2 DISPLAY REF then CLR pushbuttons until REL light goes out (if lit). Use OUTPUT LEVEL VERNIER to place CRT trace two divisions below center horizontal graticule line. Add −20 dB of offset with REF OFFSET pushbuttons. CRT trace should move 4 divisions. If not, refer to paragraph A5-28 Y-Deflection Amplifier.

X-Deflection

q. Connect DVM to A3A15TP1.

r. Set SCAN TIME SEC to MAN and SCAN TIME SEC VERNIER to full counterclockwise position.

s. Using display panel X POSN control, place CRT dot on the left most graticule line of the CRT.

t. Note DVM indication.

u. Set SCAN TIME SEC VERNIER to place CRT dot on the right most graticule line of the CRT.

v. Note DVM indication.

w. The difference in DVM readings in steps t and v should be 3.00 Vdc ±0.05 Vdc. If not, adjust "SWP WIDTH" control A3A15R1 and repeat steps r through w.

x. Set CRT dot to the fourth graticule line from the left edge of the CRT with the SCAN TIME SEC VERNIER and note DVM indication.

y. Move CRT dot to the right until DVM indication is one volt greater than that noted in step x.

z. CRT dot should have moved to the right by four divisions. If not, refer to paragraph A5-28 X-Deflection Amplifier.

Intensity

aa. Set INTENSITY control on CRT display panel to approximately mid-position and adjust "INT" control A3A15R8 to the point where the CRT trace just disappears. This usually occurs with A3A15R8 at full clockwise position.

ADJUSTMENTS

A5-27. A3A28 X-DEFLECTION AMPLIFIER

NOTE

If the adjustment of A3A15 Analog Display Multiplex in Paragraph A5-26 was successfully completed, do not adjust X-Deflection Amplifier Gain control A3A28R27 in the following steps.

EQUIPMENT:

Digital Voltmeter (DVM) .... HP 3490A
Extender Board (15 pin) .... HP 08505-60041
Extender Board (18 pin) .... HP 08505-60042
Function Generator .... HP 3312A
Oscilloscope .... HP 180A

PROCEDURE:

a. Set 8505A controls as follows:
On A1 Source/Converter
OUTPUT LEVEL dBm .... −10
OUTPUT LEVEL VERNIER 0
INPUT LEVEL dBm MAX .... −10

On A2 Frequency Control
RANGE MHz .... .5 — 130
MODE .... LIN EXPAND
WIDTH .... CW
CW FREQUENCY .... 30 MHz
SCAN TIME SEC .... MAN
TRIGGER .... AUTO

On A3 Signal Processor
Channel 1
INPUT .... R
MODE .... MAG
SCALE/DIV .... 5 dB

Channel 2
MODE .... OFF

Electrical Length
MODE .... OFF

Display Section
BANDWIDTH KHz 10

b. Connect equipment as shown in Figure A5-22. Put A3A28 X-Deflection Amplifier on extender board (See Figure A5-23).

c. Connect DVM to A3A15TP1

d. Press Channel 1 DISPLAY MKR then ZRO pushbuttons to place CRT dot on center graticule line.

ADJUSTMENTS

A5-27. A3A28 X-DEFLECTION AMPLIFIER (Cont'd)

Gain Adjustment

e. Set CRT dot to the second graticule line from the left edge of the CRT with the SCAN TIME SEC VERNIER and note DVM indication.

f. Move CRT dot to the right until DVM indication is exactly two volts greater than indiction noted in step e.

g. CRT dot should have moved to the right by eight divisions. If not, adjust "GAIN" control A3A28R27.

h. Repeat steps e through g until no further adjustment is necessary.

X Position

i. Set SCAN TIME SEC to .1 – .01 position. On CRT display, press REF LINE POSN pushbutton. Set front-panel X POSN control to the center of its range. Adjust POS (position) control A3A28R15 to center reference line on CRT graticule.

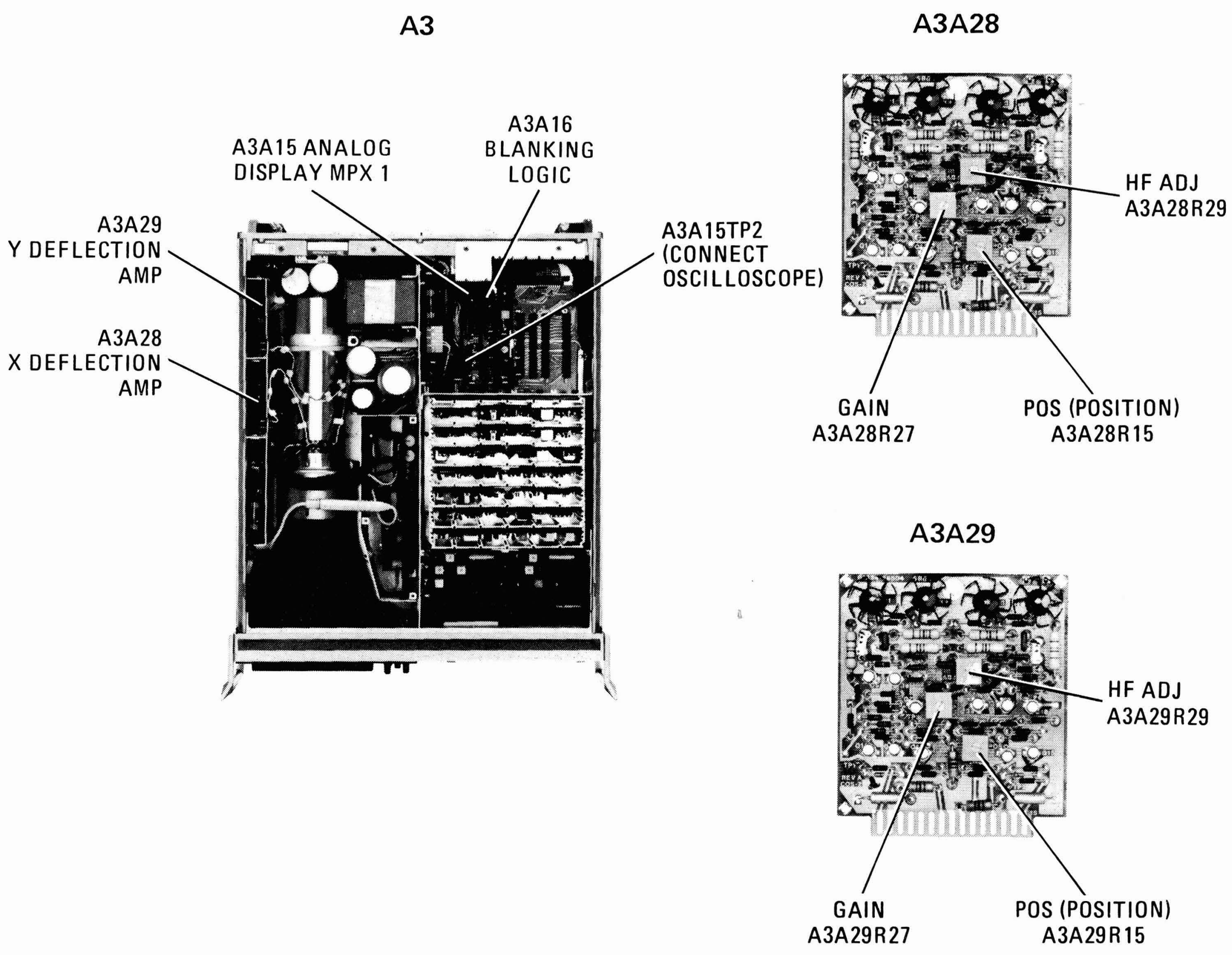


Figure A5-23. Adjustment Locations for X and Y Deflection Amps

ADJUSTMENTS

A5-27. A3A28 X-DEFLECTION AMPLIFIER (Cont'd)

High Frequency Adjustment

j. Connect pulse generator output to the monitor oscilloscope vertical input; terminate line in 50Ω load.

k. Adjust pulse generator offset and amplitude controls for a positive +1 Vp-p square wave, 100 kHz output with a 50% duty cycle pulse width. Disconnect from oscilloscope.

l. Remove Blanking Logic A3A16 (see Figure A5-23) and install 18-pin extender board in its place. Connect pulse generator output to pin 22 of extender board.

m. Connect monitor oscilloscope vertical input through a 10:1 divider probe to output pin 6 at top of A3A28 PC board. The displayed waveform should be approximately 25 Vp-p.

n. Adjust HF ADJ (high frequency adjust) A3A28R29 for best square wave pulse shape.

o. Remove extender and reinstall A3A28 and A3A16.

A5-28. A3A29 Y-DEFLECTION AMPLIFIER

NOTE

If the adjustment of A3A15 Analog Display Multiplex in Paragraph A5-26 was successfully completed, do not adjust Y-Deflection Amplifier GAIN control A3A29R27 in the following steps.

EQUIPMENT:

Digital Voltmeter (DVM) .... HP 3490A
Extender Board (15 pin) .... HP 08505-60041
Function Generator .... HP 3312A
Oscilloscope .... HP 180A

PROCEDURE:

a. Put A3A29 Y-Deflection Amplifier on extender board (see Figure A5-23). Set 8505A controls as follows:

On A1 Source/Converter
OUTPUT LEVEL dBm .... −10
OUTPUT LEVEL Vernier 0
INPUT LEVEL dBm MAX .... −10

On A2 Frequency Control
RANGE MHz .... .5 — 130
MODE .... LIN EXPAND
WIDTH .... CW ±ΔF
CW FREQUENCY .... 30 MHz
±ΔF 00.00
SCAN TIME SEC .... .1 — .01
TRIGGER .... AUTO

ADJUSTMENTS

A5-28. A3A29 Y-DEFLECTION AMPLIFIER (Cont'd)

On A3 Signal Processor
Channel 1
INPUT .... R
MODE .... MAG
SCALE/DIV .... 5 dB

Channel 2
MODE .... OFF

Electrical Length
MODE .... OFF

Display Section
BANDWIDTH KHz 10

b. Connect equipment as shown in Figure A5-22 and connect DVM to A3A15TP2.

c. Ground A3A4TP9 and A3A4TP10 to put Processor in "TEST" mode.

d. Ground A3A6TP2.

e. Press Channel 1 DISPLAY REF then CLR pushbuttons.

f. Set CH1 REF LINE POSN control on Display panel for 0.000 Vdc ±0.005 Vdc indication on DVM and adjust "POS" control A3A29R15 to place CRT trace on center graticule line. (See Figure A5-23.)

g. Set CH1 REF LINE POSN control for +1.000 Vdc ±0.005 Vdc indication on DVM and adjust "GAIN" control A3A29R27 for a CRT trace deflection of four divisions above the center graticule line.

h. Set CH 1 REF LINE POSN control for −1.000 Vdc ±0.005 Vdc indication on DVM. The CRT trace should reflect four divisions below the center graticule line. If not, a slight adjustment of "GAIN" control A3A29R27 may be necessary.

High Frequency Adjustment

i. Connect pulse generator output to the monitor oscilloscope vertical input; terminate line in 50Ω load.

j. Adjust pulse generator offset and amplitude controls for a positive +1 Vp-p square wave, 100 kHz output with a 50% duty cycle pulse width. Disconnect from oscilloscope.

k. Remove Blanking Logic A3A16 and install 18-pin extender board in its place. Connect pulse generator output to pin 24 of extender board.

l. Connect monitor oscilloscope vertical input through a 10:1 divider probe to output pin 6 at top of A3A29 PC board. The displayed waveform should be approximately 25 Vp-p.

m. Adjust HF ADJ (high frequency adjust) A3A29R29 for best square wave pulse shape.

n. Remove extender and reinstall A3A29 and A3A16.

ADJUSTMENTS

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS MAGNITUDE ADJUSTMENT

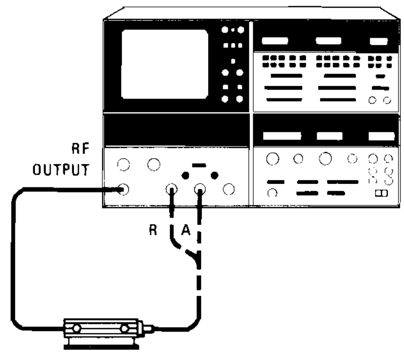


Figure A5-24. Magnitude Detector Adjustment Test Setup

EQUIPMENT:

Oscilloscope	HP 180/1801/1820
10:1 Probes (2)	HP 10004D
Digital Voltmeter (DVM)	HP 3490A
Attenuator	HP 8496A
Extender Board (15 pin)	HP 08505-60041

NOTE

The Processor Digital-to-Analog Converter Adjustment (Paragraph A5-24), the Resolution Adjustment (Paragraph A5-25), the Analog Display Multiplex Adjustment (Paragraph A5-26), and the Y-Deflection Amplifier Adjustment (Paragraph A5-28) must be checked before the magnitude detectors are adjusted in the following steps.

a. Put A3A13 on extender board. (See Figure A5-25.) Set 8505A controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL Vernier	0
INPUT LEVEL dBm MAX	−10

ADJUSTMENTS

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS MAGNITUDE ADJUSTMENT (Cont'd)

On A2 Frequency Control

FREQUENCY RANGE MHz	.5 — 130
MODE	LIN EXPAND
WIDTH	CW ±ΔF
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO
CW FREQUENCY	30 MHz
ΔF FREQUENCY	00.00

On A3 Signal Processor

Channel 1

INPUT	R
MODE	MAG
SCALE/DIV	20 dB

Channel 2

MODE	OFF

CRT Display Panel

BANDWIDTH KHz	10
VIDEO FILTER	ON

Electrical Length

MODE	OFF

b. Connect equipment as shown in Figure A5-24 with step attenuator connected to "R" input and to RF OUTPUT.

c. Set external attenuator to 10 dB. Set oscilloscope A Channel to positive polarity and B Channel to negative polarity. Connect one 10:1 probe of oscilloscope to pin 1 and the other 10:1 probe to pin 13. Adjust the vertical gain of the oscilloscope for equal height of the two traces. Expand oscilloscope to display one half cycle.

d. "Adjust "PHASE" control A3A13L3 and "100 kHz TRIM" A3A13C26 for zero degree phase difference between the two traces.

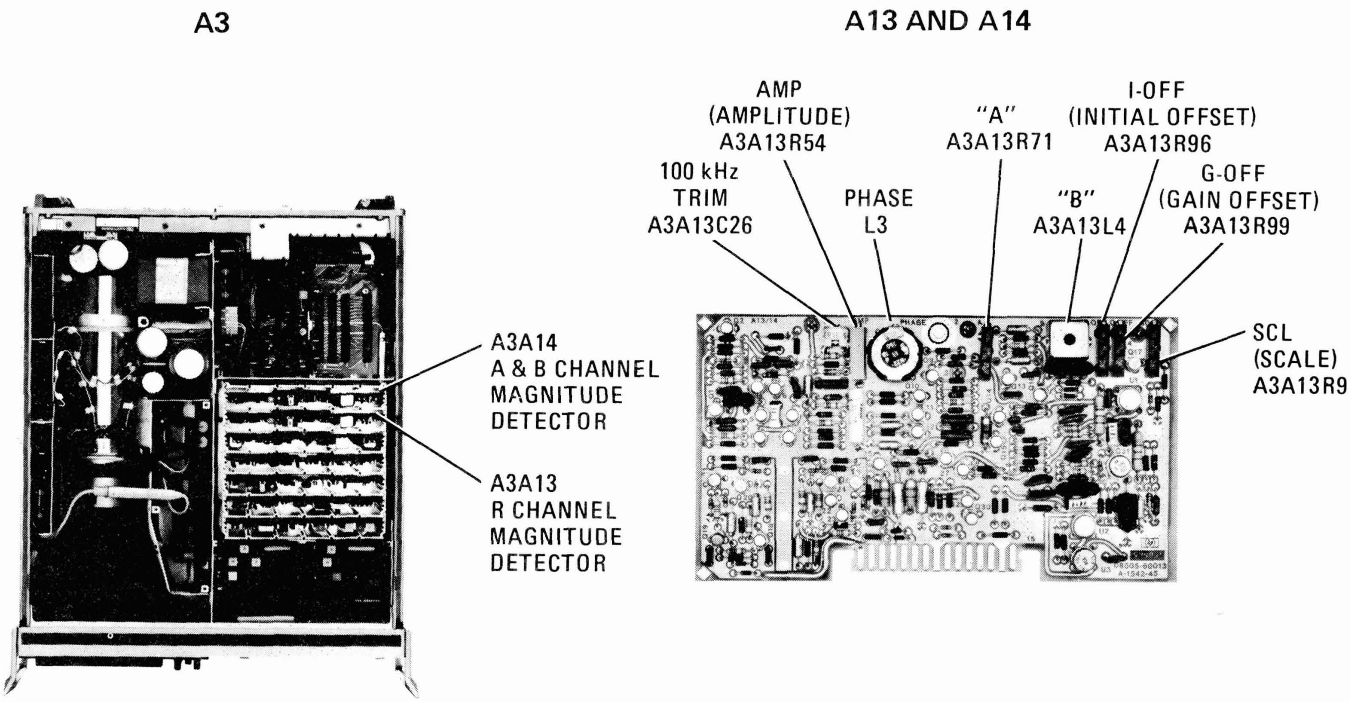
e. Switch between BANDWIDTH 10 KHz and 1 KHz and fine tune "PHASE" control A3A13L3 for zero phase difference between Bandwidths. Remove 10:1 probes.

f. On display, press REF LINE POSN, adjust Channel 1 trace to center line, then press REF LINE POSN again for normal operation.

g. Set Channel 1 SCALE/DIV to 0.1 dB. Press Channel 1 DISPLAY MKR then ZRO pushbuttons to place the CRT trace on the center graticule line.

ADJUSTMENTS

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS MAGNITUDE ADJUSTMENT (Cont'd)



A5-25. Magnitude Adjustments on A13 and A14

h. On display section, select 10 kHz bandwidth, then 1 kHz and adjust "AMP" control A3A13R54 (Figure A5-25) for ≤0.2 dB change in trace position when bandwidth is changed.

i. Set front panel Channel 1 SCALE/DIV switch to .2 dB. Press DISPLAY MKR then ZRO then REF pushbuttons.

j. Step external attenuator from −10 to −40 dB. As attenuator is stepped 10 dB, add 10 dB of offset with REF OFFSET pushbuttons to bring trace back to Reference line.

k. Adjust "SCL" control A3A13R91 for accurate 10 dB steps.

l. Step external attenuator from −50 to −90 dB (−60 to −100 dBm signal level at "R" INPUT). As attenuator is stepped 10 dB, add 10 dB of offset with REF OFFSET pushbuttons to bring CRT trace back to Reference line. Adjust "A" control A3A13R71 and "B" control A3A13L4 for accurate 10dB steps on CRT display in the input range of −70 to −110 dBm. See Figure A5-26 for area that each control affects.

NOTE

Use non-metallic adjusting tool for A13L4.

NOTE

The step from −110 dBm to −120 dBm may not indicate a full 10 dB change of trace position but can show noise floor at about −115 dBm.

ADJUSTMENTS

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS MAGNITUDE ADJUSTMENT (Cont'd)

m. Set external step attenuator to zero dB. Set OUTPUT LEVEL dBm to – 10 dBm. Connect DVM to pin 1 of A13 connector at extender board. Adjust front panel OUTPUT LEVEL Vernier for a reading of 0.35 VRMS ±0.02 VRMS.

n. Set external attenuator to 20 dB. Connect DVM to A13TP4 and adjust "I OFF" control A3A13R96 for an indication on the DVM of –1.50 Vdc ±0.01 Vdc. Return OUTPUT LEVEL Vernier to 0 dB.

o. Set external step attenuator to –30 dB and set front panel OUTPUT LEVEL dBm switch to –10 dBm. Set SCALE/DIV to 0.1 dB. Press Channel 1 DISPLAY MKR then ZRO to place trace on center graticule line. Switch front panel INPUT LEVEL dBm MAX switch from –10 to –30 dBm. Adjust "Y" (G–OFF) control A3A13R99 for ⩽.02 dB change between –10 and –30 dBm switch position.

p. Check the entire INPUT range from – 10 dBm to – 110 dBm by stepping the external step attenuator. Repeat adjustments in steps j through o to get accurate 10 dB steps through the entire input range.

q. Remove extender board and reinstall A3A13. Put A3A14 on extender board.

r. Connect external step attenuator to "A" INPUT and set Channel 1 INPUT switch to "A". Repeat adjustments in steps c through p for A3A14 A and B Channel magnitude detector.

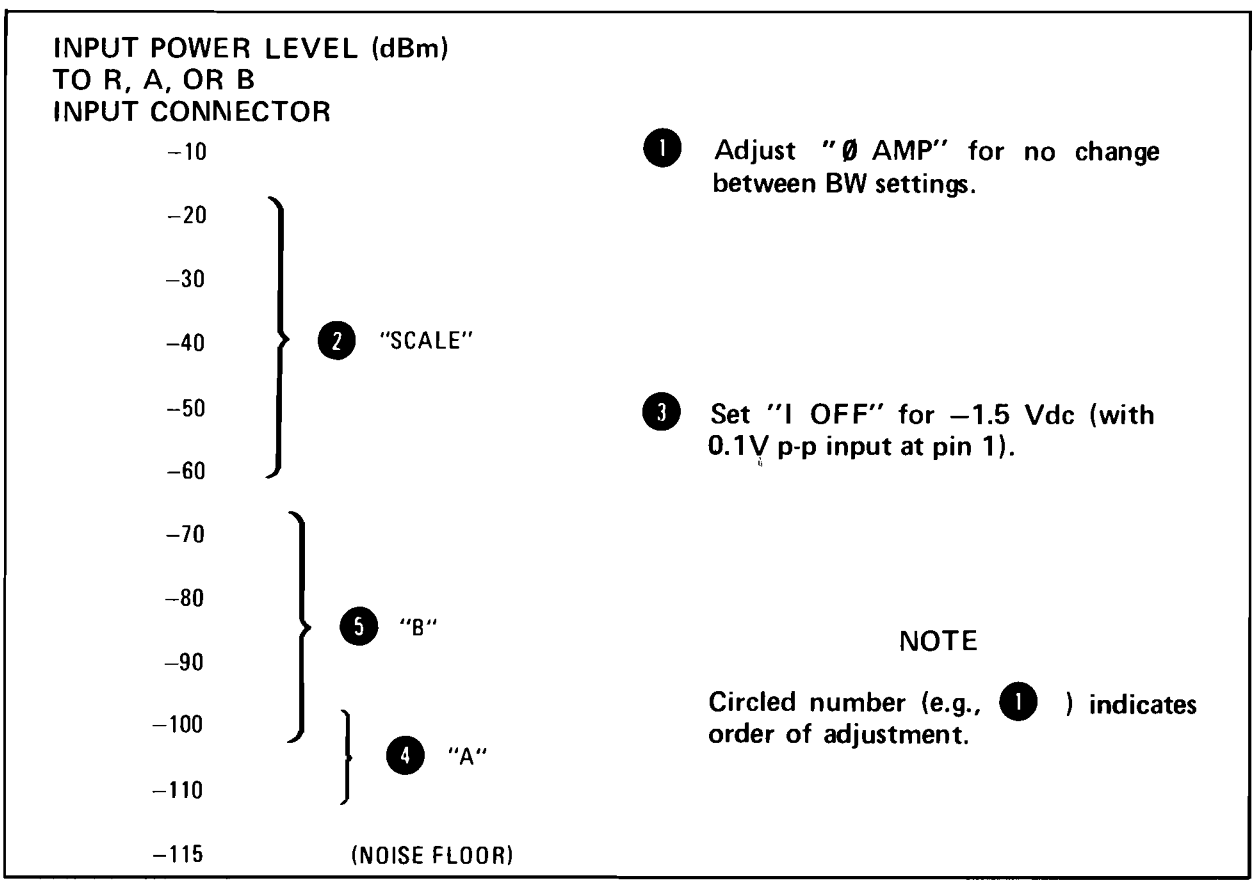


Figure A5-26. Graph of A3A13 and A3A14 Magnitude Detector Adjustments

ADJUSTMENTS

A5-30. ABSOLUTE MAGNITUDE CALIBRATION

EQUIPMENT:

3-Way Power Splitter .... HP 11850A
Matched Coaxial Cable Kit .... HP 11851A

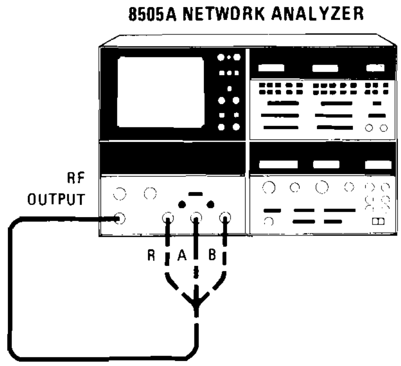


Figure A5-27. Absolute Magnitude Test Setup

a. Set 8505A controls as follows:

On A1 Source/Converter
OUTPUT LEVEL dBm 10 dB/step .... −10
OUTPUT LEVEL Vernier 0
MAXIMUM INPUT dBm .... −10

On A2 Frequency Control
FREQUENCY RANGE MHz .... .5 — 130
MODE .... LIN EXPAND
WIDTH .... CW $\pm\Delta F$
SCAN TIME SEC .... .1 — .01
TRIGGER .... AUTO
CW FREQUENCY .... 30 MHz
ΔF FREQUENCY .... 00.00 MHz

On A3 Signal Processor
Channel 1
INPUT .... R
MODE .... MAG
SCALE/DIV .... .1 dB

Channel 2
MODE .... OFF

Electrical Length
MODE .... OFF

Display Panel
BANDWIDTH KHz 10
VIDEO FILTER .... OFF

ADJUSTMENTS

A5-30. ABSOLUTE MAGNITUDE CALIBRATION (Cont'd)

b. Connect equipment as shown in Figure A5-27 with RF OUTPUT connected to INPUT "R".

c. On display section, press CH 1 REF LINE POSN pushbutton and adjust CRT trace to the center graticule line. Press CH 1 REF LINE POSN again for normal operation.

d. Press Channel 1 DISPLAY REF pushbutton then CLR pushbutton until REL light goes off (if lit). Press upper 10 dB REF OFFSET pushbutton to place – 10 dB of offset at the digital readout. The trace should be on the CRT. Adjust A1A4 "R" IF Amplifier "MAGNITUDE ADJ" control A1A4R6 (Figure A5-28) to place the trace directly on the center graticule line. (This calibrates for INPUT R absolute magnitude measurement.)

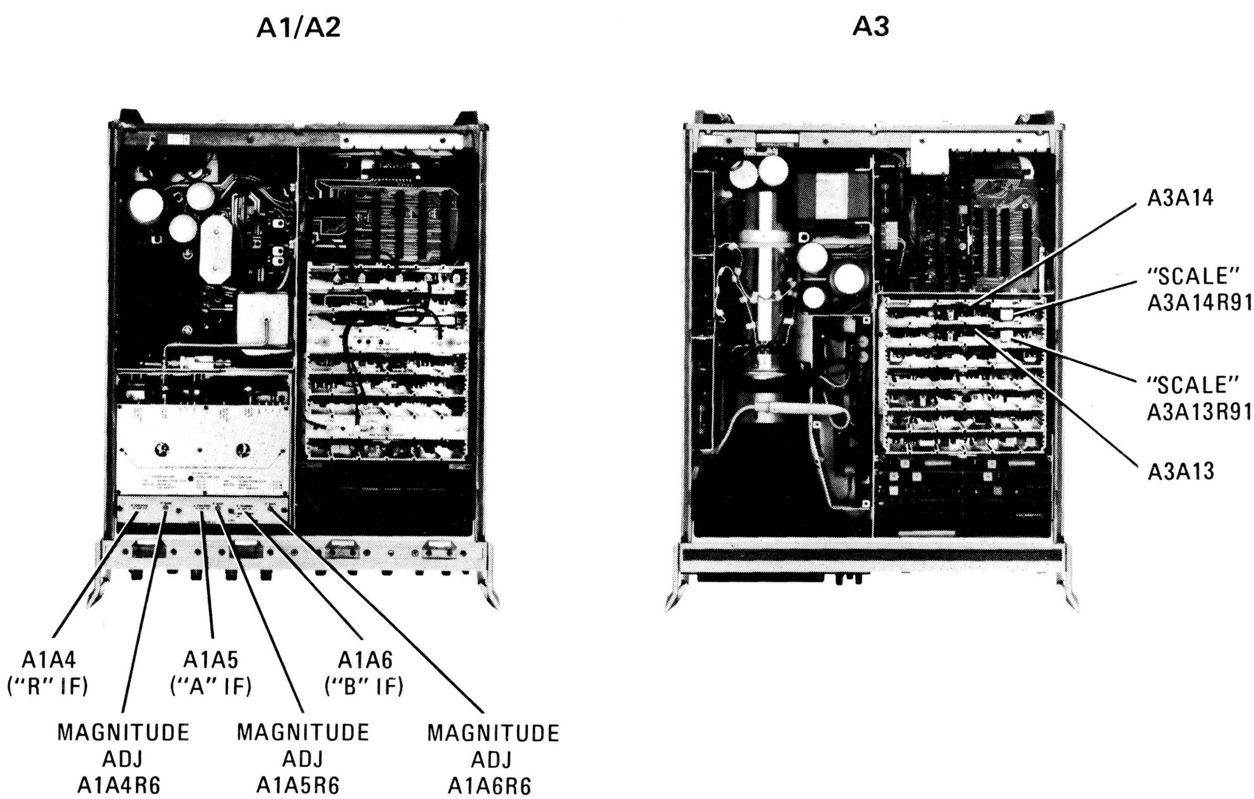


Figure A5-28. Absolute Magnitude Calibration Adjustment Locations

e. Disconnect coaxial cable from front panel INPUT R and connect it to INPUT A connector. Set Channel 1 INPUT switch to "A". Adjust A1A5 "A" IF Amplifier "MAGNITUDE ADJ" control A1A5R6 (Figure A5-28) to place the trace directly on the center graticule line. (This calibrates for INPUT A absolute magnitude measurement.)

f. Disconnect coaxial cable from front panel INPUT A and connect it to INPUT B connector. Set Channel 1 INPUT switch to "B". Adjust A1A6 "B" IF Amplifier "MAGNITUDE ADJ" control A1A6R6 (Figure A5-28) to place the trace directly on the center graticule line. (This calibrates for INPUT B absolute magnitude measurement.)

ADJUSTMENTS

A5-30. ABSOLUTE MAGNITUDE CALIBRATION (Cont'd)

g. Connect power splitter as shown in Figure A5-29. Set Channel 1 INPUT to A/R. Press DISPLAY REF, then CLR until REL light goes off (if lit).

h. Step A1 Source/Converter OUTPUT LEVEL dBm switch to each 10-dB position between −10 dBm and −50 dBm and the CRT trace should stay on the center graticule line (±0.05 dB or ½ division). If not, make fine adjustments to "SCL" controls A3A13R91 and A3A14R91 on the two magnitude detectors. Set Channel 1 SCALE/DIV switch to 0.1 dB and make fine adjustment of "SCL" controls for best tracking through the +10 to −50 dBm range.

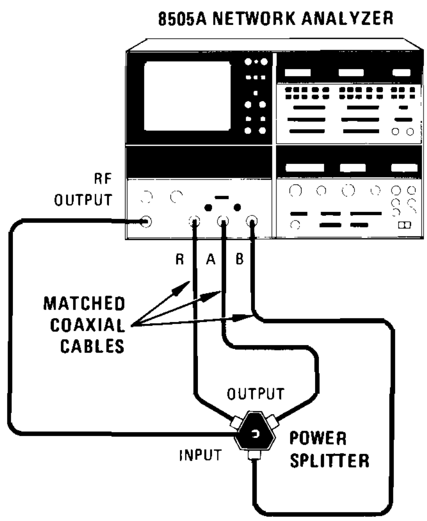


Figure A5-29. Ratio Test Setup

A5-31. A3A12 PHASE DETECTOR ADJUSTMENT

EQUIPMENT:

Spectrum Analyzer	HP 141/8552/8553
Active Probe	HP 1121A
Oscilloscope	HP 180/1801/1820
10:1 probes (2)	HP 10004D
Digital Voltmeter (DVM)	HP 3490A
Attenuator	HP 8496A
3-Way Power Splitter	HP 11850A
Coaxial Cable Kit	HP 11851A
Extender Board (15 pin)	HP 08505-60041
Type N-to-N Female Adapter	HP 1250-0777

PROCEDURE:

a. Remove A3A10 Phase Offset I board, place A3A12 Phase Detector board on extender, and place a short jumper between pins 4 and 6 of the extender board. (This eliminates any phase change through the electrical line stretcher.)

ADJUSTMENTS

A5-31. A3A12 PHASE DETECTOR ADJUSTMENT (Cont'd)

b. Set 8505A controls as follows:

On A1 Source/Converter
- OUTPUT LEVEL dBm 0
- OUTPUT LEVEL Vernier 0
- INPUT LEVEL dBm MAX .... −10

On A2 Frequency Control
- RANGE MHz .... .5 – 130
- MODE .... LIN EXPAND
- WIDTH .... CW ±ΔF
- SCAN TIME SEC .... 1 — .1
- TRIGGER .... AUTO
- CW FREQUENCY .... 30 MHz
- ±ΔF FREQUENCY 00.00

On A3 Signal Processor

Channel 1
- INPUT .... A/R
- MODE .... PHASE
- SCALE/DIV .... 90 DEG

Channel 2
- MODE .... OFF

c. Connect equipment as shown in Figure A5-30. Set external attenuator to 40 dB.

d. Connect the Spectrum Analyzer to A3A12TP2 using HP 1121A probe. Adjust "REF BAL 1" control A3A12R19 (Figure A5-31) to null the 200 kHz second harmonic signal.

e. Connect Spectrum Analyzer to A3A12TP8 using HP 1121A probe. Adjust "TEST BAL 1" control A3A12R20 to null the 200 kHz second harmonic signal.

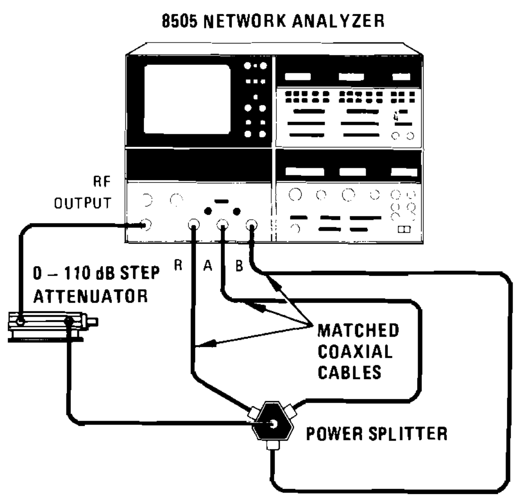


Figure A5-30. A3A12 Phase Detector Test Setup

ADJUSTMENTS

A5-31. A3A12 PHASE DETECTOR ADJUSTMENT (Cont'd)

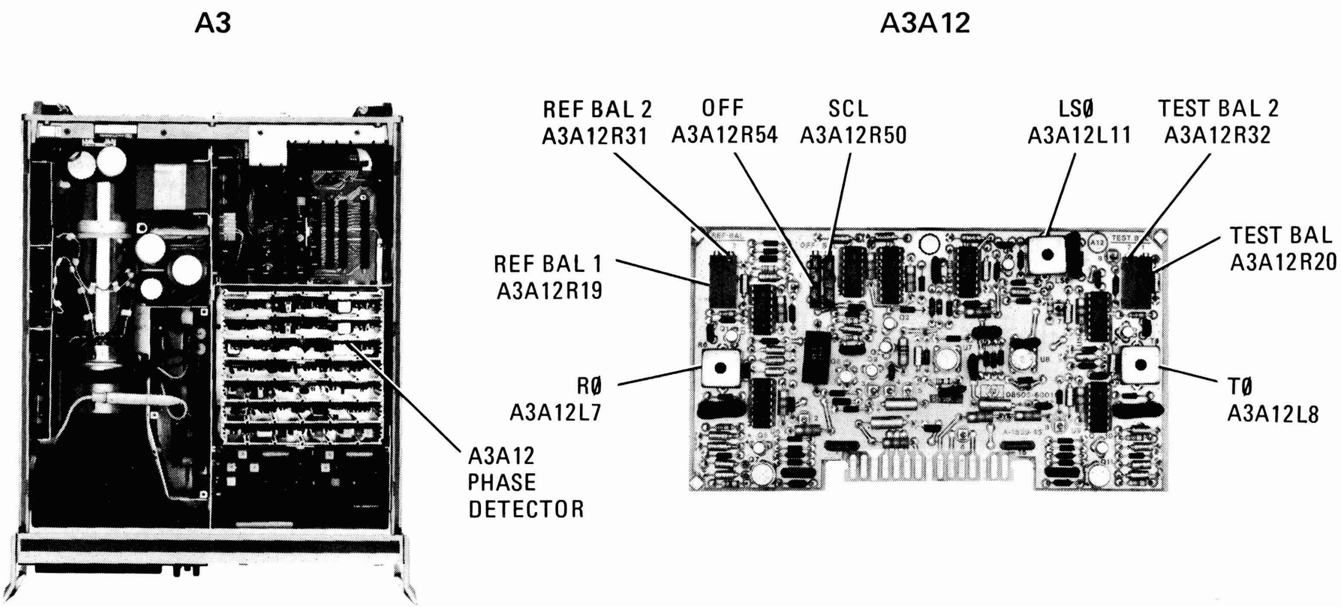


Figure A5-31. A3A12 Phase Detector Adjustments Location

f. Connect the two vertical oscilloscope probes (which have identical electrical lengths) to A3A12TP1 and A3A12TP2. Adjust "Rφ" control A3A12L7 for zero phase difference between the two CRT traces (one trace superimposed on the other).

g. Connect the two vertical oscilloscope probes to A3A12TP7 and A3A12TP8. Adjust "Tφ" control A3A12L8 for 180 degree phase difference between the two CRT traces. (Change polarity of oscilloscope Channel B to negative to superimpose one trace on the other.) Remove oscilloscope probes.

h. Set A1 Source/Converter OUTPUT LEVEL dBm switch to −30 dBm. Connect Spectrum Analyzer to A3A12TP1 using HP 1121A Probe. Adjust "REF BAL 2" control A3A12R31 to null the 200 kHz second harmonic signal.

i. Connect Spectrum Analyzer to A3A12TP7 using HP 1121A probe. Adjust "TEST BAL 2" control A3A12R32 to null the 200 KHz second harmonic signal.

j. On 8505A, set controls as follows:

On A2 Frequency Control
WIDTH . . . . CW ±ΔF
CW FREQUENCY . . . . 30 MHz
ΔF FREQUENCY . . . . 0.2 MHz

On A3 Signal Processor
Channel 1
SCALE/DIV . . . . PHASE 1 DEG

ADJUSTMENTS

A5-31. A3A12 PHASE DETECTOR ADJUSTMENTS (Cont'd)

Electrical Length Panel
INPUT . . . . A
MODE . . . . OFF

CRT Display
BANDWIDTH KHz 10
VIDEO FILTER . . . . ON

k. On CRT Display, press REF LINE POSN and adjust CH 1 position control to place the CRT trace on the center graticule line. Press REF LINE POSN pushbutton again for normal operation.

l. On A3 Signal Processor Channel 1, press DISPLAY REF pushbutton then CLR pushbutton until REL light goes out (if it was lit).

m. Observe the trace on the CRT. If it is not 0 degrees ± 1 degree, adjust "LS ϕ" control A3A12L11 to place the CRT trace on 0 degree (center graticule line) ±1 degree.

n. Set Channel 1 SCALE/DIV switch to PHASE 45 DEG. Disconnect the coaxial cable from "B" port of 8505A and from the 3-way power splitter. Use this cable to extend the "A" port cable to twice its length. (The "A" port cable is now twice the length of the "R" port cable.) Use a Type N female adapter to connect the two cables.

o. Connect DVM to A3A12TP9. On A2 Frequency Control, set RANGE MHz switch to .5 — 1300 MHz. Adjust CW FREQUENCY control through the range until a phase transition occurs as shown in Figure A5-32.

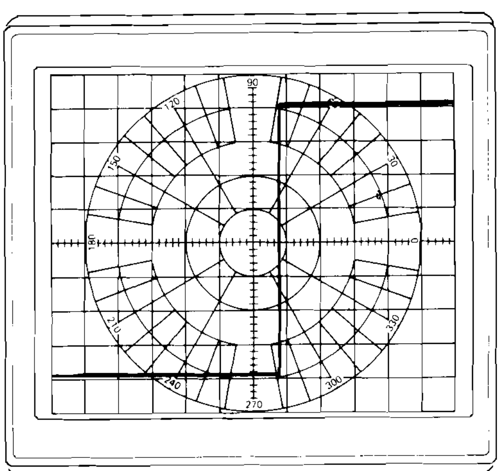


Figure A5-32. Phase Transition Waveform

ADJUSTMENTS

A5-31. A3A12 PHASE DETECTOR ADJUSTMENTS (Cont'd)

p. Set A2 Frequency Control SCAN TIME SEC switch to MANUAL. Rotate MANUAL sweep control slowly clockwise and note point at which a negative to positive transition occurs as in Figure A5-33. Then rotate MANUAL sweep control slowly counterclockwise and note point at which a positive to negative transition occurs. Adjust ±ΔF FREQUENCY sweep width until the hysteresis loop is at least four divisions wide as shown in Figure A5-33.

q. Set CRT trace dot to the right-hand edge of the CRT with the MANUAL sweep control, then bring the dot back to a point half-way between transitions (Point A on Figure A5-33).

r. Indication on DVM should be +900 mV ±1 mV. If indication is out of tolerance, adjust "OFF" control A3A12R54 (Figure A5-31) for +900 mV ±1 mV.

s. Set CRT trace dot to the left-hand edge of the CRT with the MANUAL sweep control, then bring the dot back to a point half-way between transitions (Point B on Figure A5-33). DVM should indicate −900 mV ±1 mV. If not, adjust "SCL" control A3A12R50 for −900 mV ±1 mV.

t. Remove extender and reinstall A3A12. Put A3A10 on extender for the following adjustment.

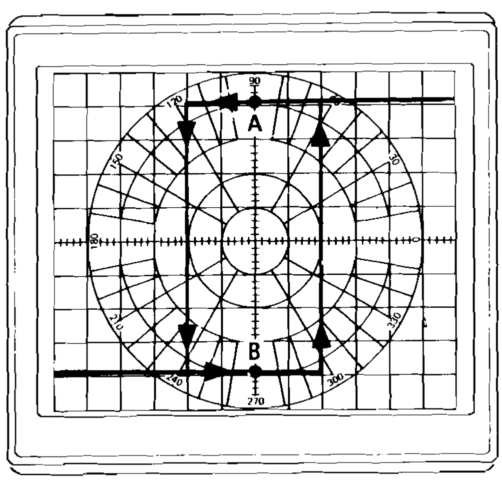


Figure A5-33. Hysteresis Loop Waveform

A5-32. A3A10 PHASE OFFSET 1 and A3A9 PHASE OFFSET II

EQUIPMENT:

3-Way Power Splitter	HP 11850A
RF Cable Kit	HP 11851A
Spectrum Analyzer	HP 141/8552/8553
Active probe	HP 1121A
Counter	HP 5340A
Digital Voltmeter (DVM)	HP 3490A
Extender Board (15 pin)	HP 08505-60041

a. Put A3A10 Phase Offset 1 board on extender and set 8505A controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL Vernier	0
INPUT LEVEL dBm MAX	−10

On A2 Frequency Control

RANGE MHz	.5 — 130
MODE	LIN EXPAND
WIDTH	CW ±ΔF
SCAN TIME	1 — .1
TRIGGER	AUTO
CW FREQUENCY	030.0 MHz
ΔF FREQUENCY	10.00 MHz

On A3 Signal Processor

Channel 1

INPUT	A/R
MODE	POLAR PHASE
SCALE/DIV	POLAR 1

Channel 2

MODE	OFF

Electrical Length

INPUT	A
MODE	OFF
VERNIERS A and B	0

CRT Display

BANDWIDTH KHz	10
VIDEO FILTER	OFF

b. Connect equipment as shown in Figure A5-29.

c. Press Channel 1 DISPLAY REF pushbutton then CLR pushbutton until REL light goes off (if lit). Press Electrical Length DISPLAY CLR pushbutton.

ADJUSTMENTS

A5-32. A3A10 PHASE OFFSET I AND A3A9 PHASE OFFSET II (Cont'd)

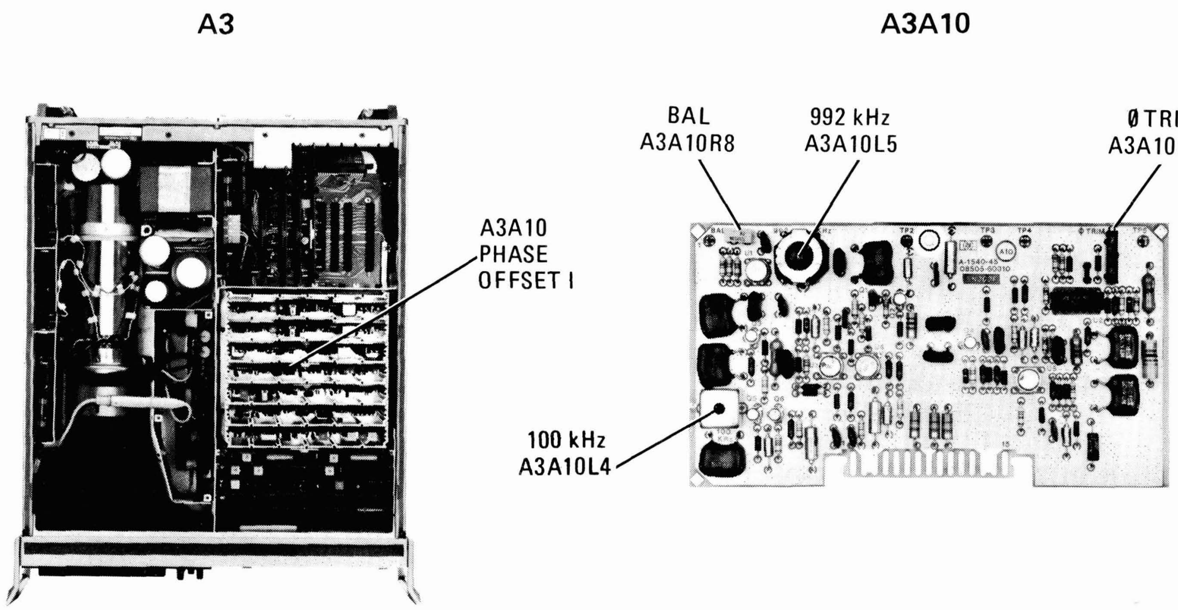


Figure A5-34. A3A10 Adjustment Locations

Filter Adjustment

d. Set NORM-ALIGN switch S1 on A3A9 PHASE OFFSET 2 board to NORM (left). Connect 8553B Spectrum Analyzer to A3A10TP1 using 1121A probe. Adjust "100 KHZ" control A3A10L4 (Figure A5-34) for maximum 100 KHz signal.

e. Connect 8553B Spectrum Analyzer to A3A10TP3 using 1121A probe. Center the 893 KHz signal on the Spectrum Analyzer screen as shown in Figure A5-35.

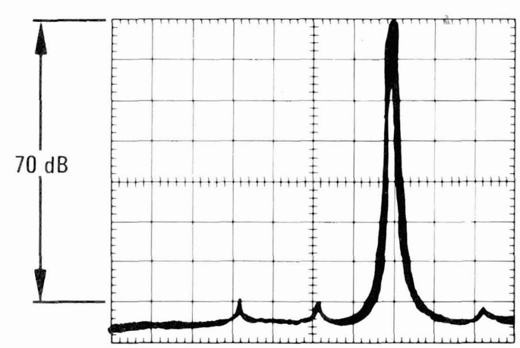


Figure A5-35. Waveform at A3A10TP3 Displayed on Spectrum Analyzer

ADJUSTMENTS

A5-32. A3A10 PHASE OFFSET I AND A3A9 PHASE OFFSET II (Cont'd)

NOTE

If the signals displayed are ≥70 dB down from 993 kHz signal as shown in Figure A5-35, no adjustment of "BALANCE" or "992 KHz PEAK" is necessary.

f. Adjust "BAL" control A3A10R8, if necessary, for minimum 893 kHz signal (down > 70 dB from 992 kHz signal).

g. Adjust "992 KHz PEAK" control A3A10L5 for maximum 992 kHz signal.

h. Observe the 793 kHz signal (if it can be seen). Adjust the 793 kHz signal to minimum by selecting the value of A3A10C17. If the 793 kHz signal is below the 992 kHz signal by > 70 dB, C17 does not have to be changed.

i. Install A3A10 and put A3A9 on extender board.

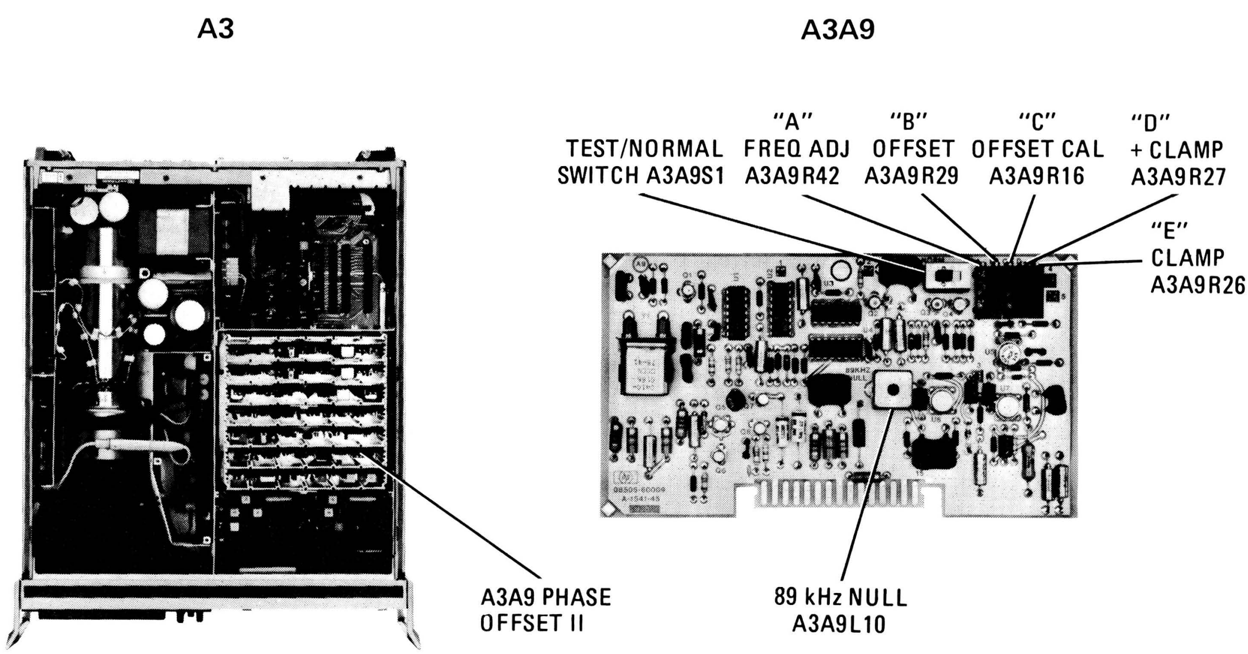


Figure A5-36. A3A9 Phase Offset II Adjustment Locations

ADJUSTMENTS

A5-32. A3A10 PHASE OFFSET I AND A3A9 PHASE OFFSET II (Cont'd)

j. On A3 CRT display section, press BEAM CENTER pushbutton. Adjust Polar controls to place CRT dot in the center of the polar graticule. Press BEAM CENTER pushbutton again to resume normal operation.

k. Press Channel 1 DISPLAY REF pushbutton, then CLR pushbutton until REL light goes out (if it was lit). Press ELECTRICAL LENGTH DISPLAY CLR pushbutton.

l. Set A3A9S1 TEST switch to TEST position (right). (See Figure A5-36).

m. Connect external Frequency Counter to pin 15 of A3A9 connector. (Use a 10:1 oscilloscope probe to avoid loading circuit.) If the counter indicates 893 kHz ±3 kHz, go to next step. Adjust "A" control A3A9R42 (Figure A5-36) for an output frequency of 893 kHz ±3 kHz. Disconnect Frequency Counter.

n. Set A3A9S1 TEST switch to NORMAL position (left). Connect DVM to A3A9TP2 and adjust "A" control for −0.5 Vdc ±0.2 Vdc. Disconnect DVM.

o. Connect 8553B Spectrum Analyzer to A3A9TP3 using 1121A probe, and adjust "89 KHz NULL" A3A9L10 with a nonmagnetic adjustment tool for minimum 89 kHz signal amplitude. Disconnect Spectrum Analyzer.

Phase Offset Zero

p. Press Channel 1 DISPLAY REF pushbutton then CLR pushbutton until REL light goes out (if it was lit). Observe the CRT trace. If the trace dot is not on zero degrees ±2 degrees, adjust "B" control A3A9R29 phase offset to place the dot at zero degrees.

q. Set Channel 1 MODE switch to PHASE and set SCALE/DIV switch to PHASE 1 DEG/DIV position. Press Channel 1 DISPLAY REF pushbutton, then CLR pushbutton until the REL light goes out (if it was lit).

r. Press REF LINE POSN pushbutton, adjust CRT trace to the center graticule line, then press REF LINE POSN pushbutton again for normal operation.

s. Observe the CRT trace. If the trace is not o the center graticule line, adjust "ϕ TRIM" control A3A10R45 to place the trace on the center graticule line ±0.2 degrees (Figure A5-34).

Offset Accuracy

t. Press Channel 1 REF OFFSET pushbuttons to select +360 degrees offset. The CRT trace should return to the center graticule line ±0.5 degrees. If not, adjust "C" control A3A9R16 phase offset cal. adjustment to place the trace on the center graticule line ±0.5 degrees.

Positive Offset Clamp

u. Set Channel 1 SCALE/DIV switch to PHASE 90 DEG position. Press Channel 1 DISPLAY REF then CLR pushbutton until REL light goes out (if it was lit).

v. On A3 Signal Processor Electrical Length panel, set INPUT switch to "A" and set MODE switch to PHASE X 10 degrees/SCAN position. Press DISPLAY CLR Pushbutton. Press LENGTH pushbuttons to place +175 on digital display. (+175 on display represents +1750 degrees/scan.)

ADJUSTMENTS

A5-32. A3A10 PHASE OFFSET I AND A3A9 PHASE OFFSET II (Cont'd)

w. The display should look like Figure A5-37. Increase the phase offset with LENGTH pushbuttons to +177 and clamping action should be observed at right end of trace. (Clamping action appears as a horizontal line at the right end of trace.) If clamping does not occur between +175 and +177, adjust "D" control A3A9R27 for clamping action in this range.

x. Press Electrical Length DISPLAY CLR.

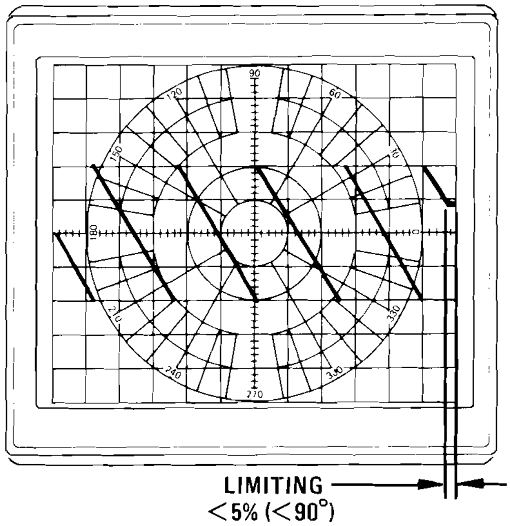


Figure A5-37. Waveform of Positive Offset Clamp

Negative Offset Clamp

y. Press LENGTH pushbuttons to place −175 on digital display. (−175 on display represents −1750 degrees/scan.)

z. The display should look like Figure A5-38. Increase the phase offset with LENGTH pushbutton to −177 and clamping action should be observed at right end of trace. If clamping does not occur between −175 and −177 , adjust "E" control A3A9R26 for clamping action in this range.

aa. Remove extender and reinstall A3A9.

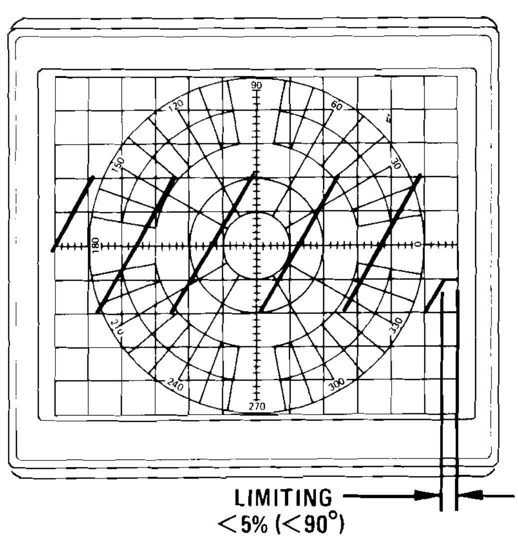


Figure A5-38. Waveform of Negative Offset Clamp

ADJUSTMENTS

A5-33. A3A8 POLAR CONVERTER

EQUIPMENT:

3-Way Power Splitter	HP 11850A
RF Cable Kit	HP 11851A
Spectrum Analyzer	HP 141/8552/8553
Active Probe	HP 1121A
Digital Voltmeter (DVM)	HP 3490A
Extender Board (15 pin)	HP 08505-60041

a. Put A3A8 on extender board. Set 8505A controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	–10
OUTPUT LEVEL Vernier	0
MAXIMUM INPUT dBm	–10

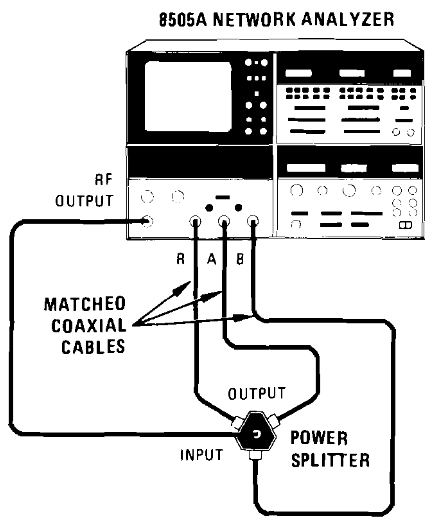


Figure A5-39. A3A8 Polar Converter Test Setup

On A2 Frequency Control

FREQUENCY RANGE MHz	.5 — 130
MODE	LIN EXPAND
WIDTH	CW±ΔF
SCAN TIME SEC	.1 — .01
TRIGGER	AUTO
CW FREQUENCY	30.00
ΔF FREQUENCY	10.00

On A3 Signal Processor

Channel 1

INPUT	A/R
MODE	POLAR MAG
SCALE/DIV	POLAR 1

ADJUSTMENTS

A5-33. A3A8 POLAR CONVERTER (Cont'd)

Channel 2
MODE . . . . OFF

Electrical Length
INPUT . . . . A
MODE . . . . LENGTH X10°/SCAN
LENGTH . . . . +36

b. Connect equipment as shown in Figure A5-39.

c. On A3 Display, press BEAM CENTER pushbutton. Adjust POL centering controls to place the dot at the center of the graticule. Do NOT release BEAM CENTER pushbutton.

d. Adjust "MAG BAL" control A3A8R18 (Figure A5-40) to the center of its range. Adjust "IF BAL" control A3A8R10 for the smallest dot. Readjust "MAG BAL" control for the smallest dot. Release BEAM CENTER pushbutton. Set ELECTRICAL LENGTH MODE to OFF.

e. Connect HP 8553B Spectrum Analyzer to A3A8TP7 using HP 1121A probe. Adjust "Y BAL" control A3A8R40 for minimum 100 kHz signal amplitude.

f. Connect HP 8553B Spectrum Analyzer to A3A8TP8 using HP 1121A probe. Adjust "X BAL" control A3A8R44 for minimum 100 kHz signal amplitude.

g. Connect DVM to A3A8TP5 and adjust "YOFFS" control A3A8R95 for 0.000 Vdc ±0.005 Vdc.

h. Connect DVM to A3A8TP6 and adjust "XOFFS" control A3A8R93 for 0.000 Vdc ±0.005 Vdc.

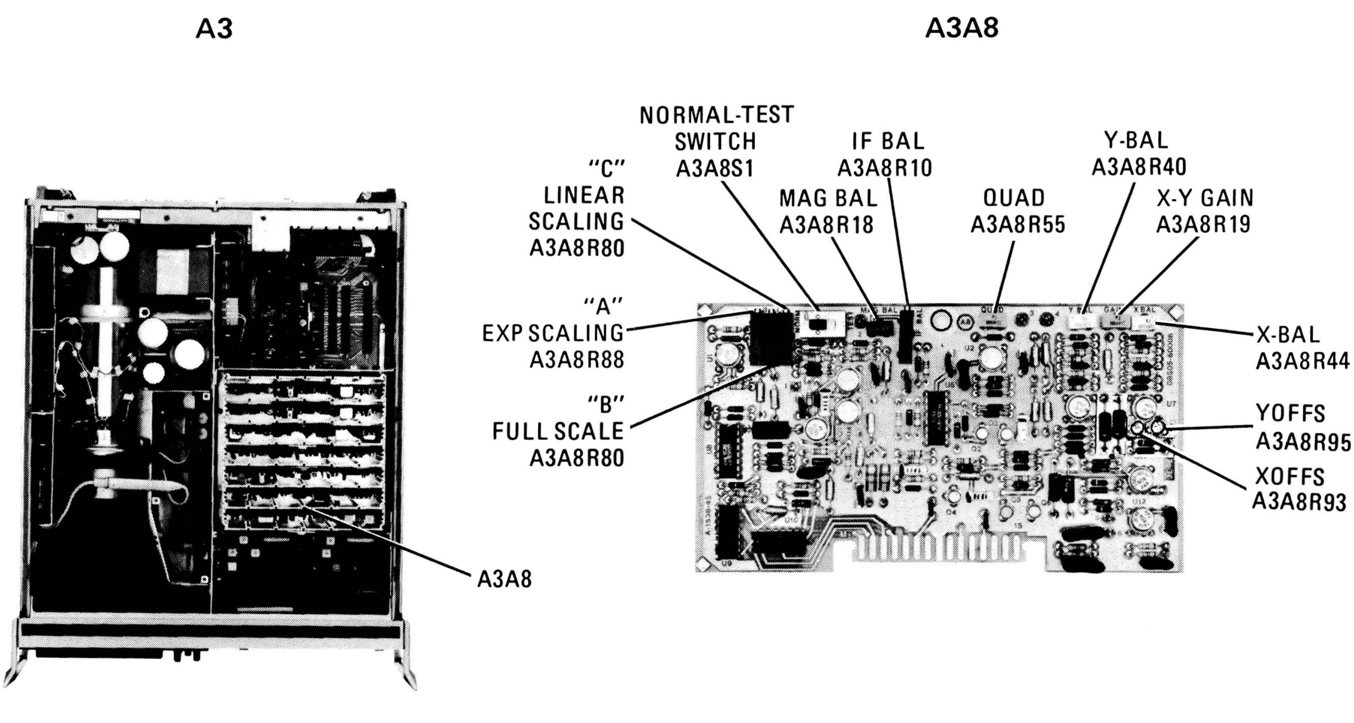


Figure A5-40. A3A8 Polar Converter Adjustments Location

A5-33. A3A8 POLAR CONVERTER (Cont'd)

i. Set ELECTRICAL LENGTH MODE TO X10°/SCAN and LENGTH pushbuttons for +36. A full circle should be displayed on the CRT.

j. Adjust "QUAD" control A3A8R55 and "X-Y GAIN" control A3A8R19 for best circularity of circle on the CRT.

k. Connect DVM to A3A8TP2 and record indication.

l. Add +40.0 dB of offset with REF OFFSET pushbuttons and note DVM indication, it should be 1.0% of the value recorded in step k ±5 mVdc. If not, adjust "A" (EXP SCALE) control A3A8R88.

m. Repeat steps k and l until no further adjustment is necessary.

n. Set Channel 1 MODE to MAG and SCALE/DIV to .1 dB. Offset with REF OFFSET pushbuttons to place trace exactly on center graticule reference line.

o. Set Channel 1 MODE to POLAR MAG and SCALE/DIV to POLAR 1. The trace should be coincident with the outer circle of the CRT. If not, adjust "B" (FULL SCALE) control A3A8R82.

p. On A3 Signal Processor press REF OFFSET pushbuttons to obtain +40 dB of offset on the digital display, then set Channel 1 SCALE/DIV switch to POLAR .01 position. The CRT trace should be a circle on the outside graticule line. If not, adjust "C" (LINEAR SCALE CONTROL) A3A8R80 to obtain the trace on the outside graticule line.

q. Remove extender and reinstall A3A8.

A5-34. A3A11 GROUP DELAY

EQUIPMENT:

3-Way Power Splitter	HP 11850A
RF Cable Kit	HP 11851A
Counter	HP 5340A
Digital voltmeter (DVM)	HP 3490A
10:1 Scope probe	
Extender Board (15 pin)	HP 08505-60041
50 ft. Test Cable	

a. A coaxial cable greater than 50 feet in length is used as a standard in the group delay adjustments. Group delay of the test cable is measured with the 8505A in phase mode as follows:

(1) Connect the "Test Cable" in the A channel between the matched cable and the power splitter as shown in Figure A5-41.

(2) Set 8505A controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL Vernier	0
INPUT LEVEL dBm MAX	−10

ADJUSTMENTS

A5-34. A3A11 GROUP DELAY (Cont'd)

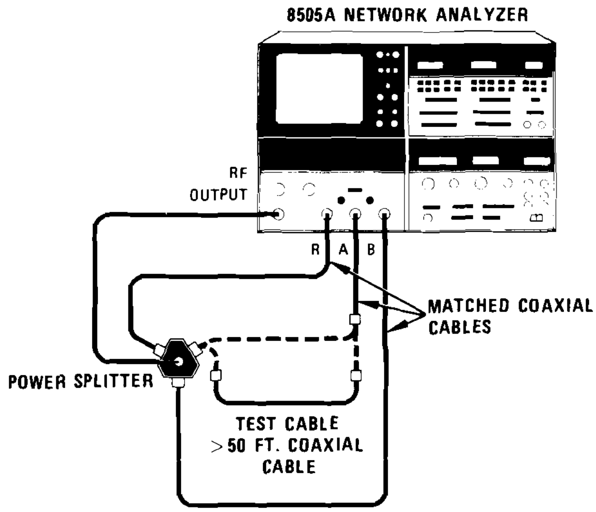


Figure A5-41. Test Setup to Measure Test Cable Group Delay

On A2 Frequency Control
- RANGE MHz .... .5 — 1300
- MODE .... LIN EXPAND
- WIDTH .... CW
- SCAN TIME SEC .... .1 — .01
- TRIGGER .... AUTO

On A3 Signal Processor
- Channel 1
  - INPUT .... A/R
  - MODE .... PHASE
  - SCALE/DIV .... 90 DEG
- Channel 2
  - MODE .... OFF
- Electrical Length
  - MODE .... OFF

(3) On A3 Signal Processor CRT Display, press REF LINE POSN pushbutton and adjust CH1 control to place the trace on the center graticule line. Press REF LINE POSN again for normal operation.

(4) Set A2 Frequency Control CW FREQUENCY TUNING and VERNIER for 700.00 MHz. Press Channel 1 DISPLAY MKR pushbutton then ZRO pushbutton to place the CRT trace on the center graticule.

ADJUSTMENTS

A5-34. A3A11 GROUP DELAY (Cont'd)

(5) On A2 Frequency Control, adjust CW FREQUENCY up in frequency until the CRT trace comes back to the center graticule line and the marker digital readout indicates 0 degrees. Note frequency for use in later calculation.

CW FREQUENCY =__________MHz

NOTE

The phase change between the two zero points is 360 degrees.

(6) Calculate the group delay of the "Test Cable" with the following formula:

EXAMPLE

Change in Phase = 360 degrees

Change in Frequency = 713 MHz − 700 MHz

= 13 MHz

$$t_D = \frac{\text{(Phase Change in degrees)}}{360 \text{ X (Change in freq. in Hz)}}$$

$$t_D = \frac{360 \text{ degrees}}{360\,(13 \times 10^6 \text{ Hz})}$$

$$t_D = 77 \text{ ns}$$

b. Connect equipment as shown in Figure A5-42. Install A2A11 on extender board.

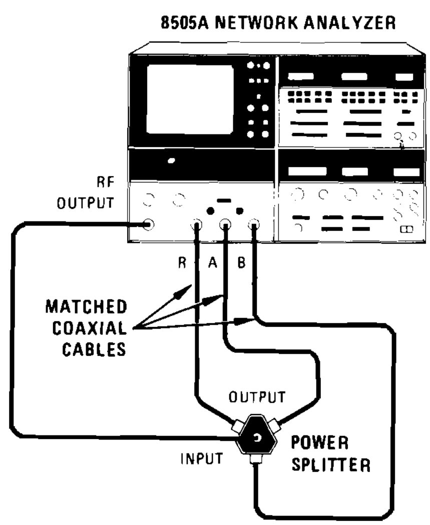


Figure A5-42. A3A11 Group Delay Test Setup

ADJUSTMENTS

A5-34. A3A11 GROUP DELAY (Cont'd)

c. Set A2 Frequency Control TRIGGER switch to EXT. Connect Frequency Counter (use a 10:1 scope probe to avoid loading circuit) to the Collector of Q13 and adjust "CK" 100 KHz clock control A3A11R13 (Figure A5-43) for 100 KHz ±10 Hz (period of 10μs). If the range on the control is not enough to reach 100 KHz, select a value of A3A11R12 in the range of 10K to 40K that allows adjustment to 100 KHz.

d. Disconnect counter and connect a DVM to A3A11TP1. Adjust "BAL" (discriminator balance) control A3A11R26 for minimum indication on the DVM.

e. On 8505A, set controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL Vernier	0
INPUT LEVEL dBm MAX	−10

On A2 Frequency Control

RANGE MHz	LOG 1 — 10
MODE	LOG FULL
WIDTH	START/STOP 1
SCAN TIME SEC	1 — .1
TRIGGER	AUTO
MARKERS	1
MARKER 1	MIDRANGE

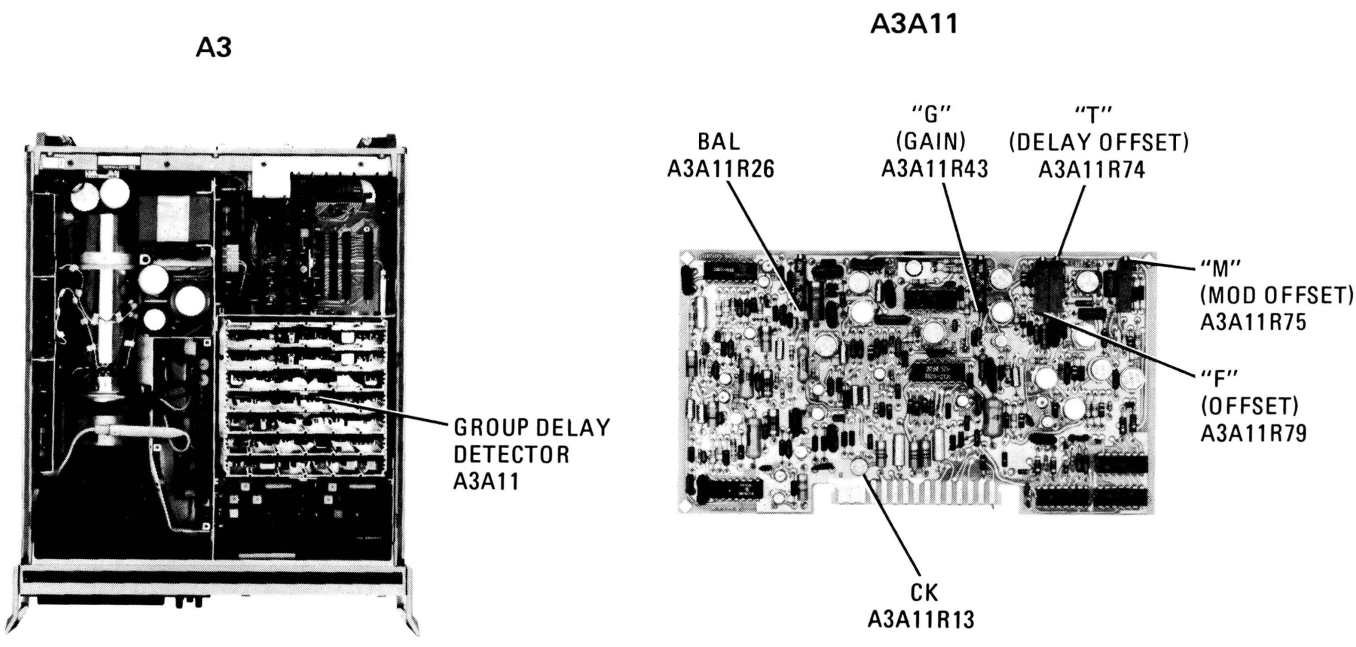


Figure A5-43. A3A11 Group Delay Adjustments Location

ADJUSTMENTS

A5-34. A3A11 GROUP DELAY (Cont'd)

On A3 Signal Processor
Channel 1
INPUT . . . . A/R
MODE . . . . DLY
SCALE/DIV . . . . DELAY 1

Channel 2
MODE . . . . OFF

Electrical Length
MODE . . . . OFF

f. Set SCAN TIME VERNIER for a CRT Display as shown in Figure A5-44A.

g. Connect a ground to A3A11TP4. Press Channel 1 DISPLAY MKR pushbutton then ZRO pushbutton. (This places the trace in the center of the CRT.)

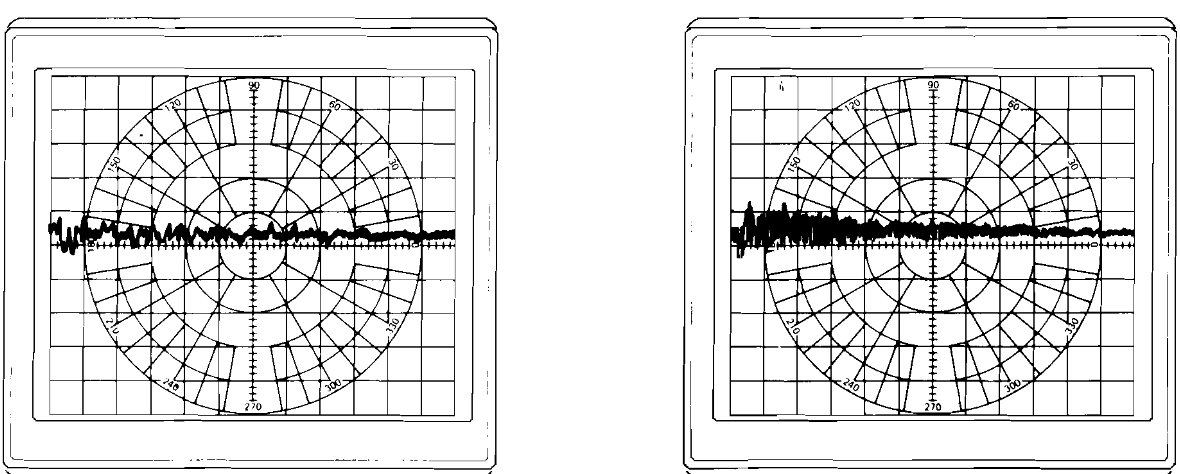
h. Set Channel 1 SCALE/DIV switch to DELAY 1 ns. Adjust "F" (ΔF offset) control A3A11R79 for a straight signal envelope across the CRT. (See Figure A5-44B.)

i. Set Channel 1 SCALE/DIV switch to DELAY 20 ns and set A2 Frequency Control RANGE MHz switch to 1—1000. Press Channel 1 DISPLAY MKR than ZRO pushbuttons to center trace on CRT. Adjust "M" (modulation offset) control A3A11R75 for a straight signal envelope across the CRT.

j. Repeat steps g through i until no further adjustment is necessary. Remove ground from A3A11TP4.

k. Set MARKER 1 to a smooth spot near the center of the trace. On A2 Frequency Control, set SCAN TIME SEC VERNIER control fully clockwise. Press Channel 1 DISPLAY REF then, CLR pushbutton until REL light goes off (if it was lit), then MKR pushbutton. Adjust "T" delay offset control A3A11R74 for a zero marker readout on Channel 1.

l. Connect "Test Cable" in the A channel. Set A2 Frequency Control MODE switch to LIN EXPAND. Adjust "G" (gain) control A3A11R43 for the group delay calculated for the "Test Cable" in step a (6) above.



A B

Figure A5-44. Group Delay Display with Sampling Disabled (TP4 grounded)

ADJUSTMENTS

A5-35. A3A27 BLANKING AMPLIFIER and A3A26 HV POWER SUPPLY

EQUIPMENT:

Digital Voltmeter (DVM)	HP 3490A
High Voltage Probe	HP 34111A
Oscilloscope w/10:1 Probe	HP 180/1801/1820
Function Generator	HP 3312A
Extender Board (18 pin)	HP 08505-60042

NOTE

Adjustment of A3A27 Blanking Amplifier should not be a routine maintenance procedure. Adjustment should only be done when the blanking amplifier or HV Power Supply is repaired or replaced.

High Voltage Power Supply

NOTE

Use a non-metallic screwdriver for adjustments in A3A27 Blanking Amplifier.

NOTE

The position of a trace on the CRT always refers to the center of the trace, and the distance between traces always refers to the orthogonal distance from trace center to trace center; or, from the edge of one trace to the corresponding edge of the other trace.

NOTE

If an assembly or an adjustable component is replaced, set all adjustments on the replaced assembly to midrange (except intensity, which should be set fully counterclockwise) before turning the instrument on. If the CRT is replaced, verify CRT is biased off before applying power.

a. Remove handle and side cover on left side of A3 Display Section to allow access to A3A27 adjustments.

b. Remove top cover from A3A26 High Voltage Power Supply assembly.

c. Connect High Voltage probe banana plug to DVM.

d. Connect high voltage probe ground to 8505A A3 Display Section ground.

e. Set DVM to 100 volt range.

WARNING

The following procedure probes 4,000-volt circuit.

ADJUSTMENTS

A5-35. A3A27 BLANKING AMPLIFIER AND A3A26 HV POWR SUPPLY (Cont'd)

f. Using High Voltage probe, measure output of high voltage CRT cathode power supply on board assembly A3A26 at HVTP (yellow wire). See Figure A5-45.

g. Adjust HV ADJ A3A27R12 (Figure A5-45) for a DVM reading of 3,950 volts.

h. Replace top cover of A3A26 High Voltage Power Supply assembly.

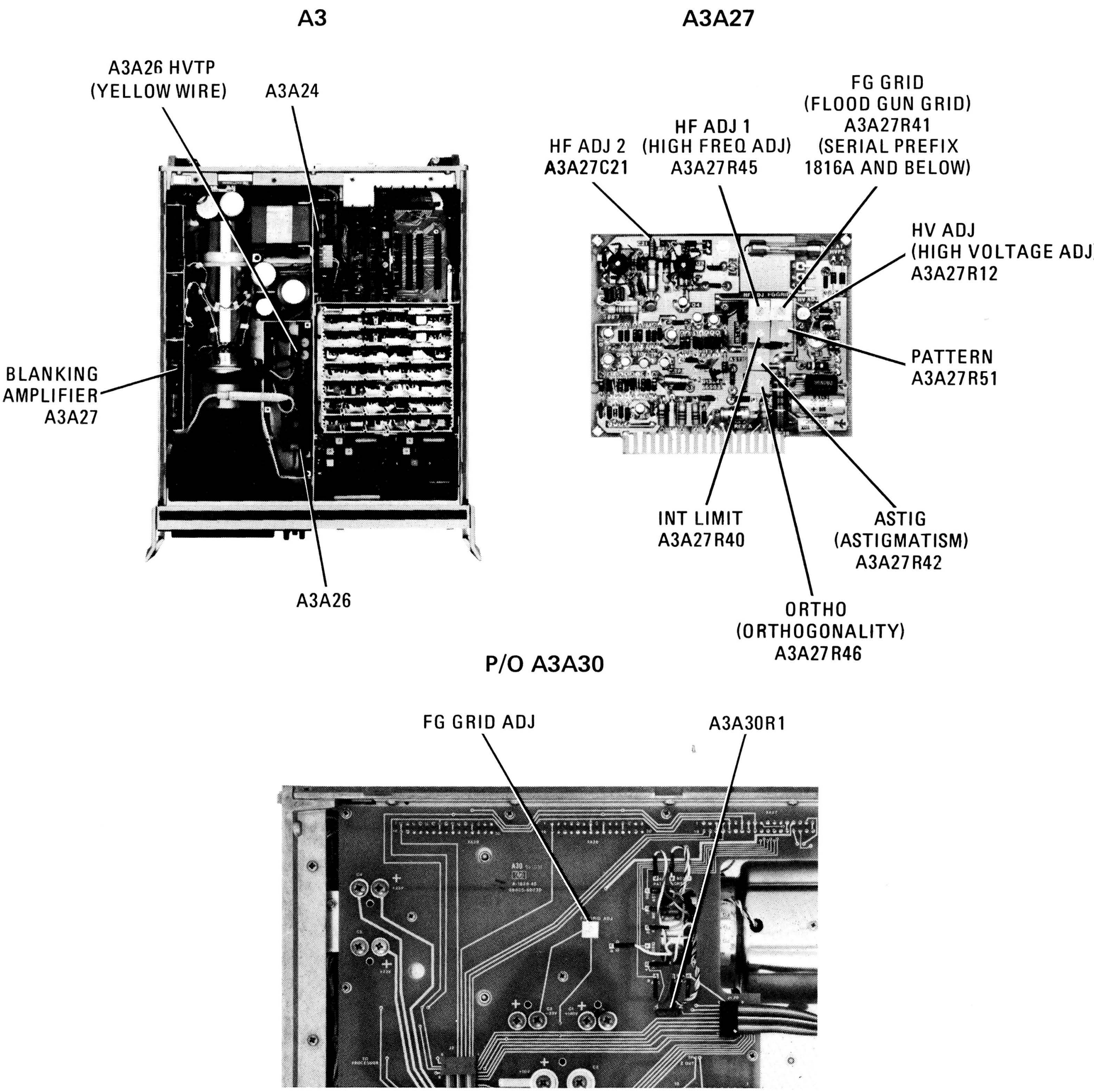


Figure A5-45. A3A27 Blanking Amplifier Adjustment Locations

ADJUSTMENTS

A5-35. A3A27 BLANKING AMPLIFIER and A3A26 HV POWER SUPPLY (Cont'd)

Focus Centering

i. Connect equipment as shown in Figure A5-46.

j. Set A2 Frequency Control WIDTH switch to START/STOP 1 and SCAN TIME SEC switch to MANUAL. On A3 Signal Processor, set Channel 1 INPUT switch to "R" and MODE to MAG. Press DISPLAY MKR then ZRO pushbuttons. Adjust MANUAL sweep control to place the trace dot in the center of the CRT screen.

k. Adjust front panel INTENSITY control for a spot of normal viewing intensity and set FOCUS control to midrange.

l. Adjust FOCUS LIMIT control A3A26R14 and ASTIG astigmatism) control A3A27R42 for sharply focused round spot.

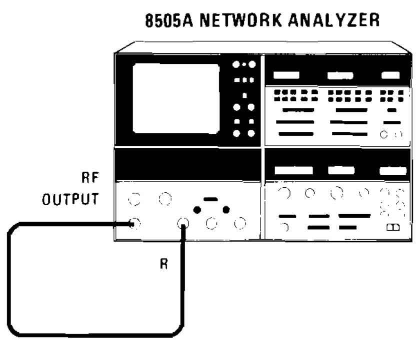


Figure A5-46. A3A27 Blanking Amplifier Adjustment Test Setup

Intensity Limit

m. Set SCAN TIME SEC switch to .1 – .01 position.

n. Set TRIGGER to AUTO. Set MARKER 1 control to mid-position.

o. Press Channel 1 MKR then ZRO pushbuttons to place CRT trace on center graticule line.

p. Set front-panel INTENSITY control approximately one-eighth of a turn clockwise.

q. Adjust INTENSITY LIMIT control A3A27R40 so diamond marker is just visible.

r. Adjust front-panel INTENSITY control clockwise to view CRT trace.

Trace Alignment and Orthogonality

s. Set A2 Frequency Control SCAN TIME SEC switch to .1 – .01 position.

ADJUSTMENTS

A5-35. A2A13 REMOTE OUTPUT LEVEL dBm VERNIER CALIBRATION (Cont'd)

t. Remove A3A16 Blanking Logic board and install extender board in its place. Connect sine-wave oscillator output to extender board pin 22. Connect a jumper lead from the +5 volt test point on the A3A24 power supply board to extender board pin 27 to unblank the CRT.

u. Set oscillator frequency to 10 kHz and amplitude for a horizontal line 10 divisions in length.

v. Position trace to center horizontal graticule line using Y-POSITION control A3A29R15.

w. Align trace with center horizontal graticule line using front-panel TRACE control A3A25R9.

x. Disconnect sine-wave oscillator output from extender board pin 22 and connect it to pin 24.

y. Adjust sine-wave oscillator amplitude for a vertical line 8 divisions in length.

z. Position trace to center vertical graticule line, using X-POSITION control A3A28R15.

aa. Align trace with center vertical graticule line, using ORTHO control A3A27R46.

ab. Repeat steps t through aa until no further adjustment is necessary.

ac. Reinstall A3A16.

ad. Perform the X-POSITION adjustment in paragraph A5-27 and Y-POSITION adjustment in paragraph A5-28.

Flood Gun

ae. Set front-panel SCALE control fully clockwise to turn on flood gun. Adjust "F G GRID" (flood gun grid) control A3A27R41 for 8505A prefix 1816A and below or A3A30R2 for 8505A prefix 1831A and above for the most uniform illumination on the screen. If illumination is too bright, increase resistance of A3A30R1 (½ watt resistor). If illumination is too dark, decrease value of A3A30R1. Do not make a smaller value than 6.8 ohms ½ watt or damage to filament may occur.

Pattern

af. Set A2 Frequency Control SCAN TIME SEC switch to .1 – .01 position. Press REF LINE POSN pushbutton to place reference line on CRT.

eg. Adjust reference line to the top graticule line on CRT. Adjust "PATTERN" control A3A27R51 for a straight reference line.

ah. Adjust the reference line to the bottom graticule line on CRT. If necessary, make slight adjustment of "PATTERN" control A3A27R51 for a straight line.

Z-Axis High Frequency

ai. On A3 Signal Processor, set Channel 1 INPUT to R and MODE TO MAG. Set Channel 2 MODE to OFF.

aj. Set INTENSITY control fully counterclockwise.

ADJUSTMENTS

A5-35. A5A27 BLANKING AMPLIFIER AND A3A26 HV POWER SUPPLY (Cont'd)

ak. Connect pulse generator output to the monitor oscilloscope vertical input; terminate line in 50 ohm load.

al. Adjust pulse generator offset and amplitude controls for a positive +1 Vp-p square wave, 100 kHz output with a 50% duty cycle pulse width. Disconnect from oscilloscope.

am. Remove Display Multiplex 1 A3A15 and install extender board in its place. Connect pulse generator output to pin 31 of extender board. Connect a jumper lead from pin 9 of extender board to ground. Connect another jumper lead from pin 5 of extender board to +5 volt test point on A3A24 power supply board to move CRT dot off screen when intensity is turned up.

an. Connect monitor oscilloscope vertical input through a 10:1 divider probe to Z-Axis output A3A27TP5. Set INTENSITY control fully clockwise.

ao. The displayed waveform should go from the baseline of less than +5 Vdc to a peak of greater than +55 Vdc. Set sweep time of oscilloscope to 0.2 microseconds.

ap. Adjust HF ADJ 1 A3A27R45 and HF ADJ 2 A3A27C21 for best pulse shape with a rise time of ≤ 150 ns.

aq. Set INTENSITY control fully counterclockwise. Remove jumper leads and extender and reinstall A3A15.

A5-36. A2A13 REMOTE OUTPUT LEVEL dBm VERNIER CALIBRATION (Cont'd)

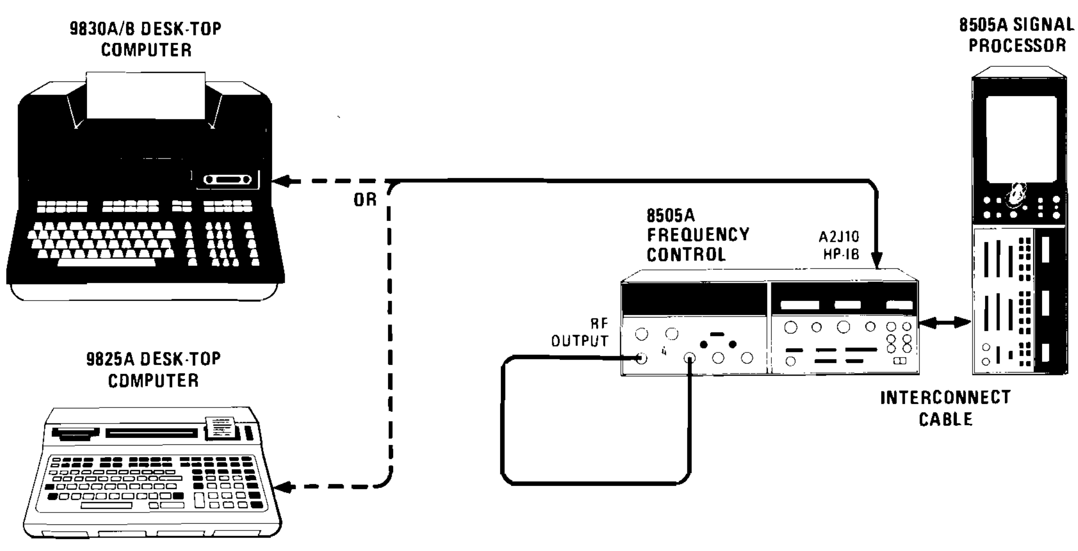


Figure A5-47. Remote Output Level dBm Vernier and Remote Marker Test Setup

EQUIPMENT:

Desk-Top Computer	HP 9830A/B or 9825A
HP-IB Interface (for 9830A/B only)	HP 59405A
HP-IB Interface Cable	HP 10631A/B/C
RF Cable	HP 11851A

ADJUSTMENTS

A5-36. A2A13 REMOTE OUTPUT LEVEL dBm VERNIER CALIBRATION (Cont'd)

PROCEDURE:

a. Set 8505A to LOCAL operation and set the controls as follows:

On A1 Source/Converter:
- OUTPUT LEVEL dBm . . . . −20
- OUTPUT LEVEL Vernier 0
- INPUT LEVEL dBm MAX . . . . −10

On A2 Frequency Control:
- RANGE MHz . . . . .0.5 − 1300
- MODE . . . . LIN EXPAND
- WIDTH . . . . CW ±ΔF
- CW FREQUENCY . . . . 30 MHz
- ±ΔF . . . . 000.0 MHz
- SCAN TIME SEC . . . . 0.1 − .01
- TRIGGER . . . . AUTO
- MARKERS 1
- Marker 1 . . . . Mid position

On A3 Signal Processor:

Channel 1 . . . .
- INPUT . . . . R
- MODE . . . . MAG
- SCALE/DIV . . . . 20 dB

Channel 2
- MODE . . . . OFF

Electrical Length
- MODE . . . . OFF

Display Section
- BANDWIDTH kHz 10
- REFERENCE LINE on CRT . . . . Center graticule line
- VIDEO FILTER . . . . OFF

b. Connect equipment as shown in Figure A5-47 with the RF output connected directly to Channel R Input.

c. The 8505A must be given a LOCAL LOCKOUT (LLO) command to disable the front panel OUTPUT LEVEL dBm VERNIER and be able to program the vernier remotely.

Enter the following program:

9830A/B:

```
10   CMD "?U3"
20   FORMAT 3B
30   OUTPUT (13, 2Ø) 256, 17, 512;
40   END
```

9825A:

```
llo 7
```

ADJUSTMENTS

A5-36. A2A13 REMOTE OUTPUT LEVEL dBm VERNIER CALIBRATION (Cont'd)

d. Press Channel 1 DISPLAY MKR, then CLR pushbuttons. This enables Channel 1 digital readout to display an absolute power measurement.

e. Program OUTPUT LEVEL dBm VERNIER to −12 dBm:

9830A/B:

CMD "?U3", "VØE"

9825A:

wrt 719, "VØE"

f. Adjust "−12 dBm Adj" control A2A13R10 (see Figure A5-48) for −32 dBm ±1 dB on Channel 1 digital readout.

g. Program OUTPUT LEVEL dBm VERNIER to Ø dBm:

9830A/B:

CM "?U3", "V99E"

9825A:

wrt 719, "V99E"

A2A13

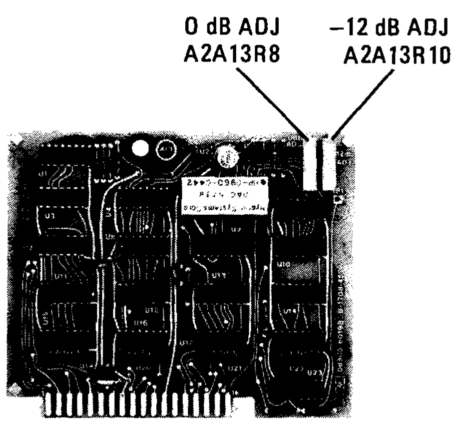


Figure A5-48. A2A13 Switch Register Storage Vernier Adjustment Locations

h. Adjust "Ø dBm Adj" control A2A13R8 (see Figure A5-48) for −20 dBm ±1 dB on Channel 1 digital readout.

i. Repeat steps e through h until no further adjustment is necessary.

ADJUSTMENTS

A5-36. A2A13 REMOTE OUTPUT LEVEL dBm VERNIER CALIBRATION (Cont'd)

j. Disable Local Lockout (LLO) command to 8505A as follows:

```
9830A/B:
  10    CMD "?U3"
  20    FORMAT 2B
  30    OUTPUT (13, 2Ø) 1024, 768;
  40    END

9825A:
  lcl 7; rem 7
```

A5-37. A2A15 REMOTE MARKER POSITION CALIBRATION (08505-60195 BOARD ASSY ONLY)

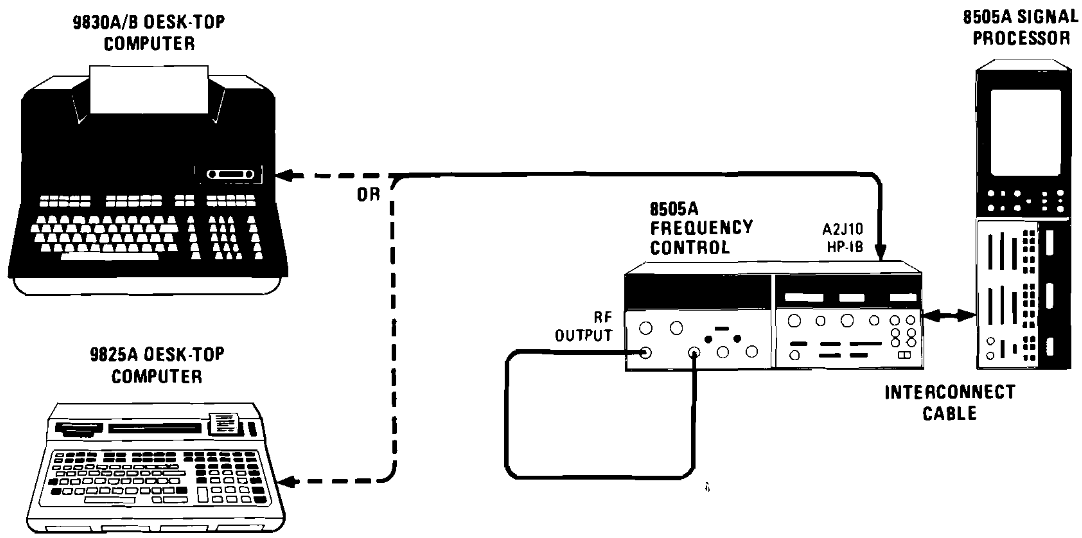


Figure A5-49. Remote Output Level dBm Vernier and Remote Marker Test Setup

EQUIPMENT:

Desk-Top Computer .... HP 9830A/B or 9825A
HP-IB Interface (for 9830A/B only) .... HP 59405A
HP-IB Interface Cable .... HP 10631A/B/C
RF Cable .... HP 11851A

ADJUSTMENTS

A5-37. A2A15 REMOTE MARKER POSITION CALIBRATION (08505-60195 BOARD ASSY ONLY) (Cont'd)

a. Set 8505A to LOCAL operation and set the controls as follows:

On A1 Source/Converter:
- OUTPUT LEVEL dBm . . . . . . —20
- OUTPUT LEVEL Vernier 0
- INPUT LEVEL dBm MAX . . . . . . —10

On A2 Frequency Control:
- RANGE MHz . . . . . . 0.5 — 1300
- MODE . . . . . . LIN EXPAND
- WIDTH . . . . . . CW ±ΔF
- CW FREQUENCY . . . . . . 30 MHz
- ±ΔF . . . . . . 000.0 MHz
- SCAN TIME SEC . . . . . . 0.1 — .01
- TRIGGER . . . . . . AUTO
- MARKERS 1
- Marker 1 . . . . . . Mid position

On A3 Signal Processor:

Channel 1
- INPUT . . . . . . R
- MODE . . . . . . MAG
- SCALE/DIV . . . . . . 20 dB

Channel 2
- MODE . . . . . . OFF

Electrical Length
- MODE . . . . . . OFF

Display Section
- BANDWIDTH kHz 10
- REFERENCE LINE on CRT . . . . . . Center graticule line
- VIDEO FILTER . . . . . . OFF

b. Connect equipment as shown in Figure A5-48 with the RF output connected directly to Channel R Input.

c. Rotate SCAN TIME SEC Vernier to full counterclockwise position.

d. Program Frequency marker (FC) to left edge of CRT trace:

9830A/B:
```
CMD "?U3", "FCØE"
```
9825A:
```
wrt 719, "FCØE"
```

e. Adjust "0" ADJ control A2A15R22 (see Figure A5-50) to place marker on left edge of CRT trace. The marker diamond must be pointing up and the FREQUENCY COUNTER readout must be unblanked.

f. Rotate SCAN TIME SEC Vernier to full clockwise position.

ADJUSTMENTS

A5-38. A2A15 REMOTE MARKER POSITION CALIBRATION (08505-60195 BOARD ASSY ONLY) (Cont'd)

g. Program Frequency Marker (FC) to right edge of CRT trace:

9830A/B:
CMD "?U3", "FC99E"

9825A:
wrt 719, "FC99E"

h. Adjust "99" ADJ control A2A15R12 (see Figure A5-50) to place marker on right edge of CRT trace. The marker diamond must be pointing up but the FREQUENCY COUNTER readout must be blanked.

i. Program Frequency Marker (FC) to "98":

9830A/B:
CMD "?U3", "FC98E"

9825A:
wrt 719, "FC98E"

j. FREQUENCY COUNTER readout must be *unblanked* at this setting. If not, adjust "99" ADJ control A2A15R12 slightly clockwise until FREQUENCY COUNTER readout is unblanked and repeat steps f through j until no further adjustment is necessary.

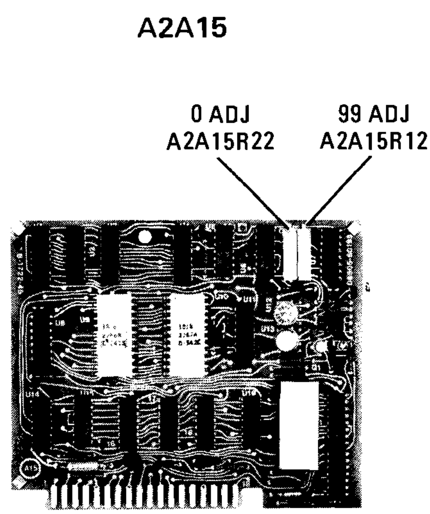


Figure A5-50. A2A15 Frequency Control I/O Vernier Adjustment Locations.

CHAPTER A
MODEL 8505A NETWORK ANALYZER

SECTION VI
SERVICE

A6-1. INTRODUCTION

A6-2. This section provides instructions for isolating a problem to a major section (A1 Source/Converter, A2 Frequency Controller, or A3 Signal Processor/Display). Figures are provided to show major assembly locations. Block diagrams are intended for use with the troubleshooting procedure, and as an aid in understanding the relationship between major sections.

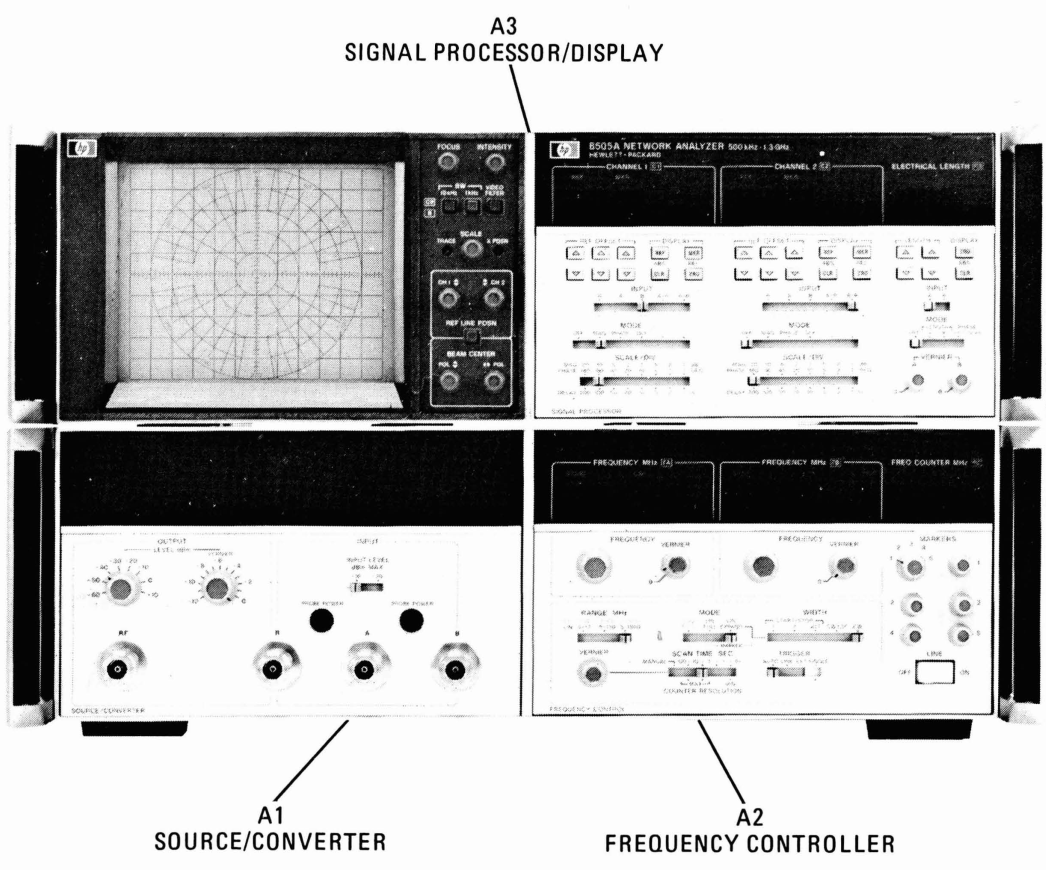


Figure A6-1. Major Sections of 8505A Network Analyzer

A1 AND A2 TOP VIEW WITH TOP COVER REMOVED

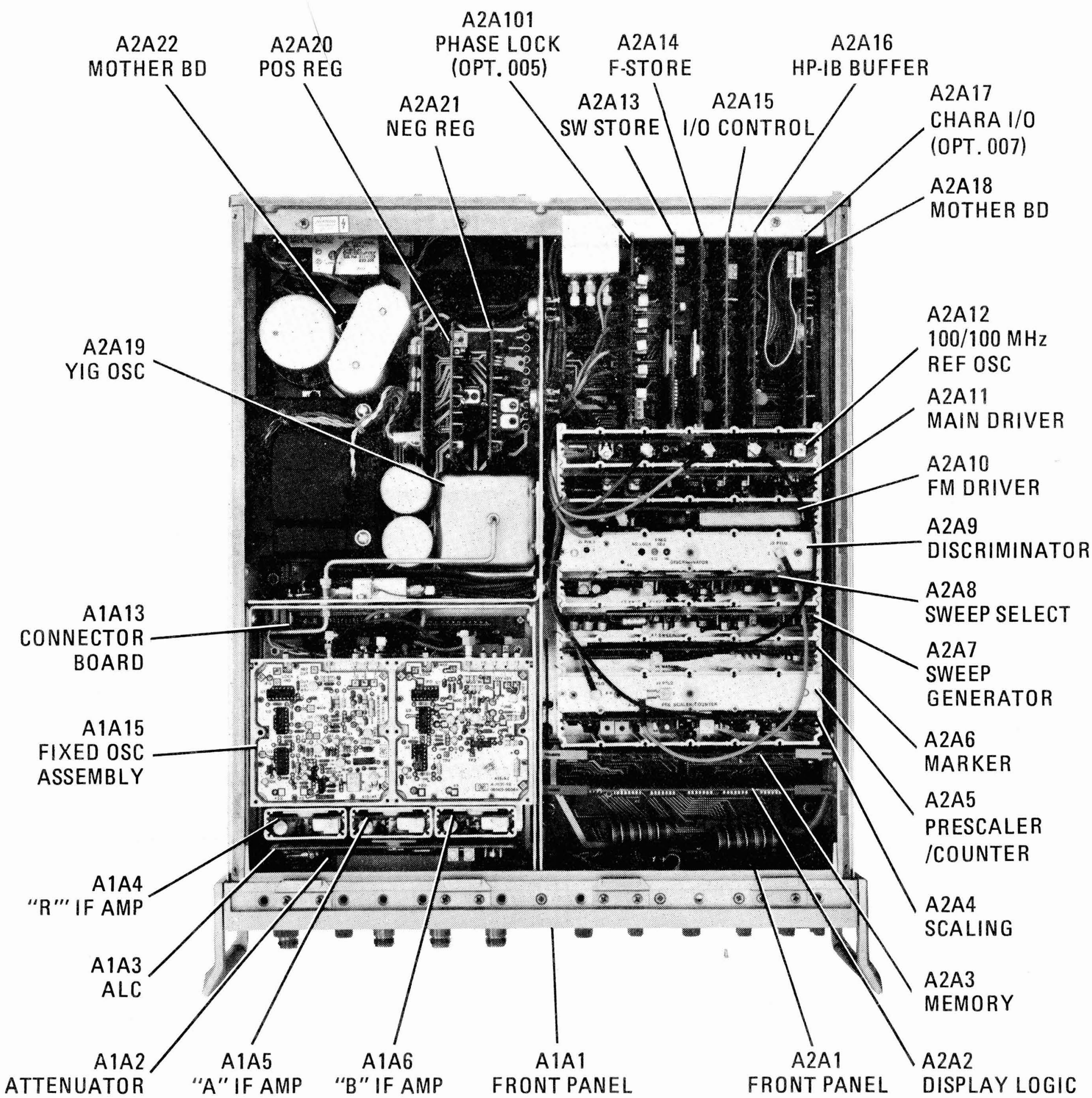


Figure A6-2. A1 and A2 Major Assemblies

A2 FRONT VIEW WITH FRONT PANEL TILTED FORWARD

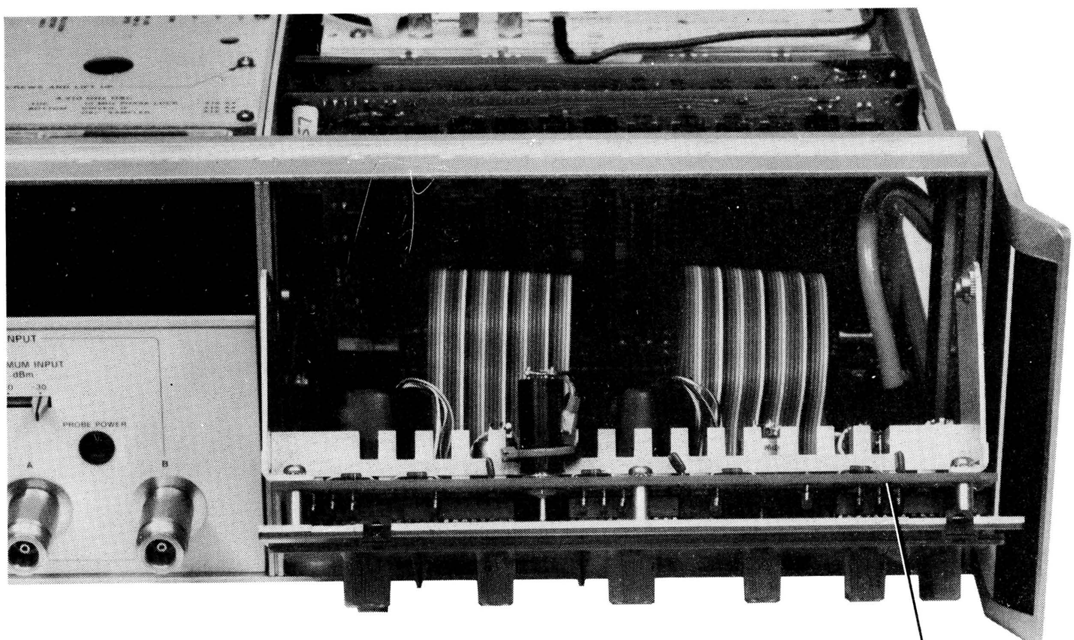


Figure A6-3. A2A1 Front Panel Folded Out

A1 TOP VIEW WITH COVERS REMOVED

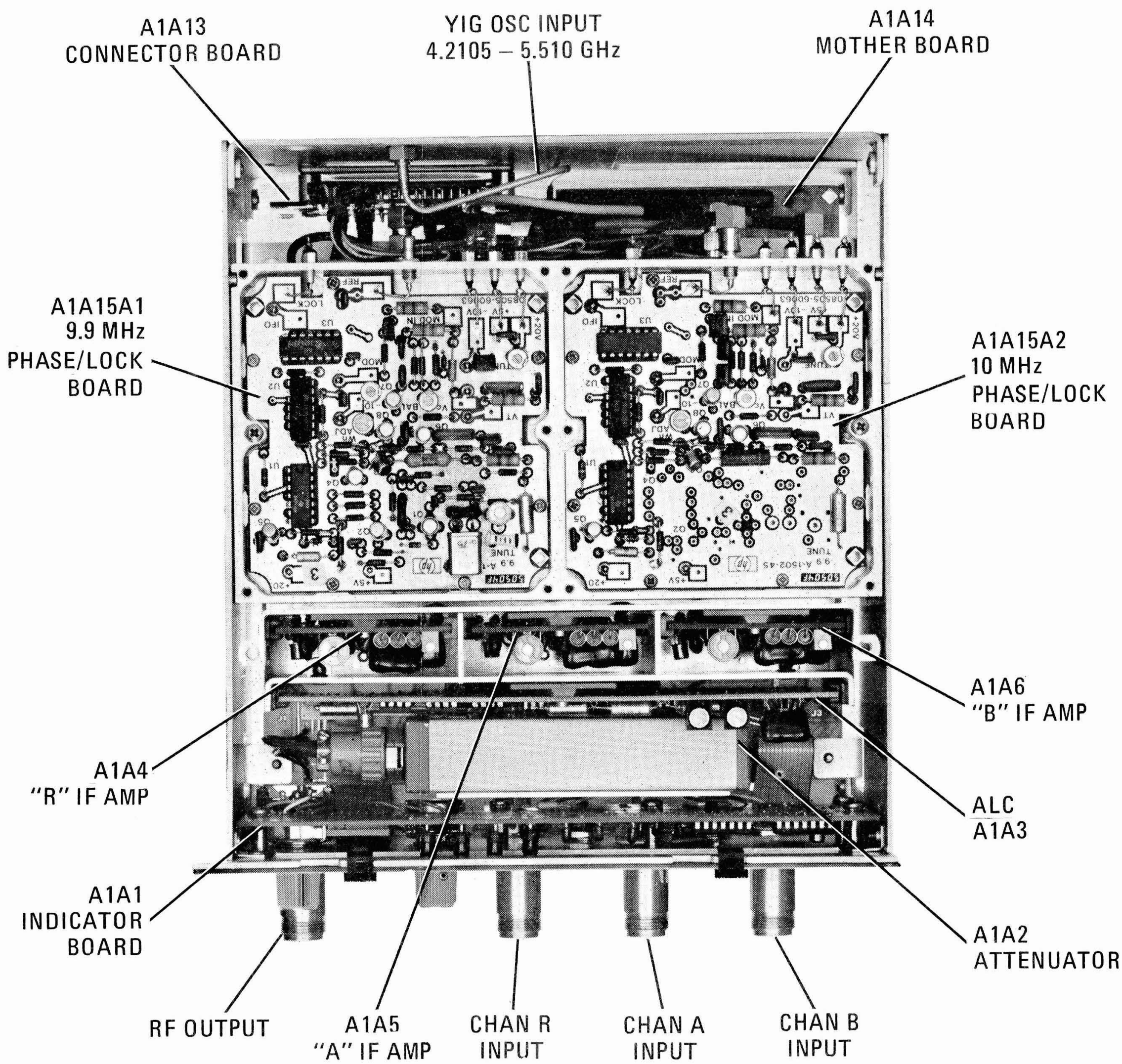


Figure A6-4. A1 Major Assemblies and Subassemblies

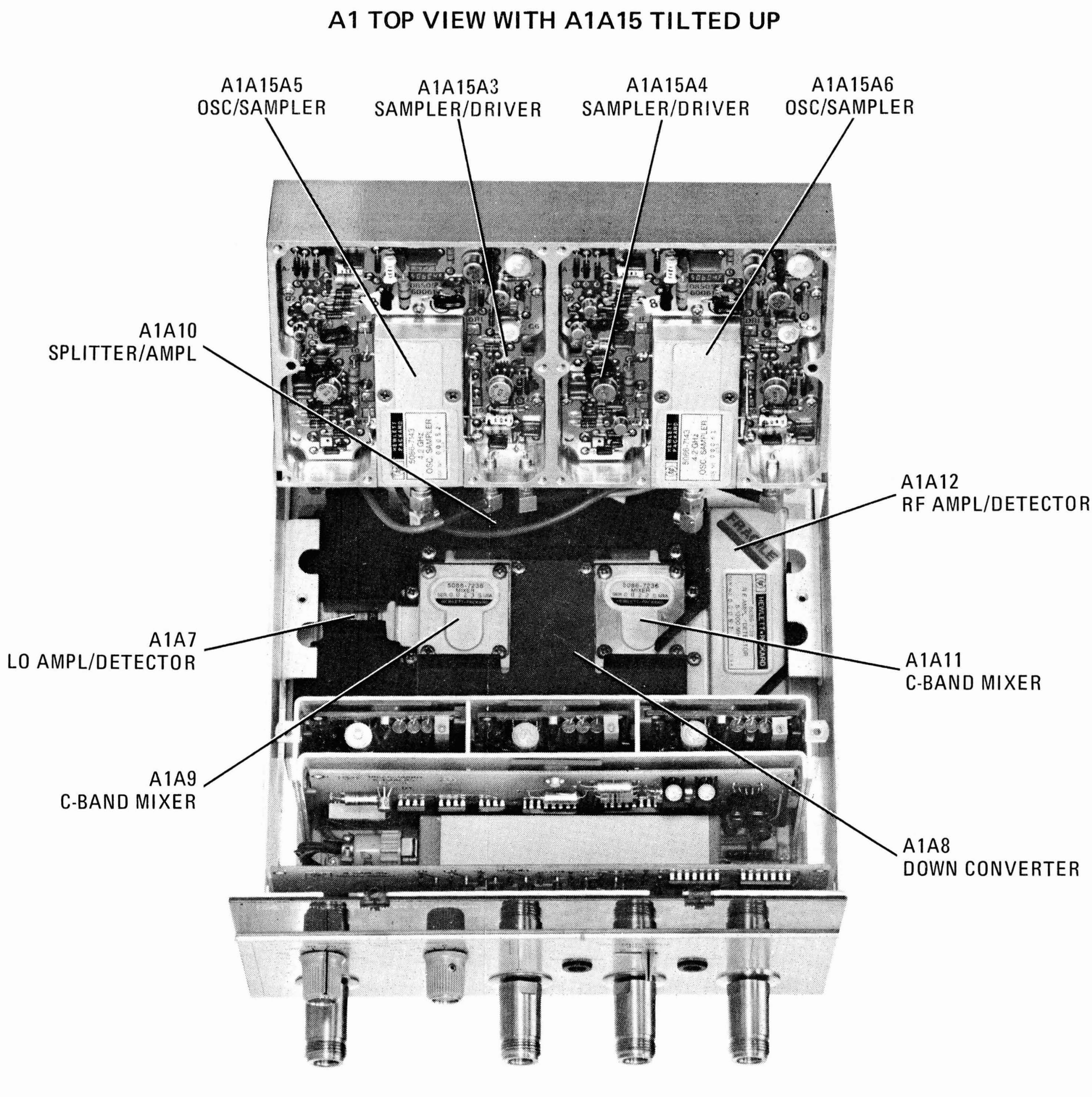


Figure A6-5. A1 Disassembled Showing Internal Assemblies

A1 BOTTOM VIEW

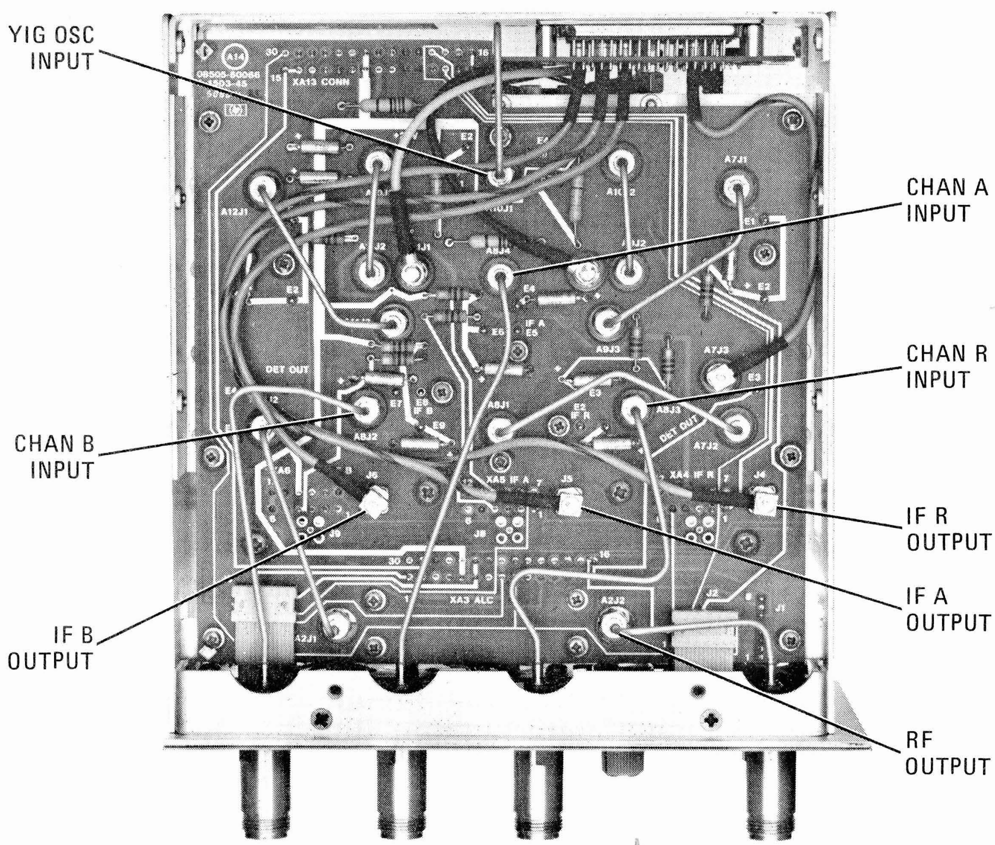


Figure A6-6. A1 Bottom View Showing Interface Connections to Mother Board

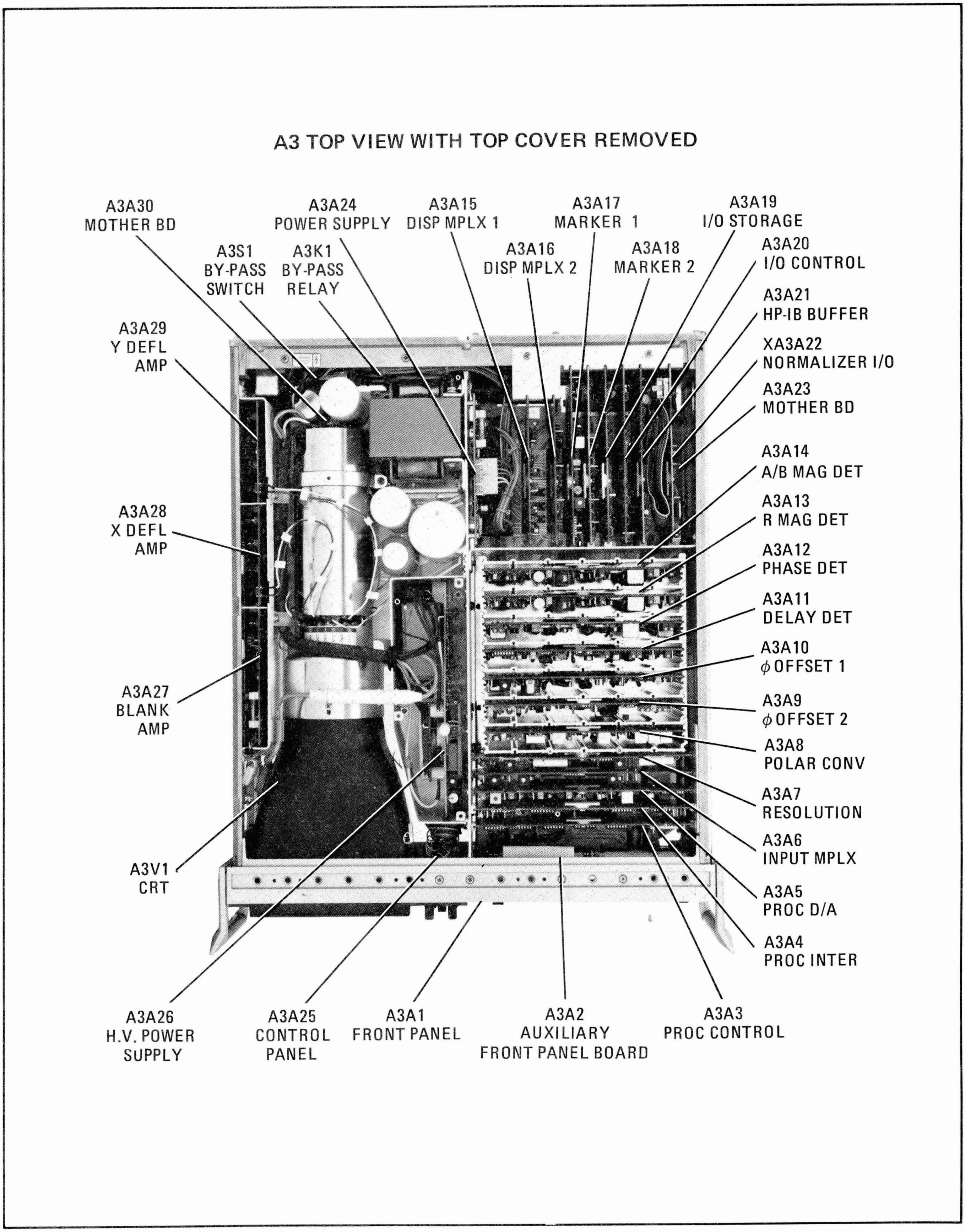


Figure A6-7. A3 Major Assemblies

A3 FRONT VIEW WITH FRONT PANEL TILTED FORWARD

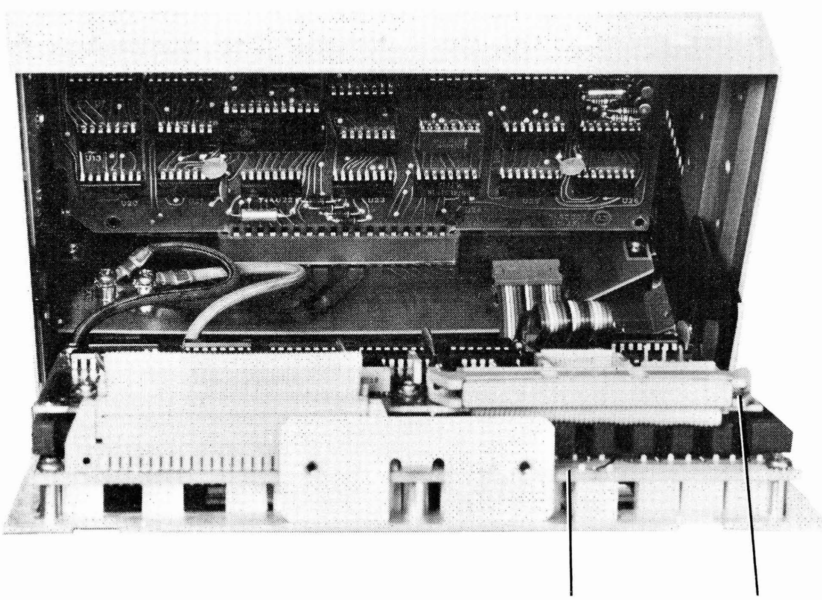


Figure A6-8. A3A1 and A3A2 Showing Front Panel Folded Out

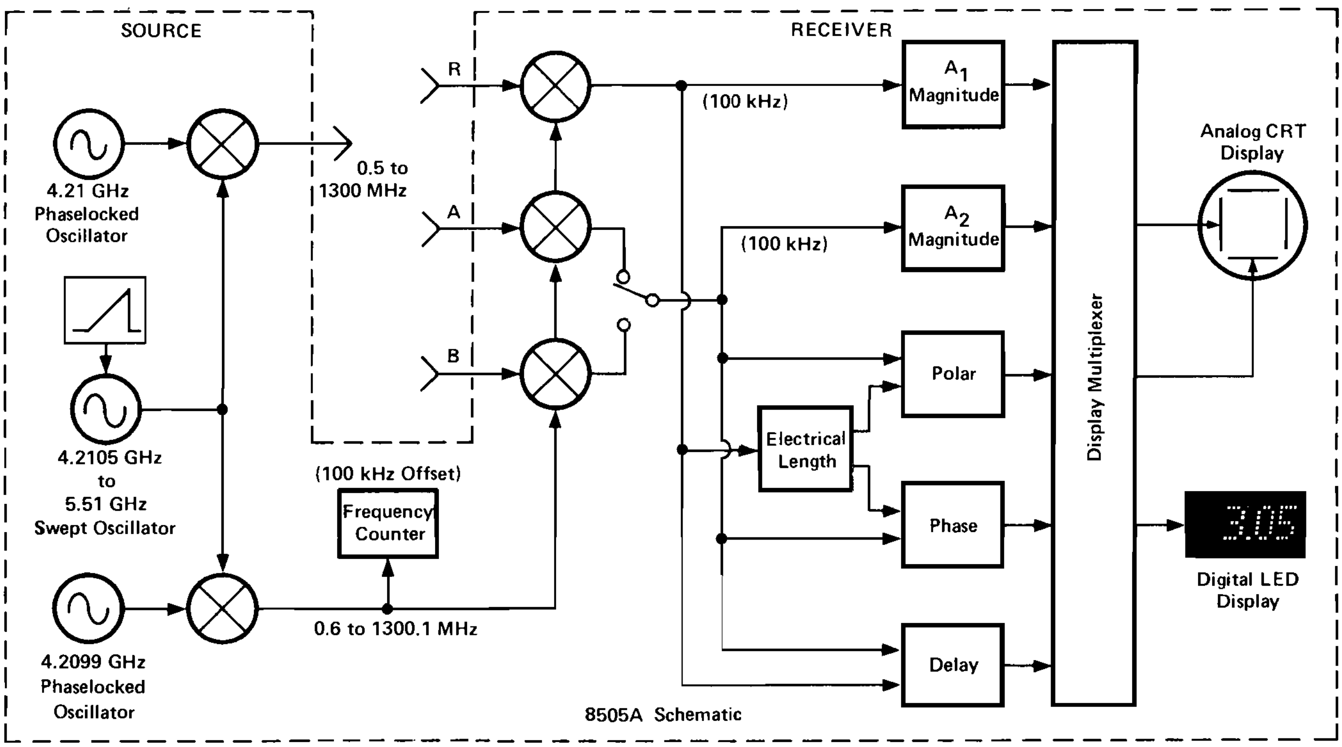


Figure A6-9. Simplified Block Diagram

CHAPTER A
MODEL 8505A NETWORK ANALYZER

SECTION VII
MANUAL CHANGES

A7-1. INTRODUCTION

A7-2. This section contains instructions for adapting this chapter of the manual to 8505A Network Analyzers having serial numbers lower than those listed on the title page. To adapt this chapter to your 8505A, refer to Table A7-1 and make all the changes listed opposite the serial number or serial number prefix indicated on the serial number plates on the top and bottom units of your 8505A.

Table A7-1. Chapter A Changes by 8505A Serial Number

Serial Number Prefix	Make Changes
1720A thru 1930A	No Changes
1602A00112, 1618A, 1622A, 1625A, 1628A, 1631A, 1644A, 1646A, 1653A, 1710A, 1712A, 1716A	A
1614A	A, B
1606A, 1610A	A, B, C

A7-3. CHAPTER A CHANGE INSTRUCTIONS

CHANGE A

Paragraph A5-34:
Change Test Point in procedure "e" to A3A8TP5.
Change Test Point in procedure "f" to A3A8TP6.
Delete steps g and h.
Change the picture of A3 and A3A8 in Figure A5-40 to the one shown in Figure A7-1 in this change.

CHANGE B

Replace paragraphs A5-37 and A5-38 with the following procedures:

A5-37. A2A13 MAGNITUDE CALIBRATION (Serial Prefix 1614A and Below)

a. Connect a power meter to the front panel Source/Converter RF OUTPUT connector. On calculator, program output verier to —12 dB (VO). Adjust A2A13R10 "—12 dB ADJ" control for 0 dBm output.

b. On calculator, program output vernier to 0 dB. Adjust A2A13R8 "0 dB" control for +12 dBm output.

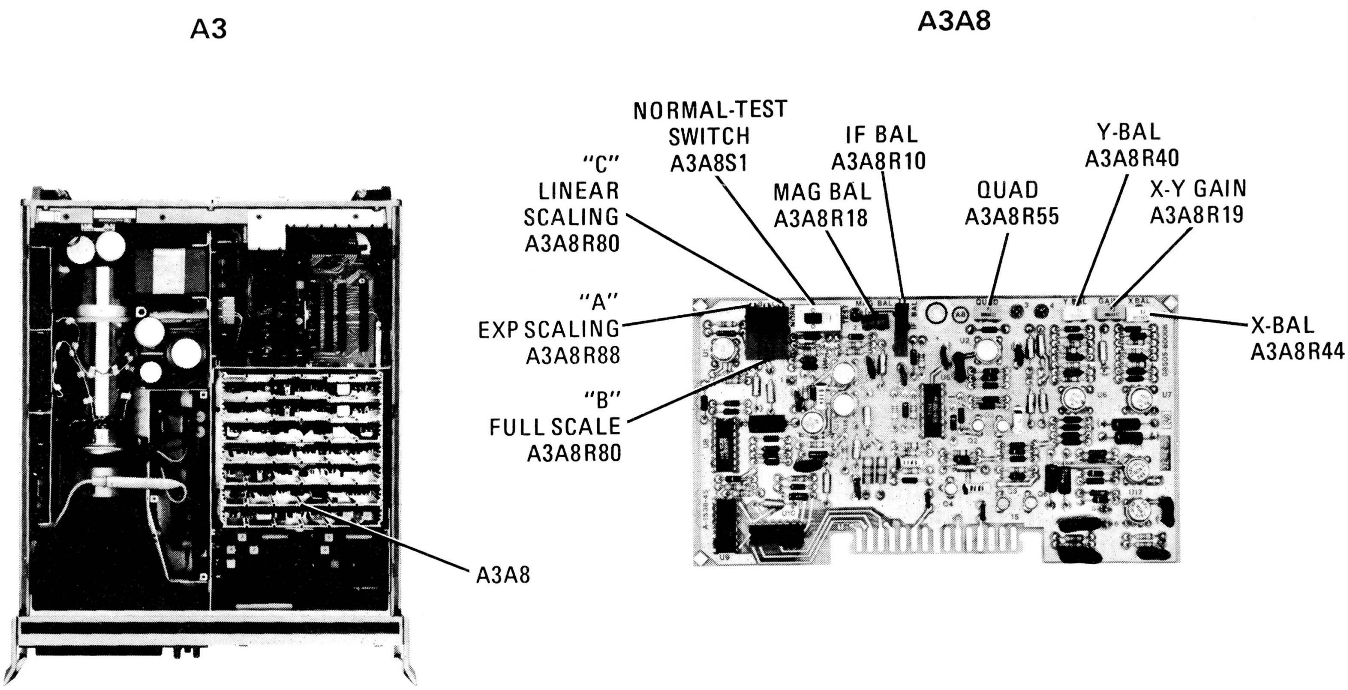


Figure A7-1. "Figure A5-40. A3A8 Polar Converter Adjustments Location" (P/O Change A)

A5-38. A2A15 MARKER CALIBRATION (Serial Prefix 1614A and Below)

a. Program START/STOP 1 sweep mode and select "R" Channel. Connect equipment as shown in Figure A5-46.

b. Program 50% Marker position on marker number 1.

c. Adjust "MARKER" control A2A15R12 to place the marker on the center graticule line of the CRT.

CHANGE C

Table A1-1:
Change RECEIVER INPUT CHARACTERISTICS, Noise (10 kHz BW): to read "—110 dBm from 10 to 1300 MHz; —100 dBm from 0.5 to 10 MHz. Typically, —120 dBm using the —30 dBm input level position and 1 kHz BW.

Paragraph A2-53:
Change SPECIFICATION for noise floor to read:
Noise floor in 10 kHz Bandwidth: —100 dBm (0.5 to 10 MHz)
—110 dBm (10 to 1300 MHz)
Change first paragraph under DESCRIPTION to read: The noise floor is measured by offsetting the reference line 100 dB (0.5 to 10 MHz) or 110 dB (10 to 1300 MHz). Each signal at the three input ports is compared with the —100 dBm or —110 dBm reference line to verify that the noise floor is below the —100 dBm or —110 dBm level.

Change STOP FREQUENCY in step b to read: 0010 MHz.

Change side head before step c to read: NOISE FLOOR FROM 0.5 to 10 MHz.

Change steps c throuh j to read as follows: (Do not change steps k through m.)

c. Connect 50-Ohm terminations to "R" and "A" ports.

CHANGE C (Cont'd)

d. At Channel 1, press CLR pushbutton until REL light goes out (if it was lit). (This clears all previous offsets in Channel 1.)

e. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain —100 dB offset. The CRT trace should be below the center graticule line between 0.5 MHz (Marker 1) and 10.0 MHz. This shows the noise floor below —100 dBm.

f. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line between 0.5 MHz (Marker 1) and 10.0 MHz.

g. Remove the termination from port "R" and connect it to port "B". Set Channel 1 INPUT switch to "B". The CRT trace should be below the center graticule line between 0.5 MHz (Marker 1) and 10.0 MHz.

NOISE FLOOR FROM 10 TO 1300 MHz

h. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain —110 dB offset. The CRT trace should be below the center graticule line between 10.0 MHz (STOP Marker) and 1300 MHz. This shows the noise floor below —110 dBm.

i. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line between 10.0 and 1300 MHz.

j. Set Channel 1 INPUT switch to "R". Disconnect the 50-Ohm termination from the "B" port and connect it to the "R" port. The CRT trace should be below the center graticule line between 10.0 and 1300 MHz.

Paragraph A4-13:
Change Noise floor specifications to read:
Noise floor in 10 kHz Bandwidth: —100 dBm (0.5 to 10 MHz)
—110 dBm (10 to 1300 MHz)

Change DESCRIPTION to read: The noise floor is measured by the reference —100 dB (0.5 to 10 MHz) and —110 dB (10 to 1300 MHz). Each signal at the three input ports is compared with the —100 dB or —110 dB reference line to verify that the noise floor is below —100 dBm or —110 dBm.

Paragraph A4-14:
Delete steps c through m and add steps c through j shown below:

NOISE FLOOR FROM 0.5 to 10 MHz

c. Connect 50-Ohm terminations to "R" and "A" ports. Adjust Signal Processor Display REF LINE POSN CH1 control to place the CRT trace on the center graticule line.

d. At Channel 1, press CLR pushbutton until REL light goes out (if it was lit). (This clears all previous offsets in Channel 1.)

e. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain —100 dB offset. The CRT trace should be below the center graticule line between 0.5 MHz (Marker 1) and 10 MHz. This shows the noise floor below —100 dBm.

f. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line between 0.5 MHz (Marker 1) and 10. MHz.

CHANGE C (Cont'd)

g. Remove the termination from port "R" and connect it to port "B". Set Channel 1 INPUT switch to "B". The CRT trace should be below the center graticule line between 0.5 MHz (Marker 1) and 10 MHz.

NOISE FLOOR FROM 10 to 1300 MHz

h. Set START frequency to 0010 MHz and STOP frequency to 1300 MHz. At Channel 1, press DISPLAY REF, then REF OFFSET Pushbuttons to obtain −110 dB offset. The CRT trace should be below the center graticule line between 10.0 MHz and 1300 MHz. This shows the noise floor below −110 dBm.

i. Set Channel 1 INPUT switch to "A". The CRT trace should be below the center graticule line between 10.0 and 1300 MHz.

j. Set Channel 1 INPUT switch to "R". Disconnect the 50-Ohm termination from the "B" port and connect it to the "R" port. The CRT trace should be below the center graticule line between 10.0 and 1300 MHz.

MANUAL IDENTIFICATION
Model Number: 8505A Opt 005
Date Printed: September 1979
Part Number: 08505-90070

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
2050A and above	1		

► NEW ITEM

ERRATA

Page E1-4, Paragraph E1-10:
Change the last sentence of paragraph under "RECEIVER" to:
"Noise floor is typically −75 dBm from 0.5 to 0.8 MHz, −85 dBm from 0.8 to 2.0 MHz, and unchanged from 2 to 1300 MHz."

►CHANGE 1

Page E2-2, Table E2-3:
Change A2A101 to HP Part Number 08505-60238. (This assembly is the preferred replacement for A2A101 in Option 005 instruments with serial number 1816A00621 and above.)

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.

3 Pages
11 February 1981

HEWLETT PACKARD

Printed in U.S.A.

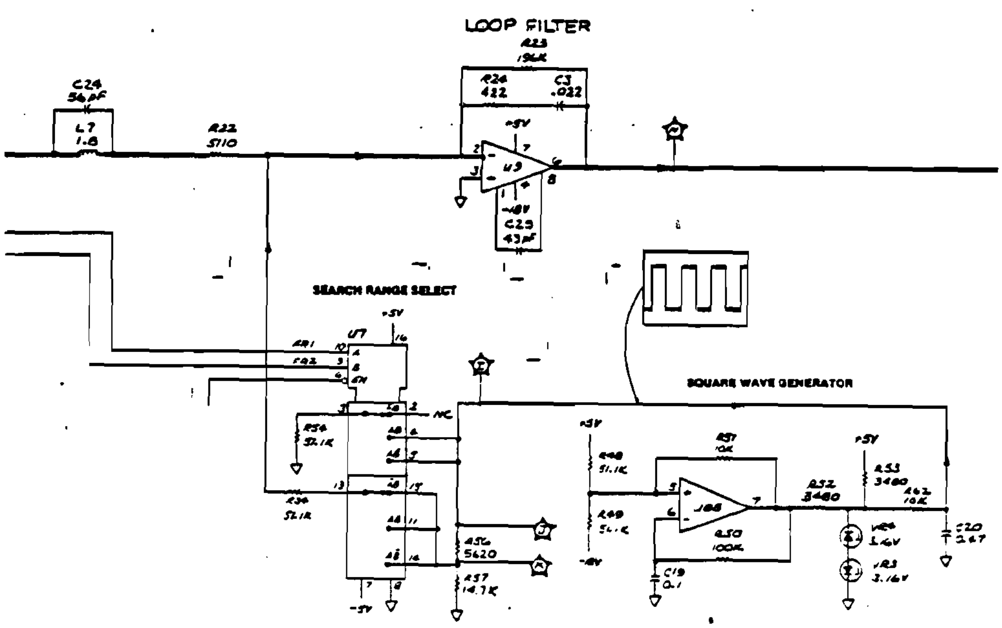
CHANGE 1 (Cont'd)

Page E4-6/7, Table E4-1:
Make the following changes/additions to the parts list:

A2A101	08505-60238	1	PHASE LOCK BOARD ASSEMBLY	28480	08505-60238
A2A101C3	0160-0162	1	CAPACITOR-FXD 0.022UF ±10% 200VDC POLYE	28480	0160-0162
A2A101C24	0140-0191	1	CAPACITOR-FXD 56PF ±5% 300VDC MICA	28480	0140-0191
A2A101C25	0160-2200	1	CAPACITOR-FXD 43PF ±5% 300VDC MICA	28480	0160-2200
A2A101L7	9100-1659	1	INDUCTOR RF-CH-MLD 1.8MH 5% .23DX.57LG	28480	9100-1659
A2A101R24	0698-7227	1	RESISTOR 422 1% .05W F TC=0±100	24546	C3-1/8-TO-422R-G
A2A101R52	0698-7249	2	RESISTOR 3.48K 1% .05W F TC=0+100	24546	C3-1/8-TO-3481-G
A2A101R53	0698-7249		RESISTOR 3.48K 1% .05W F TC=0+100	24546	C3-1/8-TO-3481-G
A2A101R55			NOT ASSIGNED		
A2A101R56	0698-7254	1	RESISTOR 5.62K 1% .05W F TC=0±100	24546	C3-1/8-TO-5621-G
A2A101R57	0698-7264	1	RESISTOR 14.7K 1% .05W F TC=0±100	24546	C3-1/8-TO-1472-G
A2A101U9	1820-0223	1	IC OP AMP GP TO-99	27014	LM301AH

Page E4-21, Figure E4-14:
Replace Figure E4-14 with the Parts Locations Diagram provided in this manual change supplement.

Page E4-21, Figure E4-15:
Replace the Loop Filter, Search Range Select, and Square Wave Generator portions of the A2A101 schematic diagram with the partial schematic provided in this manual change supplement.
Change the HP Part Number in the upper left corner to 08505-60238.



P/O Figure E4-15. A2A101 Phase Lock Assembly Schematic (CHANGE 1)

A2A101

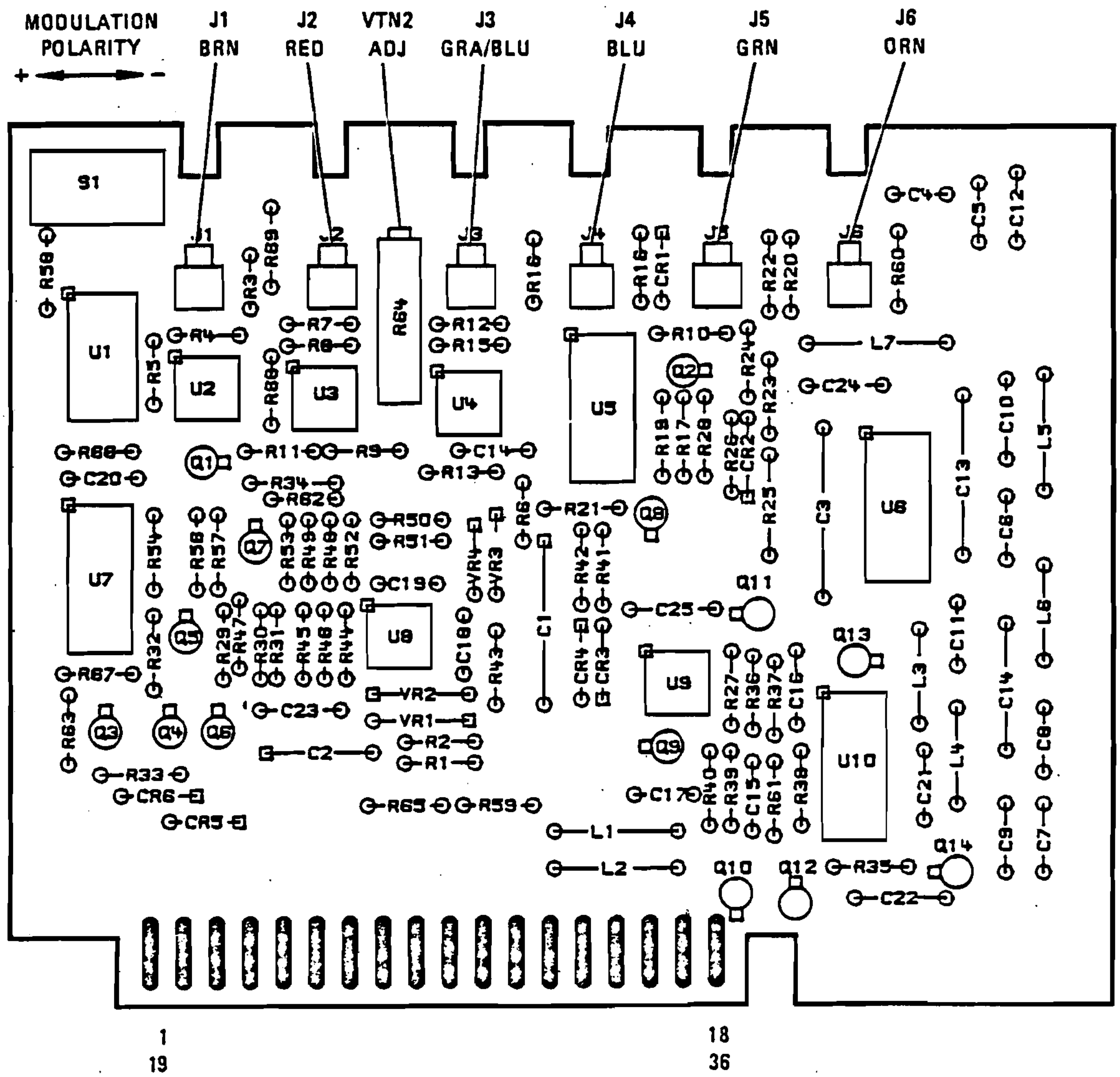


Figure E4-14. A2A101 Phase Lock Assembly, Parts Locations (Option 005) (CHANGE 1)

ERRATA (Cont'd)

Page A1-4, Paragraph A1-41:
In Table of Accessories, change HP-IB Cable (0.5 meter) to HP Part No. 10833D and delete HP-IB Cable (2 meter).

Page A1-5, Table A1-1:
Under SOURCE OUTPUT CHARACTERISTICS, change the Residual FM specification in the 0.5 to 13 MHz range to 50 Hz rms.
Under RECEIVER INPUT CHARACTERISTICS, change the Noise (10 kHz BW) heading to Noise (average displayed in 10 kHz BW).

Page A1-6, Table A1-1 (2 of 3):
Change the "**DELAY CHARACTERISTICS**" title to "**DELAY CHARACTERISTICS[4]**".

Page A1-7, Table A1-1 (3 of 3):
Add the following footnote that pertains to the **DELAY CHARACTERISTICS[4]** Performance Specification:

[4] With the 0.5 to 1300 MHz range selected, Group Delay Measurements are specified in the frequency range of 4 to 1300 MHz only (when the group delay detector is operating in the sampling mode). It is recommended that group delay measurements in the 0.5 to 4 MHz region be done with the 0.5 −13 MHz range selected on the 8505A.

ERRATA (Cont'd)

Page A1-8, Table A1-2:

Change **Power Requirements** paragraph to say:

Power Requirements: 100, 120, 220, or 240 Vac +5% −10%, 50 to 60 Hz, approximately 335 VA. (Total for Signal Processor and Source/Converter-Frequency Control units.)

Page A2-1:

Add the following note after Paragraph A2-4:

NOTE

Retain the original packaging materials. These should be used if it is necessary to return the instrument to HP for servicing.

Page A2-1, Paragraph A2-6:

Change the Operating Temperature range to "20°C to 30°C".

Page A2-1, Paragraph A2-8:

Add the following WARNING after step c.

WARNING

The top and bottom 8505A units must be separated before transporting is attempted. The 8505A must never be carried by the side strap handle while the units are locked together. Failure to heed this warning could result in dropping the instrument and subsequent injury to personnel and damage to instrument.

Page A2-2, Paragraph A2-10:

Replace paragraph A2-10 with the following:

A2-10: Two rack mounting kits are available for the 8505A. One, Option 908, is for 8505A units that do not have or need front handles. The other kit, Option 913 includes rack mount flanges (for handles) and hardware but no handles. Handles are supplied with the instrument or may be ordered separately (two each HP 5061-0089, CDO). Parts supplied with the two kits are listed in Table A2-1. The manner in which these two kits are installed is shown in Figure A2-2.

Page A2-2, Table A2-1:

Change the part number description for Option 908 to: "(Two each HP 5061-0077)".
Change Option 909 and HP Part Number to OPTION 913 (two each HP 5061-2071, CD4).
Delete Option 909 Handle Assembly entry.

Page A2-3, Figure A2-2:

Change the part number descrption for Option 908 to: "Two each HP 5061-0077)".
Replace the OPTION 909 portion of the figure with the partial Figure A2-2 (ERRATA) in this change sheet.

Add the following caution just below the "8-32 x 0.625" Pan Head screw description:

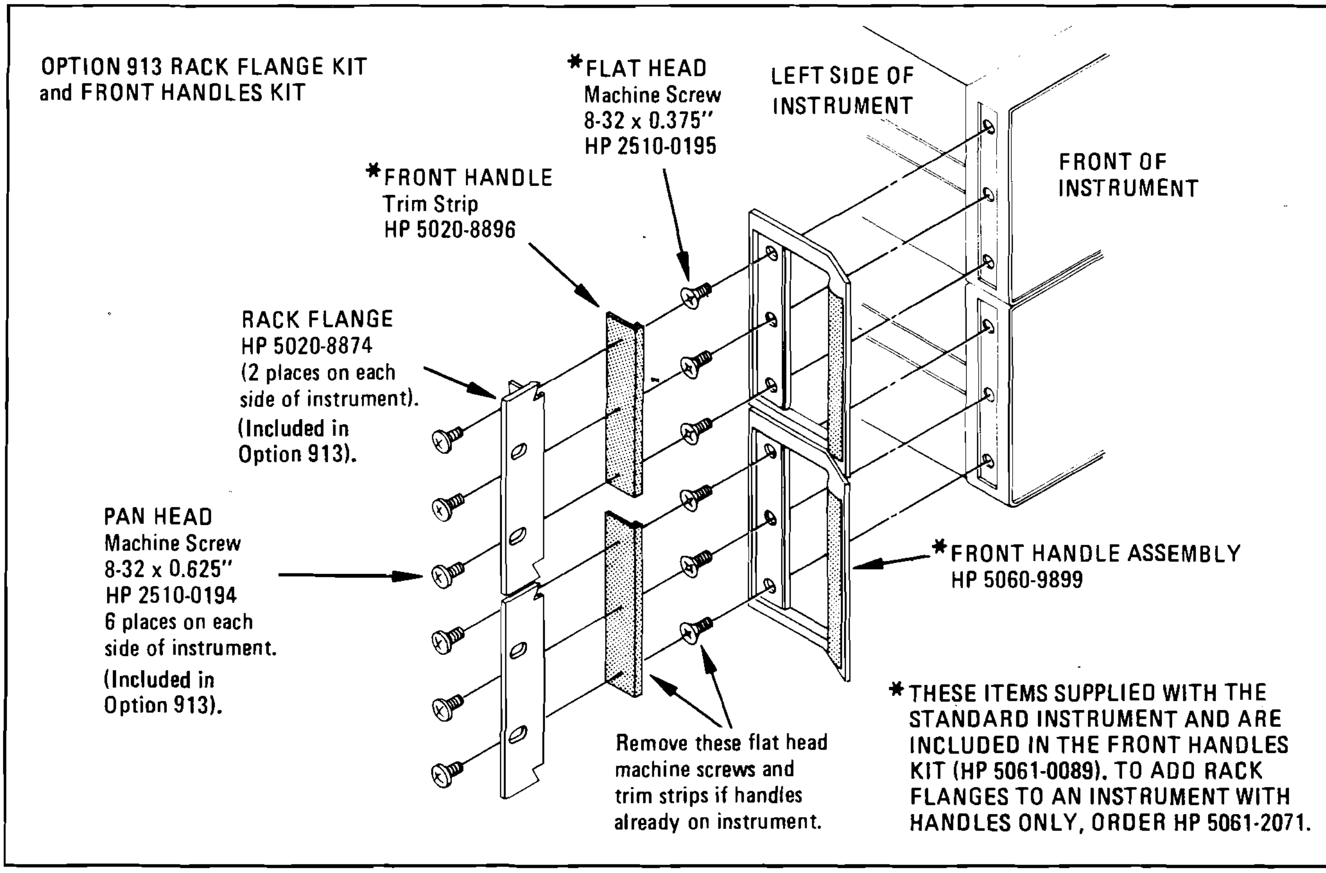
CAUTION

Do not use these 0.625 inch screws for mounting only the front handles without the rack flanges or damage to internal components may result.

Page A2-8, Figure A2-5:

Change the HP Part No. of the HP-IB cable from "10631D" to "8120-2237 (CD3)".

ERRATA (Cont'd)



Part of Figure A2-2. Attaching Rack Mounting Hardware and Handles (ERRATA)

Page A2-10, Paragraph A2-26:
Change the reference from "HP 10631D" to "HP 10833D".

Page A2-11:
Add the following WARNING after Paragraph A2-42:

WARNING

Separate the top and bottom units of the 8505A before moving, lifting, or shipping. The mechanical connections which attach the top and bottom units are not designed to support the additional weight of the bottom unit when supported only by the top unit handles.

Page A2-15, Figure A2-10:
Change the part number of Item 3 to HP 4040-1738, CD3, PACKAGING BAR .49-WD 1-THK 3.125-LG BLK.

ERRATA (Cont'd)

Page A2-24, Paragraph A2-53:
Change steps r and s to read as follows:

r. Move the RF OUTPUT cable to "A" input port and connect the two 50-Ohm terminations to "R" and "B" input ports. Set INPUT switch to "R" and the CRT trace should be below the center graticule line for 100 dB of isolation.

s. Channel 1, set INPUT switch to "B" and the CRT trace should be below the center graticule line.

Page A3-1/A3-2, Paragraphs A3-3 and A3-5:
Change all references regarding Application Note AN 219 to 8505A Local Operation Supplement. HP Part No. 08505-90084 (CD1).

Page A3-1/A3-2, Paragraph A3-9:
Add the following:
The shorthand interface codes for the 8505A are as follows:

SH1, AH1, T8, L4, SR0, RL1, PP0, DC0, DT0, C0, E1

Page A3-30, Paragraph A3-58:
Change the first sentence to read "Marker parameter output can be switched into real and imaginary format by issuing a "C0D3C1M6C2M6E" to the Processor."

Page A4-11, Paragraph A4-13:
Substitute the new RECEIVER NOISE FLOOR Performance Test in this change sheet in place of the existing one.

Page A4-13, Paragraph A4-14:
Substitute the new CROSSTALK ISOLATION Performance Test in this change sheet in place of the existing one.

Page A4-37, Paragraph A4-22:
In step e, change the reference from "Figure A4-7" to "Figure A4-22".

Page A4-43, Paragraph A4-23:
Change step m. to read as follows:
"Voltmeter indication should be less than 18.5 mVrms corresponding to residual FM of <50 Hz rms."

A4-13. RECEIVER NOISE FLOOR

SPECIFICATION:

Noise floor in 10 kHz Bandwidth: − 95 dBm (0.5 to 2 MHz)
− 100 dBm (2 to 10 MHz)
− 110 dBm (10 to 1300 MHz)

DESCRIPTION:

The noise floor is measured by offsetting the reference −95 dB (0.5 to 2 MHz), −100 dB (2 to 10 MHz), and −110 dB (10 to 1300 MHz). Each signal at the three input ports is compared with the −95 dBm, −100 dBm, or −110 dBm reference line to verify that the average noise floor is below −95 dBm, −100 dBm, or −110 dBm.

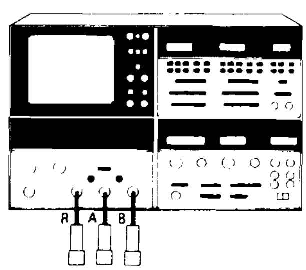


Figure A4-7. Noise Floor Test Setup

EQUIPMENT:

50 Ohm Termination (3 required) . . . . HP 909A Option 012

PROCEDURE:

a. Connect equipment as shown in Figure A4-7.

b. Set 8505A Controls as follows:

On A1 Source/Converter:
OUTPUT LEVEL dBm . . . . −60 dBm
OUTPUT LEVEL VERNIER . . . . 0 dB
INPUT LEVEL dBm MAX . . . . −30 dBm

ERRATA (Cont'd)

A4-13. RECEIVER NOISE FLOOR (Cont'd)

On A2 Frequency Control:

RANGE MHz	0.5 – 13
MODE	LIN EXPAND
WIDTH	START/STOP 1
START FREQUENCY	00.50 MHz
STOP FREQUENCY	02.00 MHz
MARKERS	1
Marker 1	Center of CRT
SCAN TIME SEC	10 – 1
SCAN TIME Vernier	Fully Clockwise
TRIGGER	AUTO

On A3 Signal Processor:

Channel 1:

INPUT	R
MODE	MAG
SCALE/DIV	10 dB/DIV

Channel 2:

MODE	OFF

CRT Display:

BANDWIDTH kHz	10 kHz
VIDEO FILTER	On (in)

NOISE FLOOR FROM 0.5 to 2 MHz

c. On Signal Processor Display, press REF LINE POSN pushbutton, then adjust CH 1 up-down control to place the CRT reference trace on the center graticule line. Press REF LINE POSN pushbutton again for normal operation.

d. At Channel 1, press DISPLAY REF, then CLR pushbutton until REL light goes out (if it was lit). Set INPUT switch to A, repeat above procedures then set INPUT switch to B and repeat above procedures. Return Channel 1 INPUT switch to R position.

e. At Channel 1, press REF OFFSET pushbuttons to obtain –95 dB offset. The average level of the CRT trace should be below the center graticule line. This shows the average noise floor below –95 dBm.

f. Set Channel 1 INPUT switch to "A". The average level of the CRT trace should be below the center graticule line.

g. Set Channel 1 INPUT switch to "B". The average level of the CRT trace should be below the center graticule line.

ERRATA (Cont'd)

PERFORMANCE TESTS

A4-13. RECEIVER NOISE FLOOR (Cont'd)

NOISE FLOOR FROM 2 TO 10 MHz

h. Set START frequency to 02.00 MHz and STOP frequency to 10.00 MHz. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain −100 dB offset. The average level of the CRT trace should be below the center graticule line. This shows the average noise floor below −100 dBm.

i. Set Channel 1 INPUT switch to "A". The average level of the CRT trace should be below the center graticule line.

j. Set Channel 1 INPUT switch to "R". The average level of the CRT trace should be below the center graticule line.

NOISE FLOOR FROM 10 TO 1300 MHZ

k. Set RANGE switch to .5 – 1300 MHz. Set START frequency to 0010 MHz and STOP frequency to 1300 MHz. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain −110 dB offset. The average level of the CRT trace should be below the center graticule line. This shows the average noise floor below −110 dBm.

l. Set Channel 1 INPUT switch to "A". The average level of the CRT trace should be below the center graticule line.

m. Set Channel 1 INPUT switch to "B". The average level of the CRT trace should be below the center graticule line.

A4-14. CROSSTALK ISOLATION

SPECIFICATION:

Crosstalk Error Limits: >100 dB isolation between inputs.

DESCRIPTION:

A signal of −10 dBm is applied to the "R" Channel inputs. The "A" and "B" Channels are terminated and the channel signal is displayed on the CRT display. The average level of the displayed signal of Channel "A" should be 100 dB below the −10 dBm level of the "R" port showing isolation between ports. The other ports are checked in the same manner.

ERRATA (Cont'd)

PERFORMANCE TESTS

A4-14. CROSSTALK ISOLATION (Cont'd)

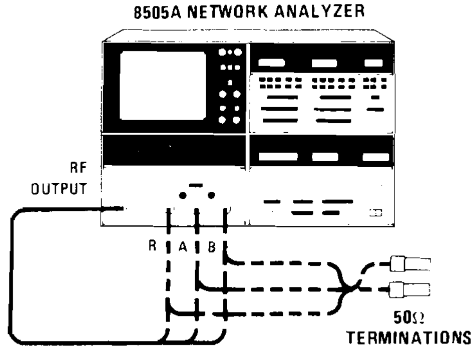


Figure A4-8. Crosstalk Isolation Test Setup

EQUIPMENT:

50 Ohm Termination (2 required) . . . . HP 909A Option 012

PROCEDURE:

NOTE

It is possible to verify the 100 dB crosstalk specifications only over the 10–1300 MHz range where the average noise level is below –110 dBm.

a. Set 8505A Controls as follows:

On A1 Source/Converter:
- OUTPUT LEVEL dBm . . . . –10 dBm
- OUTPUT LEVEL VERNIER . . . . 0 dB
- INPUT LEVEL dBm MAX . . . . –10 dBm

On A2 Frequency Control:
- RANGE MHz . . . . 0.5 – 1300
- MODE . . . . LIN EXPAND
- WIDTH . . . . START/STOP 2
- START FREQUENCY . . . . 0010 MHz
- STOP FREQUENCY . . . . 1300 MHz
- MARKERS 1
- Marker 1 . . . . Midscreen
- SCAN TIME SEC . . . . 10 – 1
- SCAN TIME VERNIER . . . . Fully Clockwise
- TRIGGER . . . . AUTO

ERRATA (Cont'd)

PERFORMANCE TESTS

A4-14. CROSSTALK ISOLATION (Cont'd)

On A3 Signal Processor:
Channel 1:
INPUT . . . . R
MODE . . . . MAG
SCALE/DIV . . . . 10 dB/DIV

Channel 2:
MODE . . . . OFF

CRT Display:
BANDWIDTH kHz . . . . 10 kHz
VIDEO FILTER . . . . Off (out)

b. Connect equipment as shown in Figure A4-8 with the RF output cable connected to "R" port and "A" and "B" ports terminated with 50-ohm loads.

c. At Channel 1, press CLR pushbutton until REL light goes out (if it was lit). Set INPUT switch to A, repeat above procedure, then set INPUT switch to B and repeat above procedure. Return Channel 1 INPUT switch to A position.

d. At Channel 1, press DISPLAY REF, then REF OFFSET pushbuttons to obtain −110 dB offset. The average level of the CRT trace should be below the center graticule line for 100 dB of isolation.

e. Set Channel 1 INPUT switch "B" and the average level of the CRT trace should be below the center graticule line.

f. Change setup by moving 50-ohm loads to port "R" and "B" and connect cable to port "A". Set Channel 1 INPUT switch to "R" and average level of the CRT trace should be below the center graticule line.

g. Set Channel 1 INPUT switch to "B" and the average level of the CRT trace should be below the center graticule line.

h. Change setup by moving 50-ohm loads to ports "R" and "A" and connect cable to port "B". Set Channel 1 INPUT switch to "R" and the average level of the CRT trace should be below the center graticule line.

i. Set Channel 1 INPUT switch to "A" and the average level of the CRT trace should be below the center graticule line.

ERRATA (Cont'd)

Page A4-44, Table A4-2:
After Paragraph No. A4-12, change the limits in steps j and m to read as follows:

	Lower Limit	Upper Limit
Step j	−189.4 dB	−190.6 dB
Step m	+189.4 dB	+190.6 dB

Insert the following note under the Receiver Noise Floor Description:

NOTE

All limits are average Noise Floor levels.

Page A4-45, Table A4-2:
Insert the following note under the Crosstalk Isolation Description:

NOTE

All limits are average Crosstalk Isolation levels.

Page A5-2, Table A5-1:
In "Paragraph Number" column, chage A5-31 to A5-30 in three places.

Page A5-3, Table A5-1:
Change the following paragraph numbers in the last column:

A5-18	to	A5-17	A5-23	to	A5-22
A5-19	to	A5-18	A5-37	to	A5-36
A5-20	to	A5-19	A5-38	to	A5-37
A5-21	to	A5-20			

Add the following entry:
Reference Designator: A2A9R32*, **Name on Board:** None, **Function:** Adjust Low Frequency Clamp Limit, **Paragraph Number:** A5-20.

Page A5-4, Table A5-1:
Change the following paragraph numbers in the last column:

A5-24	to	A5-23	A5-34	to	A5-33
A5-26	to	A5-25	A5-35	to	A5-34
A5-33	to	A5-32			

Page A5-5, Table A5-1:
Change the following paragraph numbers in the last column:

A5-30	to	A5-29	A5-32	to	A5-31
A5-31	to	A5-30	A5-35	to	A5-34

ERRATA (Cont'd)

Page A5-6, Table A5-1:
Change the following paragraph numbers in the last column:

A5-25	to	A5-24	A5-29	to	A5-28
A5-27	to	A5-26	A5-36	to	A5-35
A5-28	to	A5-27			

Page A5-27, Paragraph A5-20:
Add the following steps to the end of Adjustment Paragraph A5-20, A2A9 Discriminator:

g. Set the WIDTH to CW. Rotate the CW FREQUENCY control fully counterclockwise until the left FREQUENCY display settles at the lowest limit. The FREQUENCY display should indicate 000.375 to 000.475 Mhz. If it does not, change the value of A2A9R32* to set the A2A9 Low Frequency Clamp circuit to operate within this frequency range.

NOTE

A2A9R32* is selected at the factory. If A2A9U3 is changed, it may require that A2A9R32* be selected as described in the previous step.

Increasing the value qf A2A9R32* will raise the lower limit of the left FREQUENCY display reading. Decreasing its value will lower the reading.

Page A5-59, Paragraph A5-33:
In step d, delete the following sentence:
"Release BEAM CENTER pushbutton."

Page A5-60, Paragraph A5-33:
Add to step i as the first sentence:
"Set TRIGGER to AUTO."
Change step k to read as follows:
"Release BEAM CENTER pushbutton. Place a short across A3A8C33.(C33 is a 2.2 Ufd Capacitor located directly below and between pots "B" and "C". Clear any offset on channel 1."
Change step l to read as follows:
"Connect DVM to A3A8TP2 and record indication. Add −40.0 db of offset with REF OFFSET pushbuttons and note DVM indication; it should be 100 times the previously recorded reading ±10 mVdc. If not, adjust "A" (EXP SCALE) control A3A8R88. Remove short across C33."

Page B2-1, Table B2-1:
Add the following assembly:
A1A10 SPLITTER/AMP, New Part No. 5086-7140 (CD0), Exchange Part No. 5086-6140 (CD8).

Page B2-5, Table B2-3:
Change A1R1 to HP Part No. 2100-3943, CD2 (Recommended Replacement).

Page B2-7, Table B2-3:
Change A1A2 to HP Part No. 5086-7364, CD0.
Change A1A3Q1,2 to HP Part No. 1854-0071, CD7, (Recommended Replacement).
Change A1A3R1 to HP Part No. 0757-0442, RESISTOR 10K 1% .125W F TC=0±100, CD9 (Recommended Replacement).
Change A1A3R10 to HP Part No. 0757-0123, RESISTOR 34.8K 1% .125 F TC=0±100, CD3 (Recommended Replacement).

ERRATA (Cont'd)

Change A1A3R11 to HP Part No. 0757−0199, RESISTOR 21.5K 1% .125W F TC=0±100, CD3 (Recommended Replacement).

► Change A1A3U6 and A1A3U7 to HP Part Number 1826-0158, CD3.

Change A1A3VR2 to HP Part No. 1902-0025, DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06% CD4 (Recommended Replacement).

Change A1A3VR3 to HP Part No. 1902-0049, DIODE-ZNR 6.19V 5% DzO-35 PD=.4W, CD2 (Recommended Replacement).

Page B2-8, Table B2-3:

Change A1A4/5/6Q3 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page B2-9, Table B2-3:

Add A1A13MP5, HP Part No. 11869-20020, CD4, Qty. 2, CONNECTOR ALIGNMENT PIN.

Add A1A13MP6, HP Part No. 0510-0089, CD8, Qty. 2, CONNECTOR ALIGNMENT PIN RETAINING CLIP.

Page B2-10, Table B2-3:

Change A1A15A1C1 to HP Part Number 0121-0443, CD3, CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG (Recommended Replacement).

Change A1A15A1C2 to HP Part Number 0160-2265, CD3, CAPACITOR-FXD 22PF 500 V (Recommended Replacement).

NOTE

A1A15A1C1 and A1A15A1C2 work together; BOTH must therefore be changed at the same time.

Change A1A15A1Q1,2,3,4,6 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page B2-11, Table B2-3:

► Add the following to the Description of A1A15A1Y1: "A1A15A1Y1 MUST BE ORDERED AS A MATCHED SET, HP PART NUMBER 0410-0675, CD6."

Change A1A15A2Q1,2,3,4,5 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

► Page B2-12, Table B2-3:

Add A1A15A3E2, HP Part Number 9170-0016; CD8, CORE-SHIELDING BEAD.

Page B2-15, Table B2-3:

Change A1-6 to HP Part Number 3050-1117, CD2, WASHER.

Page B3-15, Figure B3-8:

Change the HP Part Number above the A1A2 Programmable Attenuator to 5086-7364 (CD0).

Page B3-33, Figure B3-23:

On A1A14J1, change the following pin numbers:

1 to 2
2 to 3
3 to 4
4 to 5
5 to 6
6 to 7
7 to 1

On A1A2J3, change the following pin numbers:

1 to 5
2 to 6
3 to 7
4 to 8
5 to 9
6 to 10
7 to 1

ERRATA (Cont'd)

Change the HP Part Number above the A1A2 Programmable Attenuator block to 5086-7364 (CD0).
Change the values of the following components:
A1A3R1 to 10K
A1A3R10 to 34.8K
A1A3R11 to 21.5K
A1A3VR2 to 10.0V
A1A3VR3 to 6.19V

Page B3-47, Figure B3-42:
Change the value of A1A15A1C1 to 3—9 PF.
Change the value of A1A15A1C2 to 22 PF.
► Add the words "Note 3" adjacent to A1A15A1Y1 in the 9.9 MHz OSCILLATOR Block.
► Add the following as NOTE 3 in the upper right-hand corner of the page: 'A1A15A1Y1 9.9 MHz CRYSTAL IS MATCHED WITH A2A12Y1 100 MHz CRYSTAL IN THE FREQUENCY CONTROL ASSEMBLY A2. THESE CRYSTALS MUST BE ORDERED AS A MATCHED SET.

►Page B3-51/52, Figure B3-55:
Add A1A15A3E2, CORE-SHIELDING BEAD around the base lead of A1A15A3Q5.

Page C2-7, Table C2-3:
Delete A2F1 having HP Part Number 2110-0312, CD4, **ONLY**.
Add A2J10, HP Part Number 08505-60148, CD5, HP-IB CABLE ASSEMBLY (TO REAR PANEL, INCLUDES REAR PANEL HP-IB CONNECTOR)
Add the following note before the A2A1A1 Front Panel Board Assembly entry:

NOTE

CHANGE 15 of the change sheet documents a change to the A2A1A1 Front Panel Board Assembly. Although CHANGE 15 is referenced to a specific serial number prefix, the changes referenced are RECOMMENDED REPLACEMENT parts for instruments with all serial number prefixes. Additionally, a replacement front panel assembly kit (HP Part No. 08505-60247) is available which includes the new front panel board assembly referenced in CHANGE 15 (HP Part No. 08505-60245) along with additional A2A1A1 Front Panel Board Assembly parts. Before ordering parts for the A2A1 Front Panel Assembly, refer to CHANGE 15.

Change A2A1A1DS1 through A2A1A1DS10 to HP Part Number 1990-0505, CD0.

Page C2-8, Table C2-3:
Change A2A1A1DS11 through A2A1A1DS14 to HP Part Number 1990-0505, CD0.

Page C2-10, Table C2-3:
Change A2A3C9 to HP Part No. 0160-3877, CD5, CAPACITOR-FXD 100PF ±20% 100VDC CER.
Change A2A3C17 to HP Part No. 0160-3877, CD5, CAPACITOR-FXD 100PF ±20% 100VDC CER.

Page C2-12, Table C2-3:
Change A2A3U24 to HP Part Number 1820-1908, CD0 (Recommended Replacement).
Change A2A4C11 to HP Part No. 0160-0174, CD9, CAPACITOR-FXD .47UF +80—20% 25 VDC CER.
Delete A2A4MP4 through MP13.

ERRATA (Cont'd)

Page C2-13, Table C2-3:
Change A2A4Q3,4,5,6,8 to HP Part No. 1854-0071, CD7, (Recommended Replacement).
Change A2A4U7,12 to HP Part Number 1820-1908, CD0 (Recommended Replacement).

Page C2-15, Table C2-3:
Add A2A5R64, Not Assigned.
Add A2A5R65, HP Part No. 0698-7229, CD8, RESISTOR 511 1% .05W F TC=0±100.

Page C2-18, Table C2-3:
Change A2A7Q10,11 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

►Page C2-19, Table C2-3:
Change A2A7U4 to HP Part Number 1826-1058, CD3.

Page C2-20, Table C2-3:
Change A2A8Q1 to HP Part Number 1853-0522, CD1, X-P D 1TS3154971, (Recommended Replacement).
Change A2A8Q5,6,12,13,14 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page C2-21, Table C2-3:
Change A2A8U1,2 to HP Part No. 1826-0261, CD8, IC OP AMP LOW-NOISE TO-99 PKG (Recommended Replacement).
Change A2A8U4 to HP Part Number 1826-0229, CD8 (Recommended Replacement).

Page C2-23, Table C2-3:
Change A2A9Q1,15,16,19,20 to HP Part No. 1854-0071, CD7, (Recommended Replacement).
Add A2A9Q21, HP Part No. 1854-0071, CD7, TRANSISTOR NPN SI PD=300MW FT=200 MHz, (Recommended Replacement).
Change A2A9R32 to A2A9R32* (Factory Select).

Page C2-27, Table C2-3:
Add an alternate zener diode for A2A11VR1 as follows: HP Part Number 1902-3171, CD7, DIODE-ZNR 11V 5% DO-35 PD=.4W TC=±.062% (ALTERNATE for 1902-1336).

Page C2-28, Table C2-3:
Change A1A12R28 to HP Part Number 0698-3447, CD4, RESISTOR 422 1% .12W.
Change A2A12U1 to HP Part Number 1820-1631, CD6, (Recommended Replacement). (See CHANGE 14.)
► Add the following to the Description of A2A12Y1: "A2A12Y1 MUST BE ORDERED AS A MATCHED SET, HP PART NUMBER 0410-0675, CD6.".

Page C2-29, Table C2-3:
Change A2A13R8 to HP Part No. 2100-3056, CD8, RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN.
Change A2A13R10 to HP Part No. 2100-3103, CD6, RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN.

Page C2-30, Table C2-3:
Change A2A15Q1 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page C2-31, Table C2-3:
Change A2A16Q1 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page C2-32, Table C2-3:
Change A2A18J1,2 to HP Part Number 1251-7169, CD0 (Recommended Replacement).
Under A2A19 (NEW and REBUILT) entries, change the second line of each entry to read "INCLUDES A2A11R22, A2A11R40, AND A2A19W1 WITH A2A19W1P1."
Add A2A20MP10, HP Part Number 0590-0970, CD4, INSERT NB 6-32.
Add A2A20MP11, HP Part Number 08505-00161, CD6, BRACKET-MB SUPPORT.

ERRATA (Cont'd)

Change A2A20Q4 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page C2-34, Table C2-3:

Change A2A21Q5 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page C2-35, Table C2-3:

Add the following note to the A2A22T1P1 description:

NOTE

HP Part Number 1251-3389 is the connector housing only. The transformer wire female contacts that insert into the connector housing must be ordered separately as:

Pins 1—6, 8, 9 HP Part Number 1251-0670 (each), CD4.

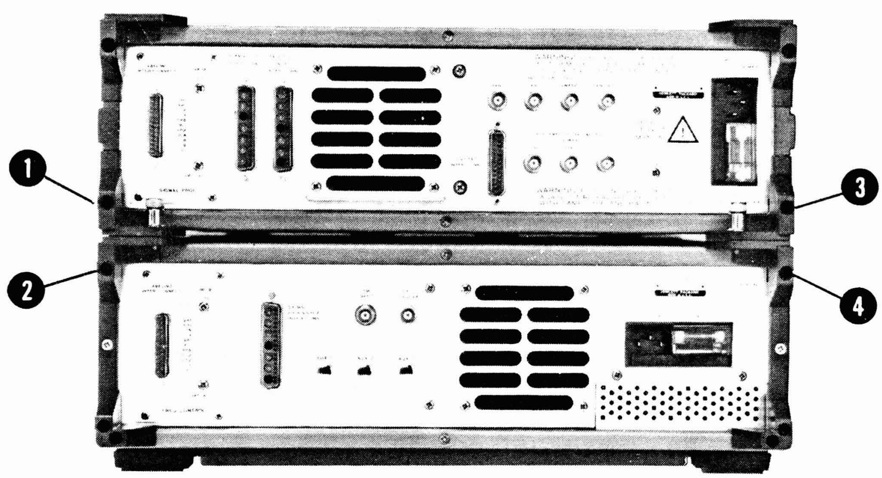
Pins 7, 10 HP Part Number 1251-2992 (each), CD7.

Change A2A23 to HP Part No. 5086-7265, CD0.

Add the following note to the A2A25J1 description:

NOTE

HP Part Number 1251-3750 includes the connector housing with pins installed.



ITEM	DESCRIPTION	QTY	HP PART NUMBER	C D
1	Lock Foot, Upper Left	1	5020-8939	9
2	Lock Foot, Lower Left	1	5020-8938	8
3	Lock Foot, Upper Right	1	5020-8937	7
4	Lock Foot, Lower Right	1	5020-8940	2

Figure C2-3. Locking Feet Part Location (ERRATA)

Page C2-36, Table C2-3:

Change Items 8 and 8A to HP Part No. 5061-0099, CD2, Rear Panel Lock Feet Kit (refer to Figure C2-3).

Change Item 26 to HP Part Number 08505-00160, CD5.

Change item 29 to HP Part Number 08505-00148, CD9, Qty. 1, PC BOARD GUIDE (Recommended Replacement).

Change Item 63 to HP Part Number 08505-00161, CD6, BRACKET-MB SUPPORT.

ERRATA (Cont'd)

Page C2-37, Figure C2-2:

► In the table, change Reference Designator 86 to HP Part Number 08505-60255; CD5; KNOB AY, JADE GRAY.

► In the table, change Reference Designator 87 to "NOT ASSIGNED."

Add the following description to each of Reference Designators 90 and 91: (Recommended Replacement is FRONT PANEL REPLACEMENT KIT, HP Part Number 08505-60254, CD4).

Page C2-38:

Insert Figure C2-3 (ERRATA), found in this change sheet.

Page C3-83, Figure C3-59:

Change C10 adjacent to U27 to C17.

Page C3-83, Figure C3-60:

Change C9 to 100 pF.
Change C17 to 100 pF.

Page C3-85, Figure C3-60:

Change U11D in the **FREQUENCY CHANGE LOGIC** block to U1D.

Page C3-89, Figure C3-63:

Change the value of C11, in the SUMMING AMPLIFIER, to .47UF.

►Page C3-97, Figure C3, Figure C3-71:

Transpose A2A6U19C pins 9 and 10, located in the Data Control Marker Block.
Change the Scan Time/Sec notation between A2A6U21A pin 3 and A2A6U22B pin 5 in the Marker Trigger Select Block to .1—.01.

Page C3-101, Figure C3-76:

Change R65 (Connected to U1 pin 4, C17 and VR5) to R55.

Page C3-104:

In the last paragraph under the heading **Frequency-to-Current Converter**, replace all references to Q2A and Q2B with Q3A and Q3B.

Page C3-109, Figure C3-87:

Add diode CR6 between pins 2 and 6 of U3; connect cathode to pin 6.
A preferred configuration change to the **Frequency-to-Current Converter** circuit, in the A2A9 assembly, is documented in CHANGE 7 of this Manual Change Sheet.
Change A2A9R32 to A2A9R32* (Factory Select).

Page C3-115, Figure C3-96:

Change Reference Designator A2A12R28 to A2A12R31.
Change Reference Designator A2A12R31 to A2A12R28.
Change the value of A2A12R28 to 422 Ohms.

► Change Note 3 to read as follows: "Y1 100 MHz CRYSTAL IS MATCHED WITH A1A15A1Y1 9.9 MHz CRYSTAL IN A1 SOURCE/CONVERTER. THESE CRYSTALS MUST BE ORDERED AS A MATCHED SET.

Page C3-121, Figure C3-102:

Change R8 to 5K.
Change R10 to 10K.

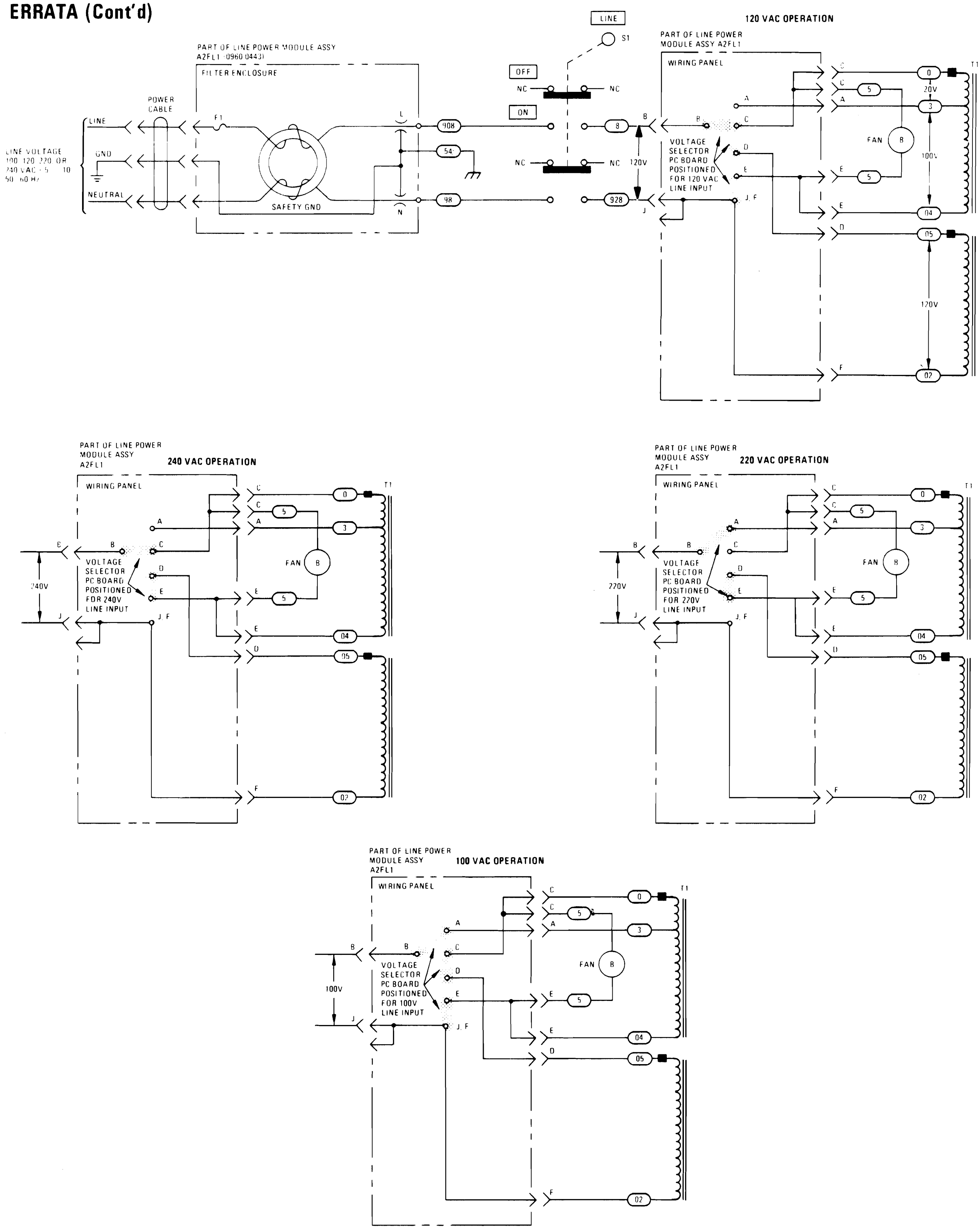
Page C3-151/152, Figure C3-128:

Insert the partial schematic diagram supplied in this change sheet [P/O Figure C3-128 (ERRATA)] in the existing A2A20 Service Sheet.

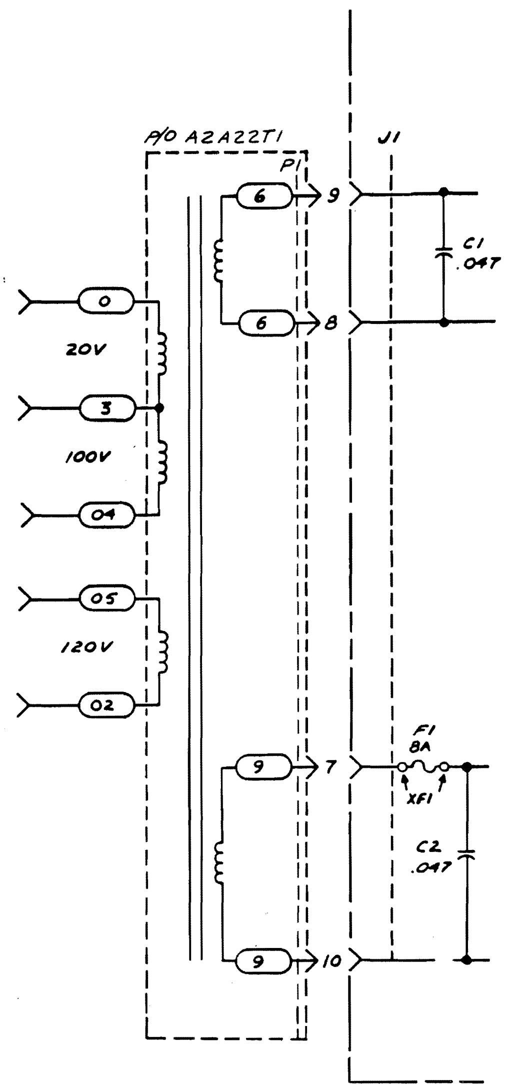
Page C3-155/156, Figure C3-131:

Insert the partial schematic diagram supplied in this change sheet [P/O Figure C3-131 (ERRATA)] in the existing A1A21/A2A25 Service Sheet.

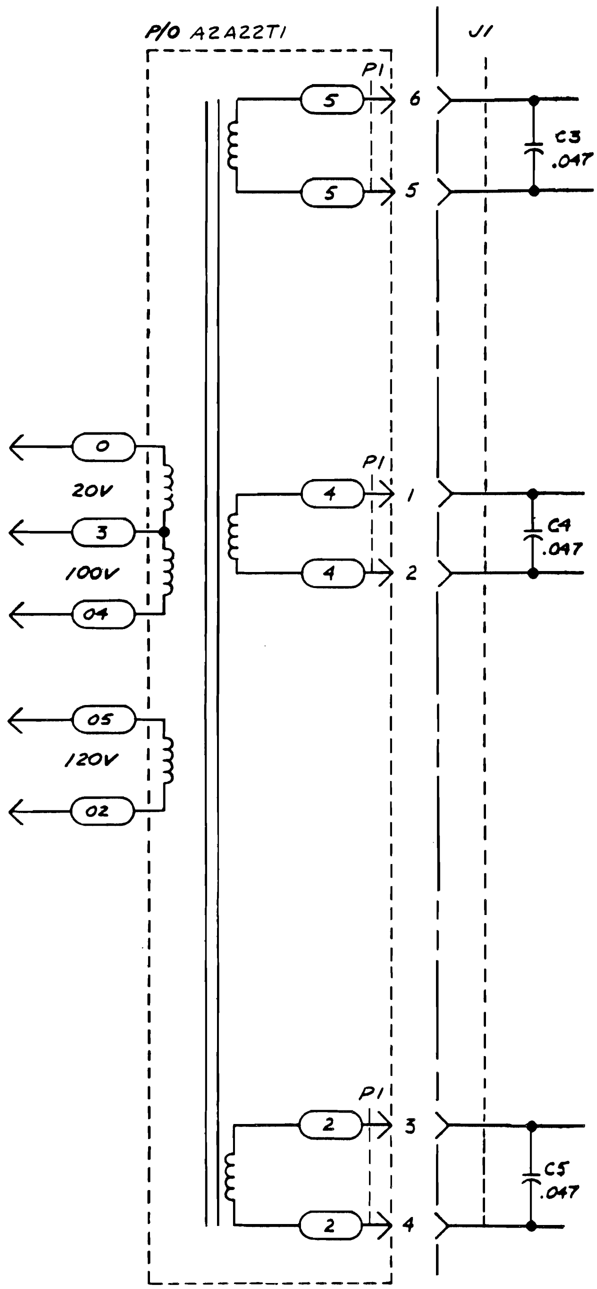
ERRATA (Cont'd)



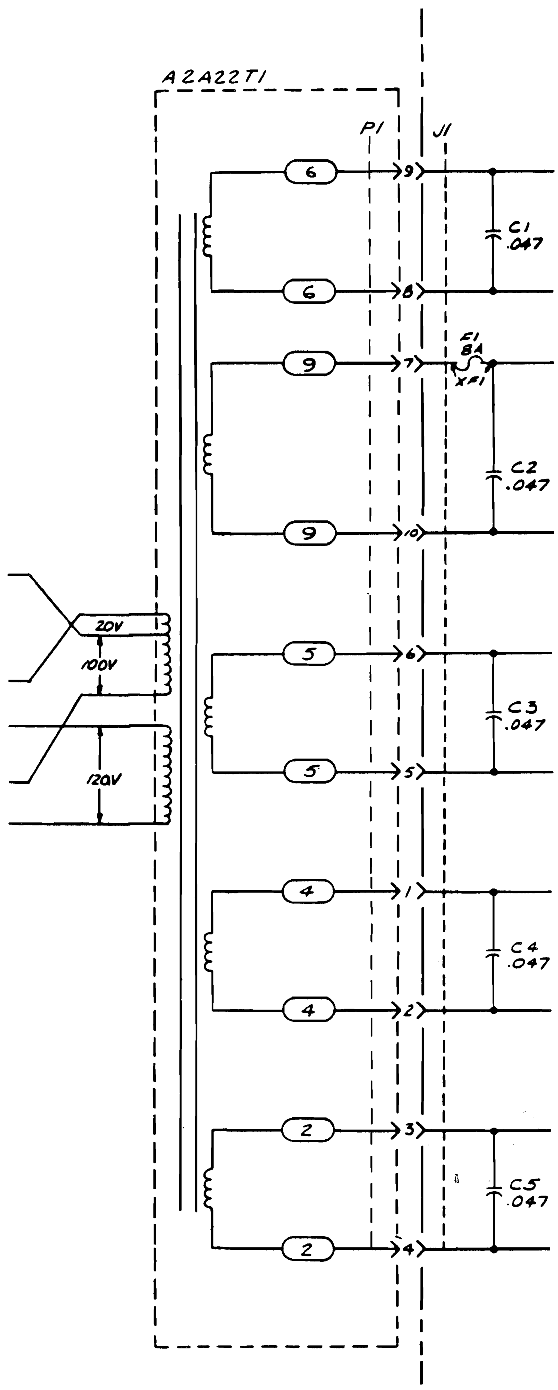
P/O C3-133. A2A22 Frequency Control Power Supply Schematic (ERRATA)



Part of Figure C3-128 (ERRATA)



Part of Figure C3-131 (ERRATA)



Part of Figure C3-133 (ERRATA)

ERRATA (Cont'd)

Page C3-157, Figure C3-133:

Change the Power Line Module schematic (A2FL1) between transformer T1 and AC power cable to the partial schematic supplied in this change sheet.

Insert the partial schematic diagram supplied in this change sheet [P/O Figure C3-133 (ERRATA)] in the existing A2A22 Service Sheet.

Page D2-5, Table D2-2:

Delete A3F1 having HP Part Number 2110-0336, CD2, **ONLY**.

Add the following entry after A3T1:

A3T1P1, HP Part Number 1251-3278, CD4, CONN-POST TYPE

NOTE

HP Part Number 1251-3278 is the connector housing only. The transformer wire female contacts that insert into the connector must be ordered separately as HP Part Number 1251-3073 (each), CD7.

Page D2-6, Table D2-2:

Change A3A1DS20 through A3A1DS22, A3A1DS24 through A3A1DS26, and A3A1DS28 through A3A1DS29 to HP Part Number 1990-0505, CD0.

Change A3A1J1 to HP Part Number 1251-6334, CD9 (Recommended Replacement).

Delete A3A1MP1-12.

Add the following note after the A3A1R2 entry:

NOTE

Refer to Figure D2-2, A3A1S1-26 Momentary Switch Parts (ERRATA), for an illustrated parts breakdown of all A3A1 assembly momentary switch components and their part numbers.

Delete A3A1S1−24.

Page D2-7, Table D2-2:

► Add A3A2C6, A3A2C7, and A3A2C8; each having HP Part Number 0160-2055; CD9, CAPACITOR-FXD .01UF +80−20% 100VDC CER.

Change A3A2J1 to HP Part Number 1251-5653, CD3 (Recommended Replacement).

Page D2-8, Table D2-2:

Change A3A3Q1,2 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page D2-9, Table D2-2:

Change A3A4U12 and A3A4U13 to HP Part Number 1820-1240, CD3, IC 74S138P DCDR.

Page D2-10, Table D2-2:

Change A3A5R37 to A3A5R37*.

Page D2-12, Table D2-2:

Add the following note before the A3A7 Resolution Control Board Assembly entry:

NOTE

CHANGE 16 of the change sheet documents a change to the A3A7 Resolution Control Board Assembly. The board documented in CHANGE 16 is a Recommended Replacement board that may also be used in instruments with all serial prefix numbers. Before ordering parts for the 08505-60007 (old Resolution Control Board Assembly), refer to CHANGE 16.

Change A3A7R33 and R34 to HP Part Number 0698-6360, CD6, RESISTOR 10K 0.1% .125W F TC=0±100.

Page D2-13, Table D2-2:

Change A3A8Q2,4 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

ERRATA (Cont'd)

Page D2-15, Table D2-2:
Change A3A8U4 to HP Part Number 1826-0229, CD8 (Recommended Replacement).
Change A3A9C7 to HP Part No. 0160-0134, CAPACITOR-FXD 220PF 300 VDC MICA, CD1, (Recommended Replacement). (See CHANGE 11.)

Page D2-16, Table D2-2:
Change A3A9Q1 to HP Part No. 1854-0071, CD7, (Recommended Replacement).
Change A3A9Q7 to HP Part No. 1853-0089, CD5, TRANSISTOR PNP 2N4917 SI PD=200 mW.
Change A3A9Q8 to HP Part No. 1853-0089, CD5, TRANSISTOR PNP 2N4917 SI PD=200 mW.
Change A3A9Q2,3 to HP Part No. 1854-0882, CD8, (Recommended Replacement). (See CHANGE 6.)
Change A3A9R5 to HP Part No. 0757-0416, RESISTOR 511 1% .125W F TC=0±100, CD7, (Recommended Replacement). (See CHANGE 11.)
Change A3A9U6 to HP Part Number 1826-0229, CD8 (Recommended Replacement).

Page D2-17, Table D2-2:
Change A3A10Q3,5,6 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page D2-19, Table D2-2:
Change A3A11C42 to HP Part Number 0160-4441, CD4.

Change A3A11Q5,7,10 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page D2-20, Table D2-2:
Change A3A11Q11 to HP Part No. 1854-0882, CD8, (Recommended Replacement). (See CHANGE 6.)
Change A3A11Q17 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

►Page D2-21, TAble D2-2:
Change A3A11U5 and A3A11U7 to HP Part Number 1826-1058, CD3.

Page D2-22, Table D2-2:
Change A3A12Q1,4,5,6,10 to HP Part No. 1854-0071, CD7 (Recommended Replacement).

Page D2-23, Table D2-2:
Change A3A13C3 and A3A13C4 to HP Part No. 0180-2474, CD8. (Recommended Replacement).

Page D2-24, Table D2-2:
Change A3A13/14Q4,5,9 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page D2-25, Table D2-2:
Change A3A13Q13 to HP Part No. 1854—0882, CD8, (Recommended Replacement). (See CHANGE 6.)
Change A3A13/14Q16,19,23,26,28 to HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page D2-26, Table D2-2:
Change A3A13U2 to HP Part Number 1826-0371, CD1, IC OP-AMP LOW-BIAS-H-IMPD TO-99, Mfr Part Number LF256H.
Change A3A13/14R107 to A3A13/14R107* (Factory Select), HP Part No. 0698-8821, CD8, RESISTOR 5.62 .1% .125W F TC=0±100.

►Page D2-27, Table D2-2:
Change A3A15U1 and A3A15U5 to HP Part Number 1826-1058, CD3.

Page D2-28, Table D2-2:
Add A3A16MP3 HP Part Number 1200-0185, CD9, INS XSTR TO-5.
Add the following note before the A3A17 Marker I Board Assembly entry:

ERRATA (Cont'd)

NOTE

Part of CHANGE 19 of the change sheet documents a change to the A3A17 Marker I Board Assembly. The board documented in CHANGE 19 is a Recommended Replacement board that may also be used in instruments with all serial prefix numbers. Before ordering parts for the 08505-60015 (old Marker I Board Assembly), refer to CHANGE 19.

Page D2-33, Table D2-2:
Add the following note to the A3A24J1 description:

NOTE

HP Part Number 1251-3904 includes the connector housing with pins installed.

Page D2-34, Table D2-2:
Change A3A24R3 to HP Part Number 0699-0233, CD2, RESISTOR 3.4K 1% .125W F TC=0±100 (Recommended Replacement).

Page D2-35, Table D2-2:
Change A3A27C8 to HP Part Number 0160-0576, CD5 (Recommended Replacement).

Page D2-36, Table D2-2:
Change A3A27Q4,5,6,7,12 HP Part No. 1854-0071, CD7, (Recommended Replacement).

Page D2-37, Table D2-2:
Change A3A28Q6,7,9,10 to HP Part No. 1854-0071, CD7, (Recommended Replacement).
Change A3A28C4-9 to HP Part No. 0160-4084, CD8, CAPACITOR-FXD .1UF±20% 50VDC CER (Recommended Replacement).

Page D2-38, Table D2-2:
Correct the Reference Designators of the following parts:

Change A3A30C1 to A3A30C4.
Change A3A30C2 to A3A30C1.
Change A3A30C4 to A3A30C5.
Change A3A30C5 to A3A30C2.

Page D2-39, Table D2-2:
Delete HP Part Number 10631B.

Page D2-40, Figure D2-1 (1 of 8):
Add the following note after item 2:

NOTE

Refer to Section II, Installation, in this manual for information regarding rack mount handles and flanges.

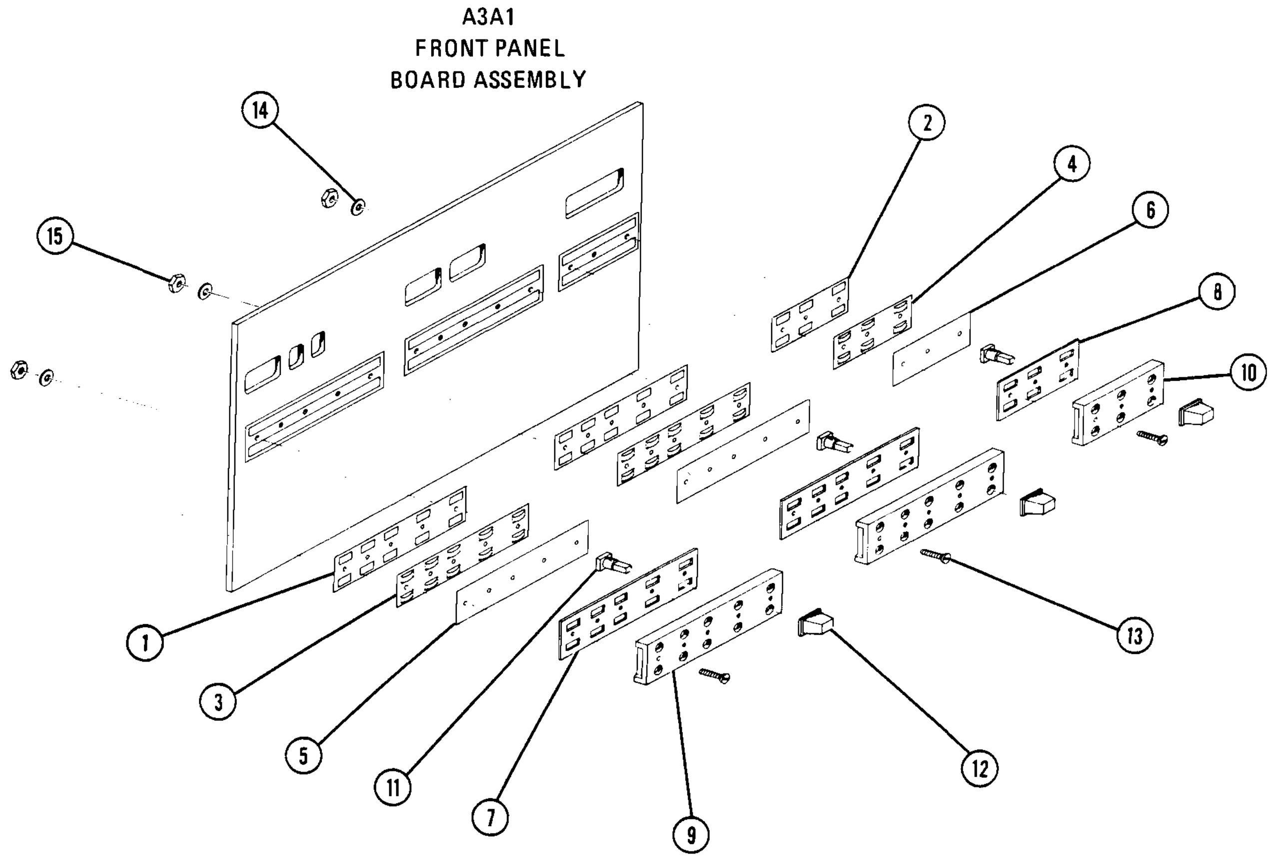
► In the table, change Reference Designator 20 to HP Part Number 08505-60256; CD6; KNOB AY, 01 BLK.

Add the following note, preceding items 28 (PANEL, FRONT) and 29 (PANEL, SUB).

NOTE

CHANGE 19 of the Manual Change Supplement documents a new Front Panel (08505-00152) and Sub Panel Assembly (08505-00153). A Replacement Kit is available as HP Part Number 08505-60251, CD1, which includes the new Front Panel, Sub Panel, Front Panel Retaining Clips (0510-1148, CD2), Front Window (08505-20029, CD7), and Front Window Retaining Clips (5040-6937, CD5).

ERRATA (Cont'd)



Item	Description	Qty	HP Part Number	Check Digit
1	Gold Plated Contact Spacer-Long	2	08505-20035	5
2	Gold Plated Contact Spacer - Short	1	08505-20034	4
3	Gold Plated Contact Plate - Long	2	08505-20030	0
4	Gold Plated Contact Plate - Short	1	08505-20032	2
5	Clear Plastic Protective Strip - Long	2	08505-20044	6
6	Clear Plastic Protective Strip - Short	1	08505-20045	7
7	Base - Long	2	08505-40004	0
8	Base - Short	1	08505-20031	1
9	Housing - Long	2	08505-40003	9
10	Housing - Short	1	08505-20003	7
11	Plunger	26	08505-40002	8
12	Pushbutton	26	Refer to Table D2-2	–
13	Screw	13	0516-0044	7
14	Washer	13	3050-0079	3
15	Nut	13	0510-0198	0

Figure D2-2. A3A1S1-26 Momentary Switch Parts (ERRATA)

ERRATA (Cont'd)

Page D2-40. Figure D2-1 (1 of 8) (Cont'd)
Change Item 30 to HP Part No. 08565-60170, CD5.
Delete item 36B.

Page D2-41, Figure D2-1 (3 of 8):
Delete item 36B.

Page D2-42:
Add Figure D2-2. A3A1S1-26 Momentary Switch Parts (ERRATA), supplied in this change sheet, following the existing Figure D2-1.

►Page D3-74, Figure D3-37:
Replace the A3A2 Auxiliary Front Panel Parts Location diagram with the Auxiliary Front Panel Parts Location diagram supplied in this Change Sheet.

Page D3-75, A3A2 Auxiliary Front Panel, Schematic:
Change the figure designation from "Figure D3-30" to "Figure D3-38".

►Page D3-75, Figure D3-38:
Add A3A2C6, .01UF capacitor from A3A2U18 pin 16 (+5V) to ground.
Add A3A2C7, .01UF capacitor from A3A2U19 pin 16 (+5V) to ground.
Add A3A2C8, .01UF capacitor from A3A2U20 pin 16 (+5V) to ground.

Page D3-99, Figure D3-57:
Change the reference designator for A3A5R37 to A3A5R37*.

Page D3-111, Figure D3-71:
Chage the value of A3A9C7 to 220 pF.
Change the value of A3A9R5 to 511 Ohms.

Page D3-125, Figure D3-88:
Change the labels at the left of the A3A13/A3A14 to A3A23 interconnections as follows:
At pins 1,16:
IF PORT R (A13)
FROM A3J2-A1
(REAR PANEL INTERCONNECT)

At pins 4,9:
IF PORT B (A14)
FROM A3J2-A3
(REAR PANEL INTERCONNECT)
NC (A13)

Change A3A13/14R107 to R107*, 5.62 Ohms.

Page D3-116, Figure D3-77:
Change TP3 label to TP5.
Change TP4 label to TP6.
Change TP5 label to TP3.
Change TP6 label to TP4.

Page D3-139, Figure D3-101:
Change R28 to 61.9 Ohms.
Change R31 to 200 Ohms.

Page D3-168, Figure D3-130:
Change reference designator T1 to A3T1.

ERRATA (Cont'd)

Page D3-169/D3-170, Figure D3-132:
Change the value of A3A24R3 to 3400 ohms.
Insert the partial schematic diagram supplied in this change sheet [P/O Figure D3-132 (ERRATA)] in the existing Figure D3-132.

Page D3-175, Figure D3-137:
Replace the existing A3A27 component location diagram with the one supplied in this change sheet (Part of Figure D3-137).

A3A27

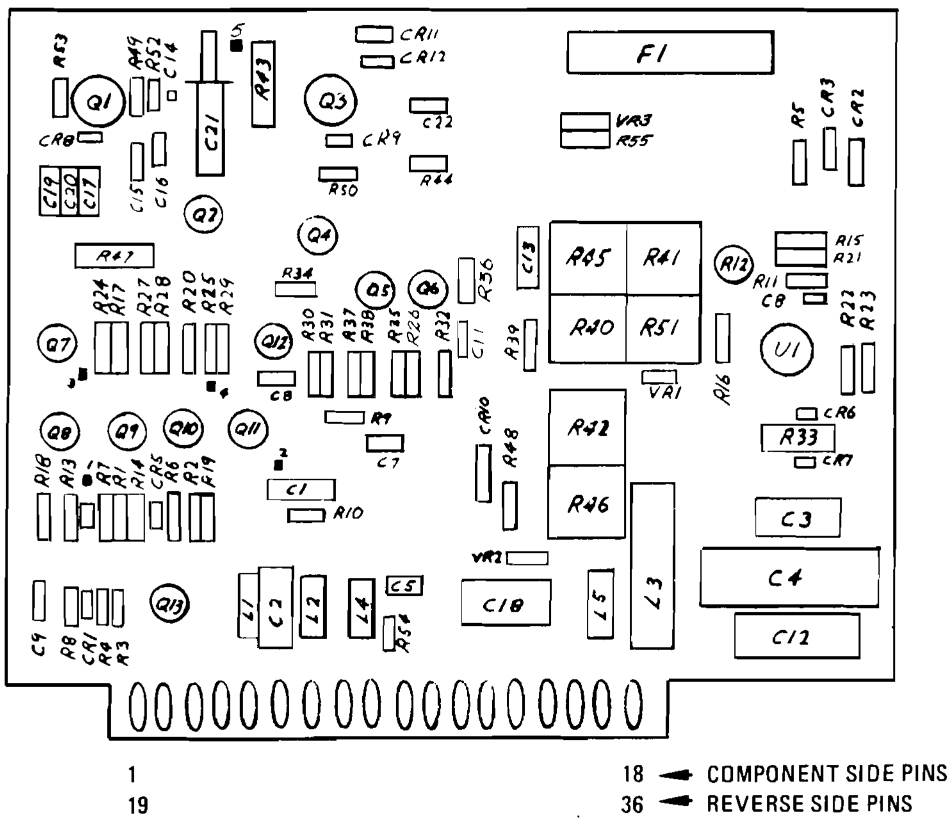
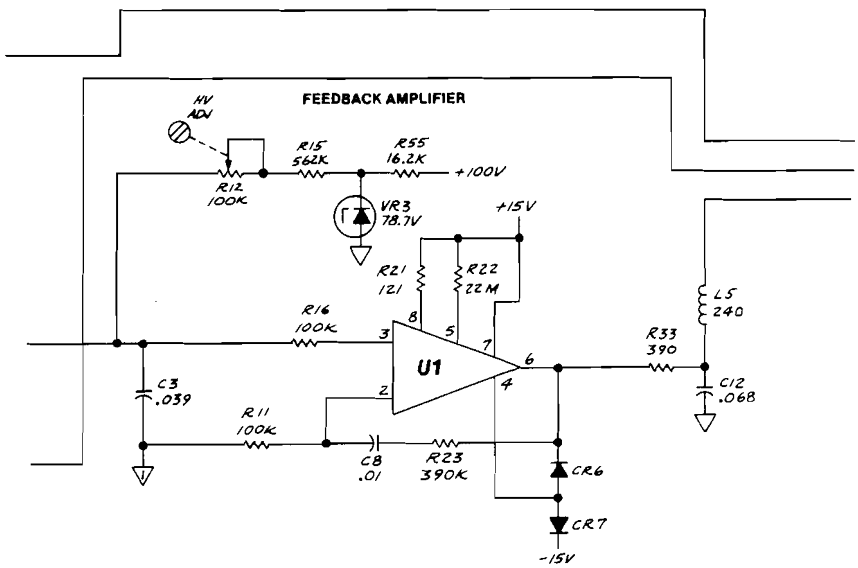


Figure D3-137. A3A27 Blanking Amplifier Parts Location (Errata)

ERRATA (Cont'd)

Change A3A27 BLANKING AMPLIFIER to HP Part Number 08505-60237, CD2.

Insert the partial schematic diagram for A3A27 supplied in this change sheet into the existing Figure D3-138.



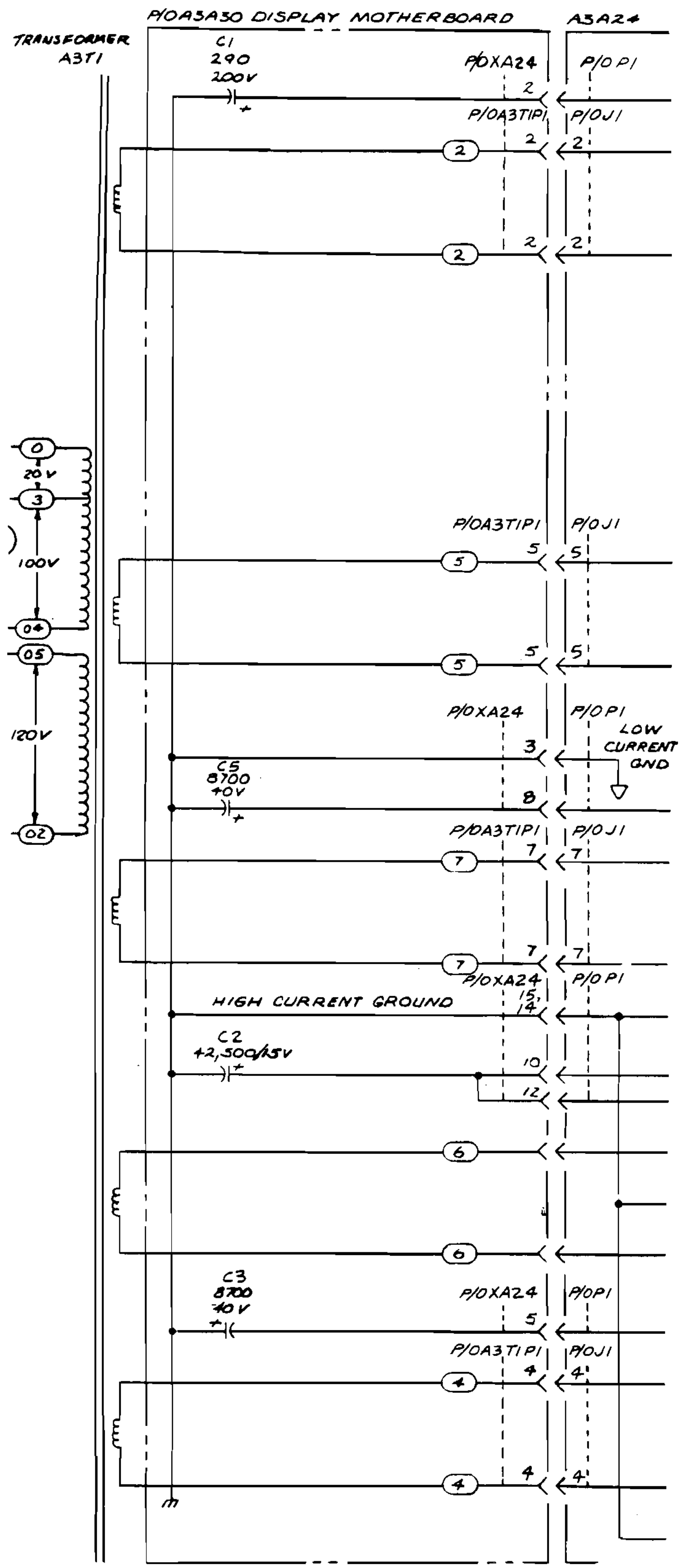
Part of Figure D3-138, A3A27 Blanking Amplifier Schematic (Errata)

Page D3-177/D3-178, Figure D3-141:
Change the W17 and W18 output cable assembly destination description to read: "CABLE ASSEMBLY TO CRT DEFLECTION PLATES".

In the 11864A 8501A/8505A LABELING INTERFACE KIT OR 8505A OPTION 007 OPERATING AND SERVICE MANUAL:

Page 5-5, Table 5-3:
Change A2A17U7 to HP Part Number 1810-0279, CD5 (Preferred Replacement).

Page 5-6, Table 5-3:
Change A3A22U9 to HP Part Number 1810-0279, CD5 (Preferred Replacement).



Part of Figure D3-132 (ERRATA)

CHANGE 1

Page A5-3, Table A5-1:

Add A2A15R10*, None, Select resistor for course adjustment of the 250 kHz clock. The clock should be in the range of 200 kHz to 335 kHz. The nominal value of R10 is 681 Ohms. (Paragraph A5-37.)

Page A5-72, Paragraph A5-37:

Add to "EQUIPMENT" list: Electronic Counter, HP Model 5340A.

Page A5-73, Paragraph A5-37:

Add the following step after step b:

b-1. Connect an electronic counter to test point 1; the 250 kHz Clock Generator should have an output of 200 kHz to 335 kHz. If not, select the value of A2A15R10 for a clock frequency within these limits. The nominal value for A2A15R10 is 681 Ohms.

CHANGE 1 (Cont'd)

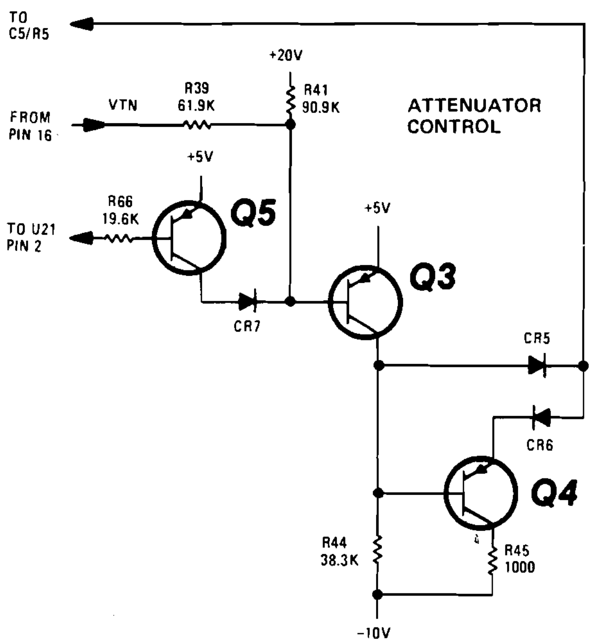
Page C2-14, Table C2-3:
Add A2A5C37, HP Part No. 0160-4084, CD8, CAPACITOR-FXD 0.1UF ±20% 50 VDC CER.
Add A2A5CR7, HP Part No. 1901-0033, CD2, DIODE-GENERAL PURPOSE 180V 0.2A. (For instruments with Serial Prefixes ≥2051A, refer to CHANGE 10 for a part number change before making the A2A5CR7 entry.)
Add A2A5Q5, HP Part No. 1853-0007, CD7, TRANSISTOR PNP 2N3251 TO-18.

Page C2-15, Table C2-3:
Add A2A5R66, HP Part No. 0698-7267, CD4, RESISTOR 19.6K 1% 0.05W.

Page C2-30, Table C2-3:
Change A2A15R10 to HP Part Number 0757-0419, CD0, RESISTOR 681 1% 0.125 W F TC=0±100 (FACTORY SELCTED).

Page C3-92, Figure C3-65:
Change the existing drawing to the one contained in this change sheet (CHANGE 1).

Page C3-93, Figure C3-66:
Add C37, a 0.1 UF capacitor from U3A, pin 16 to ground return.
Change the existing schematic as shown in the partial schematic in this change sheet.



P/O Figure C3-66 (CHANGE 1)

Page C3-141, Figure C3-120:
Place an asterisk (*) after A2A15R10 and change the value to 681 Ohms.

CHANGE 1 (Cont'd)

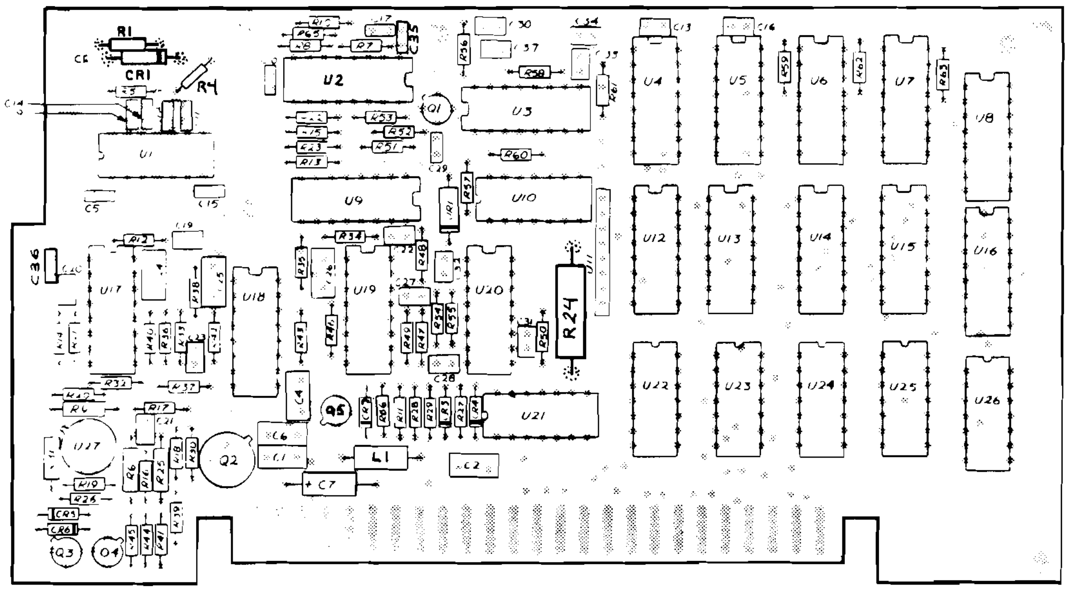


Figure C3-65. A2A5 Prescaler/Counter Parts Locations (CHANGE 1)

CHANGE 2

Page D2-21, Table D2-2:
Change A3A12 to HP Part Number 08505-60229, CD3.
Change A3A12C7 and A3A12C8 to HP Part Number 0180-1746, CD5, CAPACITOR-FXD 15UF ±10% 20 VDC TA.

Page D2-22, Table D2-2:
Change A3A12C48 to HP Part Number 0180-1746, CD5, CAPACITOR-FXD 15UF ±10% 20VDC TA.

Page D2-23, Table D2-2:
Change A3A12R46 to HP Part Number 0757-0447, CD4, RESISTOR 16.2K 1% 0.125W F TC=0±100.
Change A3A12R47 to HP Part Number 0698-3162, CD0, RESISTOR 46.4K 1% 0.125W F TC=0±100.
Add A3A12R64 through A3A12R67, HP Part Number 0757-0280, CD3, RESISTOR 1K 1% 0.125W F TC=0±100.
Change A3A12U1,2,4,5,6 and 9 to HP Part Number 1820-1308, CD4, IC RCVR ECL LINE RCVR TPL 2-INP.
Change A3A12U3 to HP Part Number 1820-0817, CD8, IC FF ECL D-M/S DUAL.
Add A3A12U10,11, and 12, HP Part Number 1810-0279, CD5, NETWORK-RES 10-SIP 4.7K OHM X9.

Page D3-120, Figure D3-82:
Replace existing parts location drawing for A3A12 with the one in this change sheet (CHANGE 2).

CHANGE 2 (Cont'd)

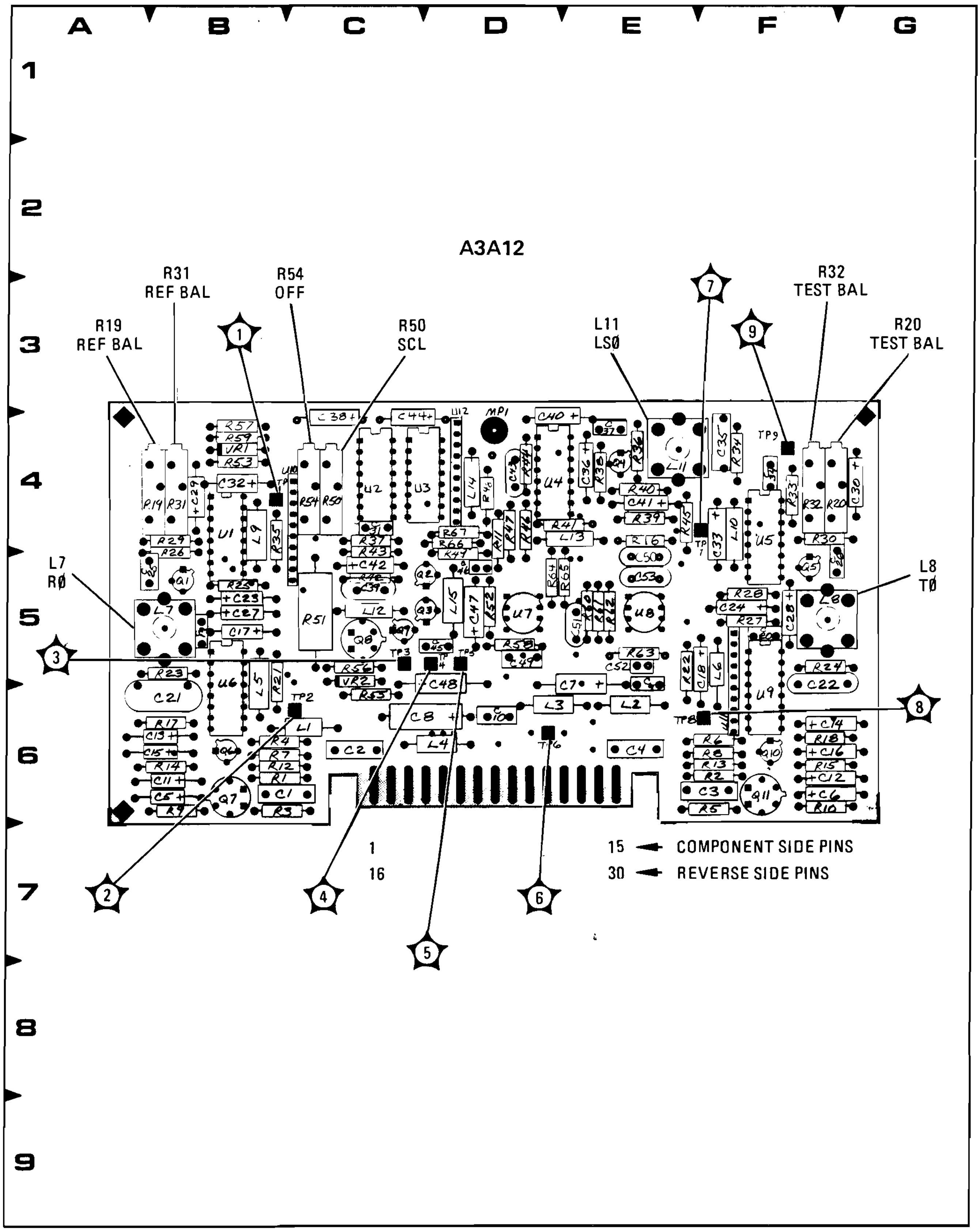


Figure D3-82. A3A12 Phase Detector Parts Locations (CHANGE 2)

CHANGE 2 (Cont'd)

Page D3-121, Figure D3-83:
Replace existing schematic of A3A12 (HP Part Number 08505-60011) with the one in this change sheet (HP Part Number 08505-60229) (CHANGE 2).

CHANGE 3

Page C2-7, Table C2-3:
Add the following fan mounting hardware items:
A2MP1, HP Part No. 0590-0025, NUT-HEX 6-32, CD0.
A2MP2, HP Part No. 2190-0007, WSHR-LK .141 ID 6, CD2.
A2MP3, HP Part No. 2360-0209, SCREW SM 6-32 1.0-IN-LG, CD7.
A2MP4, HP Part No. 5021-2563, GASKET-FAN, CD5.

Page D2-10, Table D2-2:
Change A3A5R62 to HP Part Number 0698-6360, CD6, RESISTOR 10K 0.1% 0.12W F TC=0±25.
Change A3A5R76 to HP Part Number 0683-2055, CD7, RESISTOR 2.0M 5% 0.25W TC=−900/+1100 (FACTORY SELECTED VALUE).

Page D2-18, Table D2-2:
Change A3A10R38 to HP Part Number 0757-0422, CD5, RESISTOR 909 1% 0.12W F TC=0±100.

Page D3-99, Figure D3-57:
Change resistor R76 to 2.0M and add an asterisk beside it indicating it is a factory selected value.

Page D3-113, Figure D3-73:
Change resistor R38 to 909 Ohms.

CHANGE 4

Page D2-40, Figure D2-1 (1 of 8):
Change Item 6 to HP Part Number 5061-1909, CD5.
Delete Items 7,11,12, and 13 (Strap handles and caps).

Page D2-41, Figure D2-1 (3 of 8):
Delete Items 7,11,12, and 13.

CHANGE 5

Page D2-16, Table D2-2:
Change A3A9R11 to HP Part No. 0757-0464, CD5, RESISTOR 90.9K 1% .125W F TC=0±100, MFR PART NO. C4-1/8-TO-9092-F. Add an asterisk (*) to A3A9R11 to indicate that it is a factory selected component.

Page D3-111, Figure D3-71:
Change R11, in the 3.57 MHz CRYSTAL OSCILLATOR, to 90.9K. Add and asterisk (*) to indicate that it is a factory selected component.

CHANGE 6

Page D2-16, Table D2-2:
Change A3A9Q2 and A3A9Q3 to HP Part No. 1854-0882, CD8, TRANSISTOR NPN PD=300 W FT=200 MHz.

Page D2-20, Table D2-2:
Change A3A11Q11 to HP Part No. 1854-0882, CD8, TRANSISTOR NPN PD=300 W FT=200MHz.

Page D2-25, Table D2-2:
Change A3A13Q13 to HP Part No. 1854-0882, CD8, TRANSISTOR NPN PD=300 W FT=200 MHz.
Change A3A13R36 to HP Part No. 0757-0442, CD9, RESISTOR 10K 1% .125W F TC=0±100,Mfr Code 24546, Mfr Part No. C4-1/8-TO-1002-F. (Note: A3A13 and A3A14 are identical assemblies).

Page D3-125, Figure D3-88:
Change the value of R36 in the Switchable Gain Amplifier to 10K.

CHANGE 7

Page C2-22, Table C2-3:
Delete A2A9C28.
Change A2A9C39 to Hp Part No. 0160-3878, CD6, CAPACITOR-FXD 1000 pF ±20% 100 VDC CER, MFR PART NO. 5024EM100RD102M.

Page C3-104:
In the last paragraph under the heading **Frequency-to-Current Converter**, replace reference to C28 with C39.

Page C3-109, Figure C3-86:
Delete C28.

Page C3-109, Figure C3-87:
In the collector circuit of Q3, delete C28 and change C39 to 1000PF.

CHANGE 8

Page C2-26, Table C2-3:
Delete A2A11R21.

Page C2-27, Table C2-3:
Delete A2A11VR1.

Page C3-112:
Under the heading, **"Tuning Current Source"**, delete the following sentence: "The zener diode VR1 and . . . at high frequencies."

CHANGE 8 (Cont'd)

Page C3-113, Figure C3-92:
Delete VR1 and R21.

Page C3-113, Figure C3-93:
Delete VR1 and R21 from the **TUNING CURRENT SOURCE**.

CHANGE 9

Page C2-14, Table C2-3:
Change A2A5CR7 to HP Part No. 1901-0518, CD8, DIODE-SM SCHOTTKY. (This entry applies only to instruments with Serial Prefix 2050A and above.)

Page D2-25, Table D2-2:
Change A3A13R20 and A3A13R21 to HP Part No. 0698-3160, CD8, RESISTOR 31.6K 1% 0.12W, Mfr Part No. C4-1/8-TO-3162-F. (This entry applies only to instruments with Serial Prefix 2045A and above.)

Page D3-125, Figure D3-88:
Within the INPUT SWITCH blocks, change the value of R20 and R21 to 31.6K. (This entry applies only to instruments with Serial Prefix 2045A and above.)

CHANGE 10

Page C2-12, Table C2-3:
Change A2A4C11 to HP Part No. 0160-0174, CD9, CAPACITOR-FXD .47UF +80 −20% 25VDC CER.

Page C2-21, Table C2-3:
Change A2A8U1 and A2A8U2 to HP Part No. 1826-0371, CD1, IC OP AMP LOW-BIAS-H-IMPD TO-99 PKG.
Change A2A8VR1 to HP Part No. 1902-0184, CD6, DIODE-ZNR 16.2V 5% DO-35 PD=.4W.

Page C2-33, Table C2-3:
Change A2A10R25 to HP Part No. 0811-1203, CD8, RESISTOR 68 5% 2W.

Page C3-151/152, Figure C3-128:
Change the value of R25 to 68 Ohms.

Page D2-9, Table D2-2:
Add the following as an alternate part for A3A5C15-18:
HP Part No. 0160-3491, CD9, CAPACITOR-FXD .47UF ±20% 50 VDC CER.

Page D2-19, Table D2-2:
Add the following as an alternate part for A3A11C42:
HP Part No. 0160-3491, CD9, CAPACITOR-FXD .47UF ±20% 50 VDC CER.

CHANGE 11

Page D2-10, Table D2-2:
Change A3A5R37 to A3A5R37*.

Page D2-15, Table D2-2:
Change A3A9C7 to HP Part No. 0160-0134, CAPACITOR-FXD 220PF 300 VDC MICA, CD1.

Page D2-16, Table D2-2:
Change A3A9R5 to HP Part No. 0757-0416, RESISTOR 511 1% .125W F TC=0±100, CD7.

Page D3-99, Figure D3-57:
Change the reference designator for A3A5R37 to A3A5R37*.

Page D3-111, Figure D3-71:
Change the value of A3A9C7 to 220 PF.
Change the value of A3A9R5 to 511 Ohms.

CHANGE 12

Page B2-5, Table B2-3:
Change A1R1 to HP Part No. 2100-3943, CD2 (Recommended Replacement).

Page B2-7, Table B2-3:
Change A1A3R1 to HP Part No. 07-0442, RESISTOR 10K 1% .125W F TC=±100, CD9 (Recommended Replacement).
Change A1A3R10 to HP Part No. 0757-0123, RESISTOR 34.8K 1% 125W F TC=0±100, CD3 (Recommended Replacement).
Change A1A3R11 to HP Part No. 0757-0199, RESISTOR 21.5K 1% .125W F TC=±100, CD3 (Recommended Replacement).
Change A1A3VR2 to HP Part No. 1902-0025, DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%, CD4 (Recommended Replacement).
Change A1A3VR3 to HP Part No. 1902-0049, DIODE-ZNR 6.19V 5% DO-35 PD=.4W, CD2 (Recommended Replacement).

Page D2-34, Table D2-2:
Change A3A25R2 to HP Part No. 2100-3944, CD3 (Recommended Replacement).

Page D2-35, Table D2-2:
Change A3A26T1 to HP Part No. 01332-61106, CD4 (Recommended Replacement).

CHANGE 13

Page D2-40, Figure D2-1:
Change item 46 to HP Part No. 08505-00151, RF COVER ASSY, Qty 1, CD4. (Used with Circuit Enclosure item 71A, HP Part No. 08505-60243.)

Page D2-41, Figure D2-1:
Change the quantity (Qty) of item 71 to 6.
Add item 71A, HP Part No. 08505-60243, CIRCUIT ENCLOSURE, Qty 1, CD1. (Used with RF Cover Assembly item 46, HP Part No. 08505-00151.)

CHANGE 14

Page A5-6, Table A5-1:
Add A3A30R8, No Name on Board. Used with A3A30R1 selection to adjust scale illumination, Adjustment Paragraph Number A5-35.

Page A5-68, Paragraph A5-35:
Change step ae to read as follows:
ae. Set front-panel SCALE control fully clockwise to turn on flood gun. Adjust "F G GRID" (flood gun grid) control A3A27R41 for 8505A prefix 1816A and below or A3A30R2 for 8505A prefix 1831A and above for the most uniform illumination on the screen. Adjust A3A30R8 as necessary for proper illumination.

Page C2-28, Table C2-3:
Change A2A12U1 to HP Part No. 1820-1631, CD6 (Recommended Replacement).

Page C2-36, Figure C2-2:
Delete items 15, 16, 17, and 18.

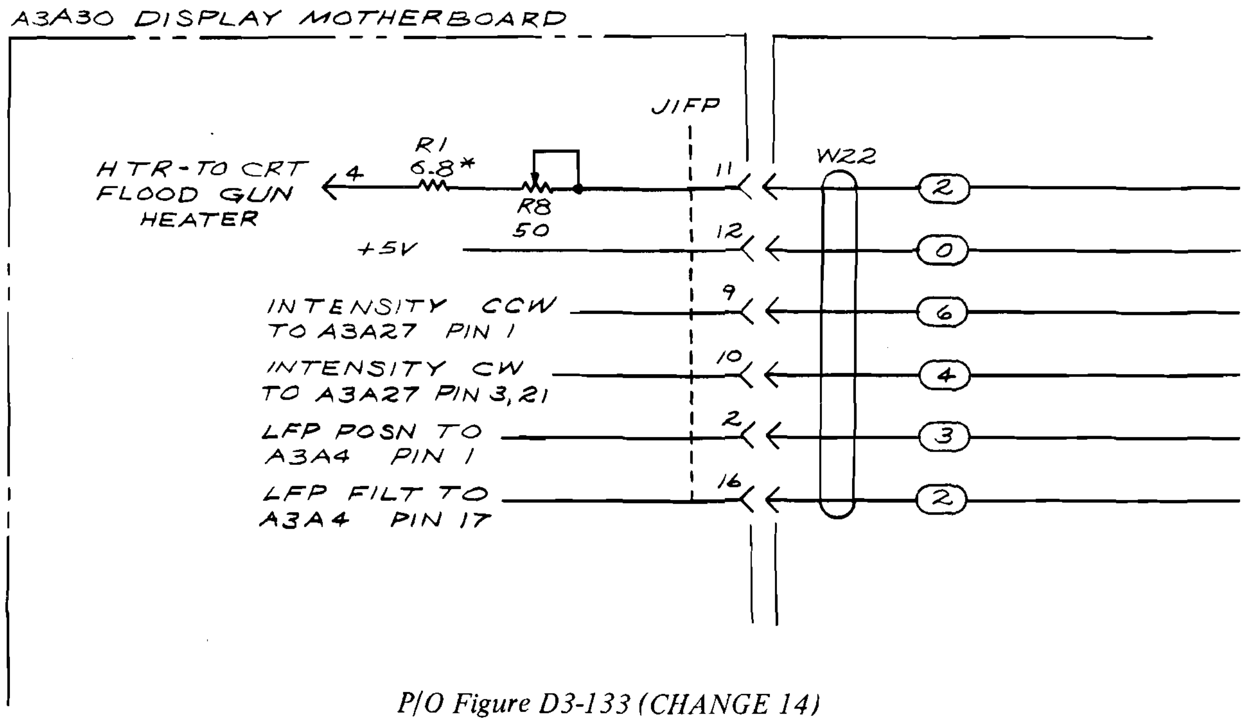
Page C2-37, Figure C2-2:
Delete item 79.

Page D2-4, Figure D2-1:
Delete items 73, 113, 114, 115, and 116.

Page D2-39, Table D2-2:
Add A3A30R8, HP Part No. 2100−1769, RESISTOR-TRMR 50 OHM 5% WW TOP-ADJ 1-TRN, CD6.

Page D3-171, Figure D3-133:
Change the existing schematic as shown in the partial schematic in this change sheet (P/O Figure D3-133 (CHANGE 14).

CHANGE 14 (Cont'd)



P/O Figure D3-133 (CHANGE 14)

CHANGE 15

Page C2-7, Table C2-3:
Add the following note after A2A1:

NOTE

08505-60120 includes all parts below prefixed with A2A1 (except A2A1W3 and A2A1W3S1) as well as all panels, knobs, cables, heat sink, and A2A1A2 and A2A1A3 RPG Assemblies.

Change A2A1A1 to HP Part No. 08505-60245, CD3, (Recommended Replacement).
Replace the note after A2A1A1 with the following:

NOTE

08505-60245 includes only C1-7, R1-12, R22-24, XDS1-7, U1, U4, VR1-4, DS15-26, and complete S1-5 switch assembly.

NOTE

A replacement kit, HP Part No. 08505-60247, is available which includes all 08505-60245 parts plus DS15-26, S6, R13-21, U2, U3, U5, U6, and both ribbon cables.

Page C2-8, Table C2-3:
Add the following note before A2A1A1S1-5:

CHANGE 15 (Cont'd)

NOTE

A2A1A1S1-5 as listed below are the switch slide assemblies only and do not include the switch guides or the S5 spring assembly.

Change A2A1A1S6 to HP Part No. 3100-3455, CD2, SWITCH–RTRY DP5T-NS .606 DIA IDX-ANG =36.
Change A2A1A1U1 to HP Part No. 1810-0399, CD0, NETWORK-RES 10-S1P68.0K OHM X9.Add A2A1A1U6, HP Part No. 1820-1851, CD2, IC ENCDR TTL LS, MFR CODE 01698, MFR P.N. 74LS148N.
Change the quantity on A2A1A1XDS1 from 6 to 2.
Change A2A1A1XDS3 and A2A1A1XDS4 to HP Part No. 1200-0576, CD2, SOCKET-IC 40-CONT DIP-SLDR.
Delete A2A1A1XDS5-14.
Add A2A1A1XU6, HP Part No. 1200-0507, CD9, SOCKET-IC 16-CONT DIP-SLDR.

Page C3-57/58:
Replace Figure C3-29 with the Parts Location Diagram supplied in this change sheet (Figure C3-29, CHANGE 15).
Replace Figure C3-30 with the schematic supplied in this change sheet (Figure C3-30 (CHANGE 15) on Service Sheet A2A1).

CHANGE 15 (Cont'd)

A2A1

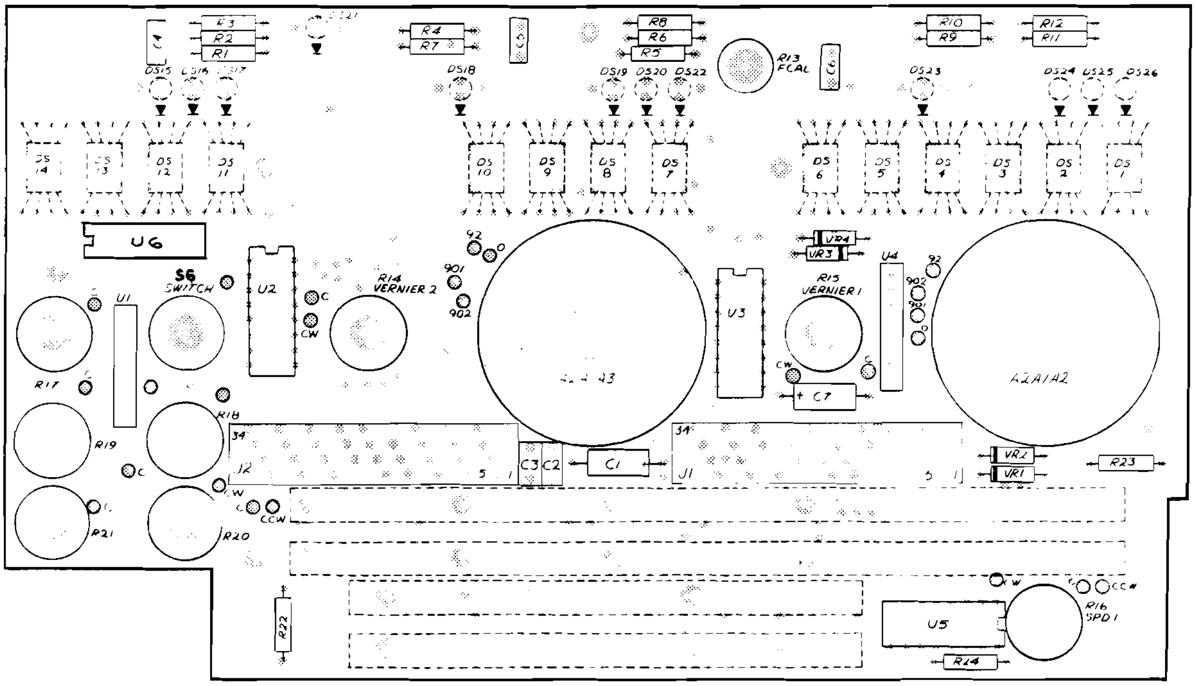
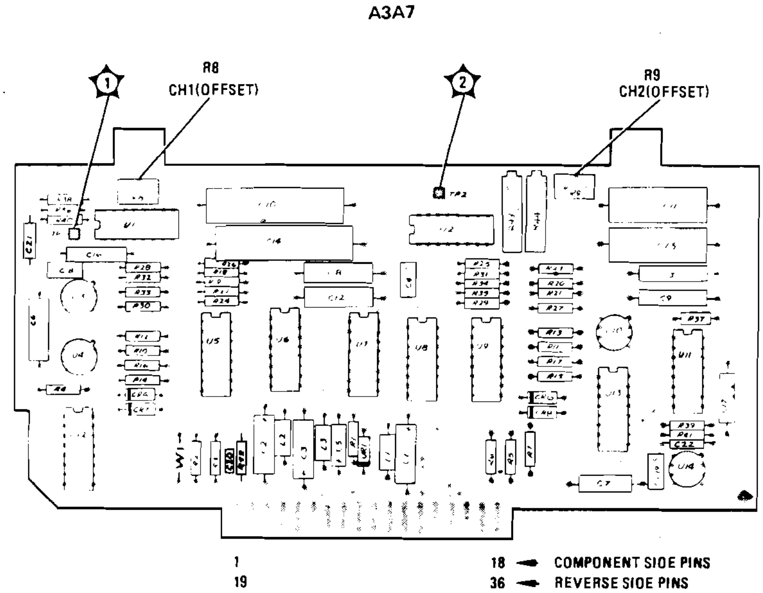


Figure C2-29. A2A1 Front Panel Parts Locations (CHANGE 15)

CHANGE 16

Page A5-34, Figure A5-21:
Replace the existing A3A7 component location diagram with the one found in this change sheet (Part of Figure A5-21 (CHANGE 16)).



Part of Figure A5-21. A3A7 Resolution Control Adjustment Locations (CHANGE 16)

Page A5-41:
Add Adjustment Paragraph A5-28A, found in this change sheet, between Adjustment Paragraphs A5-28 and A5-29.

CHANGE 16 (Cont'd)

Page D2-12, Table D2-2:
Change A3A7 to HP Part No. 08505-60249, CD7, (Recommended Replacement).
Change A3A7R2,6 to HP Part No. 0699-0638, CD1, RESISTOR 40.2K .1% .125W F TC=0±15.

Page D2-13, Table D2-2:
Add A3A7R43,44 HP Part No. 2100-3123, CD0, RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN.
Add A3A7W1, HP Part Number 8151-0013, CD4, WIRE JUMPER.

Page D3-102:
Replace the existing **A3A7 RESOLUTION CONTROL** theory **Scaling Amplifiers** paragraphs with the following:

Scaling Amplifiers

The Channel 1 Scaling Amplifier (U4) is an inverting, summing, operational amplifier with switchable feedback resistors that provide the correct gain for each of the eight front panel SCALE/DIV switch settings. The inputs to the scaling amplifier are CH 1 MPX from the A6 Input Multiplexer and V OFFSET 1 from the A5 Processor D/A Assembly. These input signals to the scaling amplifier are controlled by analog switch U12. Switch A in U12 is held in the 0 position by the ground on the swich A control input (U12−11) to compensate for the switch inpedance in the V OFFSET path through switch B. The V OFFSET 1 input is a dc voltage corresponding to the front panel offset (REF OFFSET) entered and is switched into the scaling amplifier input only when magnitude or group delay measurements are selected. The adjustment of GN 1 (R43) allows for the V OFFSET 1 summing resistance to be matched to the CH 1 MPX summing resistance. When the summing resistances of these two paths are equal, the gain of the V OFFSET 1 signal path is equal to the gain of the CH 1 MPX signal path. The gains must be exactly equal to accurately offset the Channel 1 LED display when the reference offset is large. If the CH 1 MPX input represents phase, the PH 1 control input for U12 switch B goes high (+5V) and the V OFFSET signal is shunted to ground. U12 switch C switches R3 in parallel with R2 whenever the PH 1 EXP control signal goes high (+5V). This occurs when a phase measurement is made and the SCALE/DIV switch is in the 45, 90, or 180 DEG position. The gain of CH 1 MPX input is increased to alter the normal 50, 100, 200 SCALE/DIV switch sequence to a 45, 90, 180 degree phase sequence. The 8:1 analog multiplexer (U5) selects the scaling amplifier feedback resistor and is controlled by the RES A1, RES B1, and RES C1 control register outputs. This control line logic corresponds to the SCALE/DIV switch setting. The feedback resistance selected varies from 10K (for a 20 dB/div scale and a 0.25 voltage gain) to 2 MEG (for a .1 dB/div scale and a voltage gain of 50. The U4 amplifier output is limited to ±2.5 Vdc by diodes CR5 and CR7. The CH 1 OFFSET (R8) adjustment is used to remove the input offset of operational amplifier U4. For a 0.00 dB magnitude, this adjustment forces the Channel 1 CRT trace to coincide with the Reference Line trace as the SCALE/DIV is increased from 20 dB/div to .1 dB/div. Operation of the Channel 2 Scaling Amplifier (U10) is identical with the Channel 1 Scaling Amplifier.

Page D3-103:
Replace the existing A3A7 component location diagram, Figure D3-62, with the one in this change sheet (Figure D3-62. (CHANGE 16)).

Insert the partial schematic diagram found in this change sheet (Part of Figure D3-63 (CHANGE 16)) in the existing A3A7 schematic diagram.

A5-28A. MARKER OFFSET ASSEMBLY

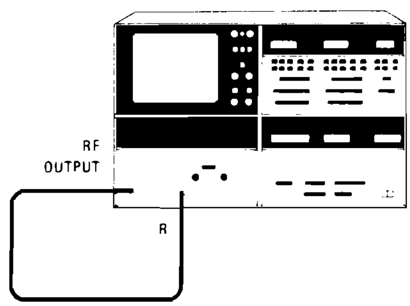


Figure A5-23A. Marker Offset Adjustment Test Setup (CHANGE 16)

EQUIPMENT:

RF Cable .... HP 11851A

a. Connect the RF cable as shown in Figure A5-51. Set the 8505A controls as follows:

On A1 Source Converter:
- OUTPUT LEVEL dBm .... −60
- OUTPUT LEVEL Vernier .... −10
- INPUT LEVEL dBm MAX .... −10

On A2 Frequency Control:
- RANGE MHz .... 0.5 − 1300
- MODE .... LIN EXPAND
- WIDTH .... CW±ΔF
- CW FREQUENCY .... 30 MHz
- ±ΔF .... 000.0 MHz
- SCAN TIME SEC .... 0.1 − .01
- TRIGGER .... AUTO
- MARKERS 1
- MARKER 1 .... Mid Position

On A3 Signal Processor:

Channel 1
- INPUT .... R
- MODE .... MAG
- SCALE/DIV .... 1 dB

Channel 2
- MODE .... OFF

Electrical Length
- MODE .... OFF

Display Section
- BANDWIDTH kHz 10
- REFERENCE LINE on CRT .... Center graticule line
- Video Filter .... OFF

CHANGE 16 (Cont'd)

ADJUSTMENTS

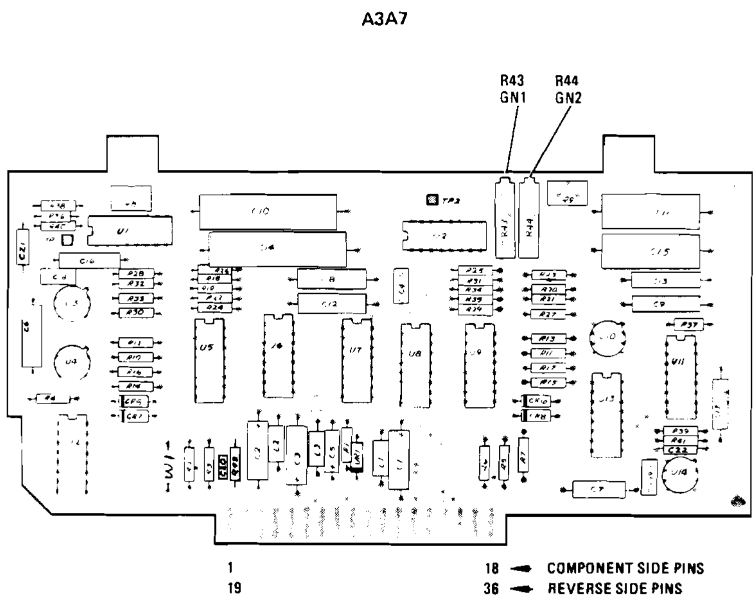


Figure A5-23B. Marker Offset Adjustment Locations (CHANGE 16)

b. Press Channel 1 MKR then ZRO pushbuttons to place the CRT trace on center graticule line. Hold the ZRO pushbutton in until the marker display reads 0.00 ± 0.01.

c. Adjust A3A7R43 GN1 (Gain 1) until the trace is at the center reference graticule line.

d. On the A3 Signal Processor, change the Channel 1 SCALE/DIV to 0.1 dB/DIV. Press Channel 1 MKR then ZRO. Readjust A3A7R43 GN1 (Gain 1) to set the trace on the center graticule line.

e. On the A3 Signal Processor, set the controls as follows:

Channel 1
MODE .... OFF

Channel 2
INPUT .... R
MODE .... MAG
SCALE/DIV .... 1 dB

f. Press Channel 2 MKR then ZRO pushbuttons to place the CRT trace on the center reference graticule line. Hold the ZRO pushbutton in until the marker display reads 0.00 ± 0.01.

g. Adjust A3A7R44 GN2 (Gain 2) until the trace is at the center reference graticule line.

h. On the A3 Signal Processor, change the Channel 2 SCALE/DIV to 0.1 dB/DIV. Press Channel 1 MKR then ZRO. Readjust A3A7R44 GN2 (Gain 2) to set the trace on the center graticule line.

CHANGE 16 (Cont'd)

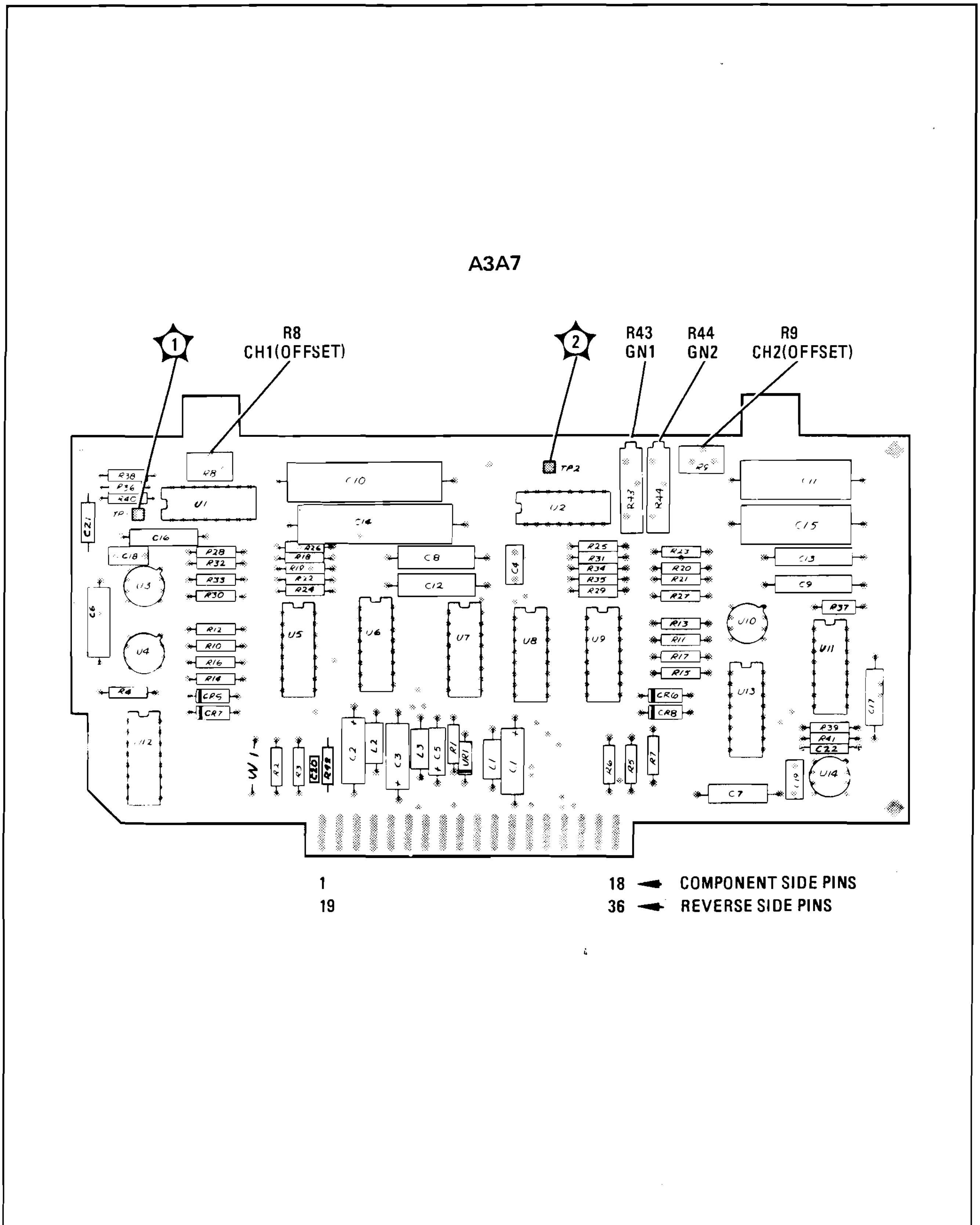
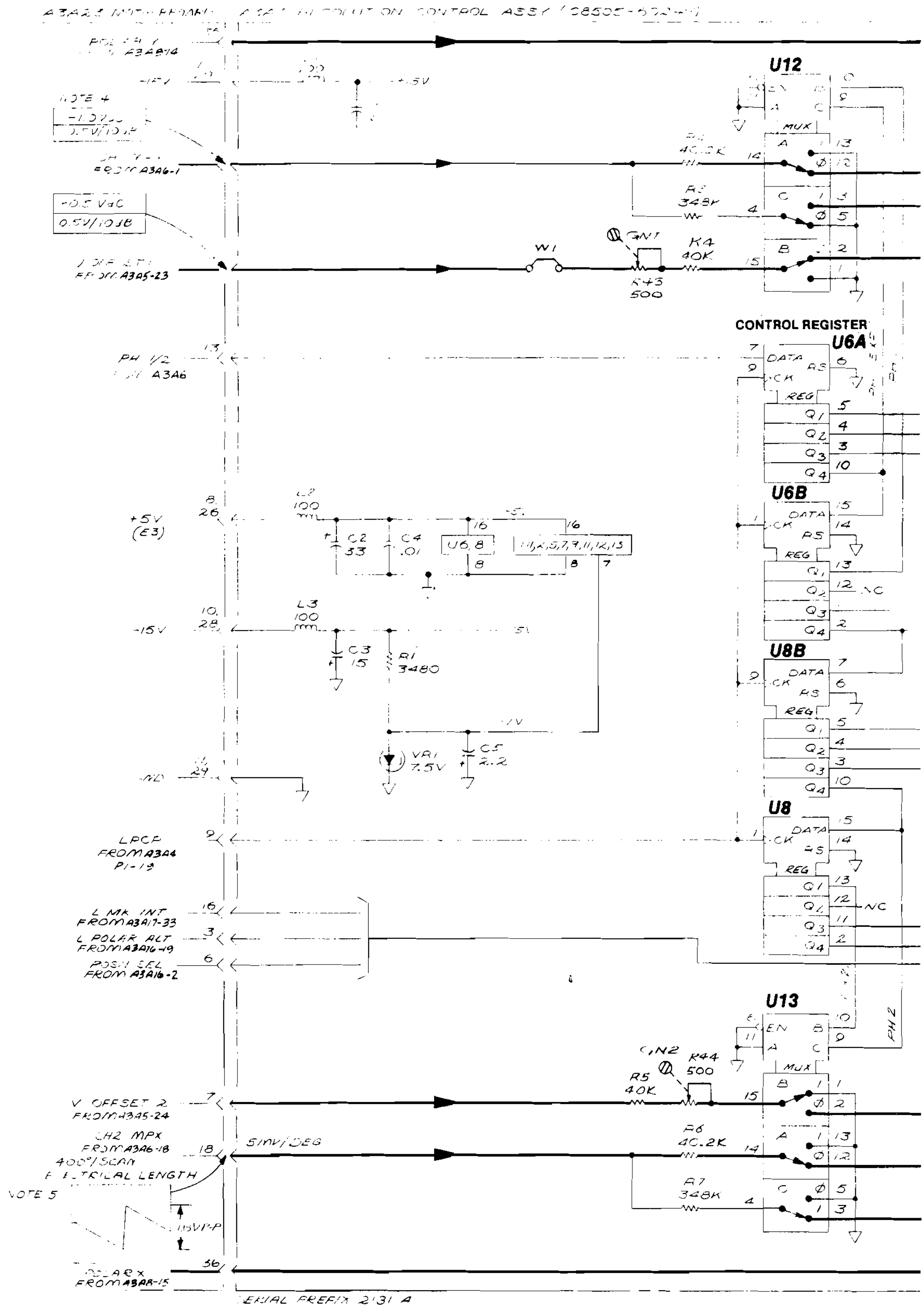


Figure D3-62. A3A7 Resolution Control Parts Locations (CHANGE 16)

CHANGE 16 (Cont'd)



Part of Figure D3-63. A3A7 Resolution Control, Schematic (CHANGE 16)

CHANGE 17

Page C2-14, Table C2-3:
Add A2A5C38, HP Part No. 0160-3874, CD2, CAPACITOR-FXD 10PF±.5PF 200VDC CER.

Page C3-92, Figure C3-65:
Add C38 to the A2A5 Prescaler/Counter Parts Location Diagram. A2A5C38 is located just to the right of A2A5C5.

Page C3-93, Figure C3-66:
Add C38, a 10 PF capacitor, from U1 pin 4 to ground.

CHANGE 18

Page A5-56, Paragraph A5-32:
Change step n to read as follows:
Set A3A9S1 TEST switch to NORMAL position (left). Connect DVM to A3A9TP2 and adjust "A" control for −0.6 Vdc ± 0.2 Vdc. Disconnect DVM.

Page D2-15, Table D2-2:
Change the HP Part Number of the A3A9 PHASE OFFSET 2 BOARD ASSEMBLY to 08505-60250, CD0.

Page D2-16, Table D2-2:
Change A3A9Q4 to HP Part Number 1855-0468, TRANSISTOR J-FET N-CHAN TO-18, CD8.
Change A3A9R42 to HP Part Number 2100-3095, RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN, CD5.
Change A3A9R43 to HP Part Number 0698-3132, RESISTOR 261 1% .125W F TC=0±100, CD4.
Change A3A9R45 to HP Part Number 0698-3441, RESISTOR 215 1% .125W F TC=0±100, CD8.
Change A3A9R47 to HP Part Number 0757-0465, RESISTOR 100K 1% .125W F TC=0±100, CD6.
Add A3A9R48, HP Part Number 0757-0279, RESISTOR 3.16K 1% .125W F TC=0±100, CD0.
Change A3A9VR3 to HP Part Number 1902-3149, DIODE-ZNR 9.09V 5% DO-35 PD=.4W, CD9.

Page D3-108:
Under **A3A9 PHASE OFFSET II Circuit Description**, delete the last sentence in the **Voltage-Controlled Oscillator** paragraph that states:
"With the loop locked, the "A" frequency adjust potentiometer, R42, should be set to place a −2 volts bias on the gate of Q4."

Page D3-110, Figure D3-70:
Replace the existing Figure D3-70 with the new component location diagram, Figure D3-70. A3A9 Phase Offset II Parts Locations (CHANGE 18), supplied in this change sheet.

Page D3-111, Figure D3-71:
Insert the partial schematic diagram, Figure D3-71. A3A9 Phase Offset II, Schematic (CHANGE 18), found in this change sheet, on the existing A3A9 assembly schematic diagram.

CHANGE 18 (Cont'd)

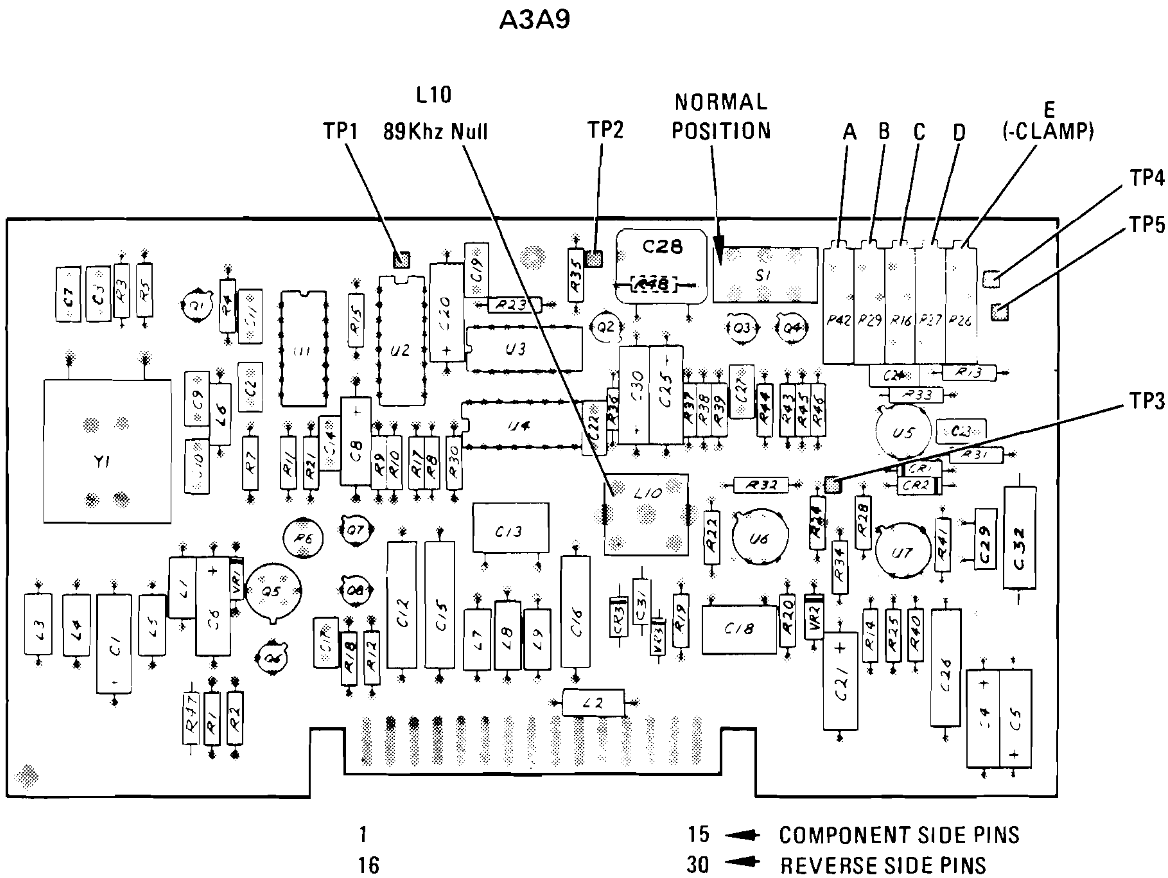


Figure D3-70. A3A9 Phase Offset II Parts Locations (CHANGE 18)

CHANGE 18 (Cont'd)

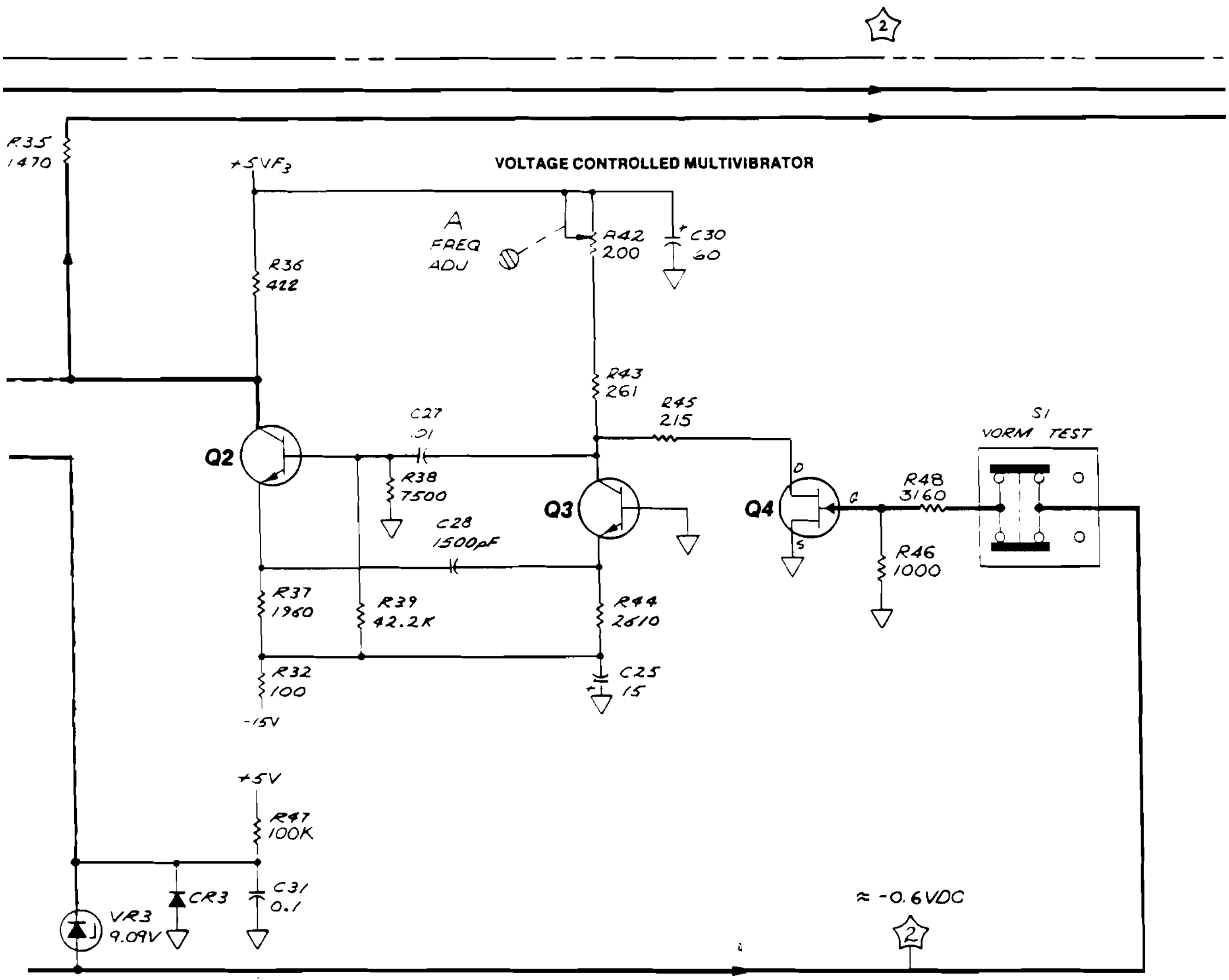


Figure D3-71. A3A9 Phase Offset II Schematic (CHANGE 18)

CHANGE 19

NOTE

CHANGE 16 of this Manual Change Supplement documents a new A3A7 Resolution Control Board Assembly (08505-60249). Part of CHANGE 16 documents the relocation of A3A7R4 and the replacement of A3A7W1 in its place. Instruments with Serial Number 2202A01725 and above include a modified 08505-60249 board assembly which has A3A7W1 deleted with a printed circuit trace in its place. The revised 08505-60249 board assembly is electrically the same as the previous 08505-60249 board assembly.

For instruments with Serial Numbers 2202A01725 and above, delete the A3A7W1 entry at the following manual locations:

1. Page A5-34, Figure A5-21. A3A7 Resolution Control Adjustment Locations (figure supplied in CHANGE 16)

2. Page A5-41, Figure A5-23B. Marker Offset Adjustment Locations (figure supplied in CHANGE 16)

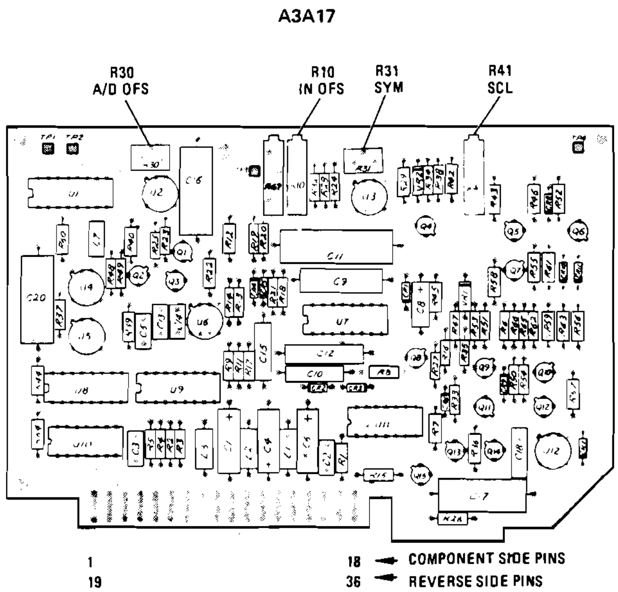
3. Page D2-13, Table D2-2. Replaceable Parts List (A3A7W1 entry referenced in CHANGE 16)

4. Page D3-103, Figure D3-62. A3A7 Resolution Control Parts Locations (figure supplied in CHANGE 16)

5. Page D3-103, Figure D3-63. A3A7 Resolution Control, Schematic (partial schematic supplied in CHANGE 16)

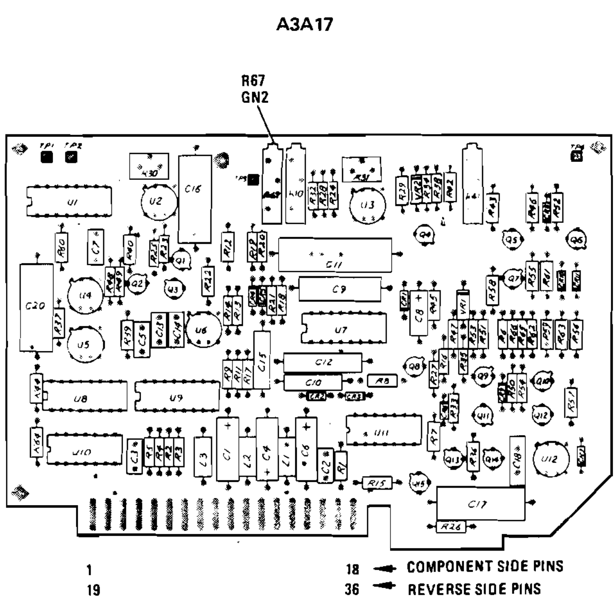
CHANGE 19 (Cont'd)

Page A5-32, Figure A5-20:
Replace the existing A3A17 component location diagram with the one supplied in this change sheet (Part of Figure A5-20 (CHANGE 19)).



Part of Figure A5-20. A3A17 Marker Test Points and Adjustments (CHANGE 19)

Page A5-41, Adjustment Paragraph A5–28A (supplied in CHANGE 16):
Add the A3A17 component location diagram supplied in this change sheet (Part of Figure A5-23B. (CHANGE 19)) to the existing Figure A5-23B (supplied in CHANGE 16).



Part of Figure A5-23B. Marker Offset Adjustment Locations (CHANGE 19)

CHANGE 19 (Cont'd)

Page A5-41, Adjustment Paragraph A5–28A (supplied in CHANGE 16):
Replace step e with the following:

NOTE

The following step references the adjustment of A3A17R67 GN2 (Gain 2). Be careful not to adjust A3A7R44 GN2 (Gain 2) instead of the correct adjustment, A3A17R67. A3A7R44 is adjusted later in this procedure.

e. On the A3 Signal Processor set the controls as follows:

Channel 2

INPUT . . . . R
MODE. . . . . MAG
SCALE/DIV. . . . . 0.1 dB

Adjust A3A17R67 GN2 (Gain 2) until the Channel 2 MKR LED display indicates the same reading as the Channel 1 MKR display. Set the Channel 1 MODE switch to OFF and the Channel 2 SCALE/DIV switch to 1 dB.

Page D2-28, Table D2-2:
Change A3A17 to HP Part No. 08505-60248, CD6 (Recommended Replacement).

Page D2-29, Table D2-2:
Change A3A17R2,3,4 to HP Part No. 0699-0638, CD1, RESISTOR 40.2K .1% .125W F TC=0±15.

Page D2-30, Table D2-2:
Add A3A17R67, HP Part No. 2100-3123, CD0, RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN.

Page D2-40, Figure D2-1:
Change item 28 (PANEL, FRONT) to HP Part Number 08505-00152, CD5.
Change item 29 (PANEL, SUB) to HP Part Number 08505-00153, CD6.
Add item 29A, HP Part Number 0510-1148, CD2, Qty 6, FRONT PANEL RETAINER CLIP.

CHANGE 19 (Cont'd)

Page D3-136:

Replace the existing **A3A17 MARKER ASSEMBLY** theory **Input Multiplexing, Scaling and Filter Amplifier** paragraph with the following:

Input Multiplexing, Scaling, and Filter Amplifier

The input stage of the A/D Converter selects the analog inputs used for the marker measurement, provides different scale factors to permit autoranging of the measurement and low-pass filters the input signal according to the front panel BW and VIDEO FILTER pushbuttons. The CH 1 MPX abd CH 2 MPX analog inputs to the A/D Converter represent magnitude, phase, or group delay values as selected by the A6 Input Multiplexer. The V OFFSET 1 and V OFFSET 2 analog inputs are offset voltages representing magnitude or group delay offsets entered on the front panel. The SW ALT control input controls switches U8 and U9 to select either Channel 1 or Channel 2 inputs for processing (SW ALT:CH 1 = 1). When both channels are displayed, the Channel 1 and Channel 2 information is processed on alternate sweeps. If the selected channel input is a phase measurement, the PH ALT control input to U10 is high (+5 volts), forcing the U10A and U10B outputs low and shunting the respective V OFFSET input to ground through switch U8 or U9; the selected CH MPX input is fed to the input of amplifier U6. The selected V OFFSET and CH MPX inputs are summed at the input of amplifier U6 for magnitude and group delay measurements. The inverting Scaling Amplifier U6 normally has a gain of 0.4 as determined by feedback resistor R17, selected by U9C, and the input resistances, R2 through R5. Reference offsets on the A3A5 Processor D/C Converter are initially adjusted using the Channel 1 summing node at U6 pin 2 as a reference. The GN 2 (R67) adjustment then allows the gain of V OFFSET 2 to be matched to the gain of V OFFSET 1. A +10 volt input to amplifier U6 gives a −4 volt output to the Sample-Hold circuit. When the U6 input signal is small, the A3A3 Processor Control Assembly can change the L A/D EXP control input to U9C from a high (+5 volts) to a low (0 volts) and switch R9 and R11 into the feedback loop of U6. This changes the U6 gain to 4.0 and increases the A/D Converter resolution so that readouts with 0.01 dB and 0.1 dB degree resolution can be obtained. INPUT OFFSET adjustment R10 removes the offset of U6 so that a change in amplifier gain will not affect the measurement due to a change in U6 output offset. The front panel BW and VIDEO FILTER pushbuttons control the bandwidth of amplifier U6 by selecting different feedback capacitors (C9-C13) through analog switch U7. The U7 control inputs are L FILT (0 = VIDEO FILTER), L 1kHz BW (0 = 1kHz BW), and L A/D EXP (0 = small channel input signal). If neither the VIDEO FILTER or 1kHz BW is selected, both the L FILT and L 1kHz control inputs are high (+5 volts) and U7 ENABLE input (U7-6) is high (+5 volts) to disable the analog switch. This opens all U7 switch connections and leaves C13 as the only capacitor in the U6 feedback loop to give an amplifier bandwidth of 10 kHz.

CHANGE 19 (Cont'd)

Page D3-139:

Replace the existing A3A17 component location diagram, Figure D3-100, with the one supplied in this change sheet (Figure D3-100. (CHANGE 19)).

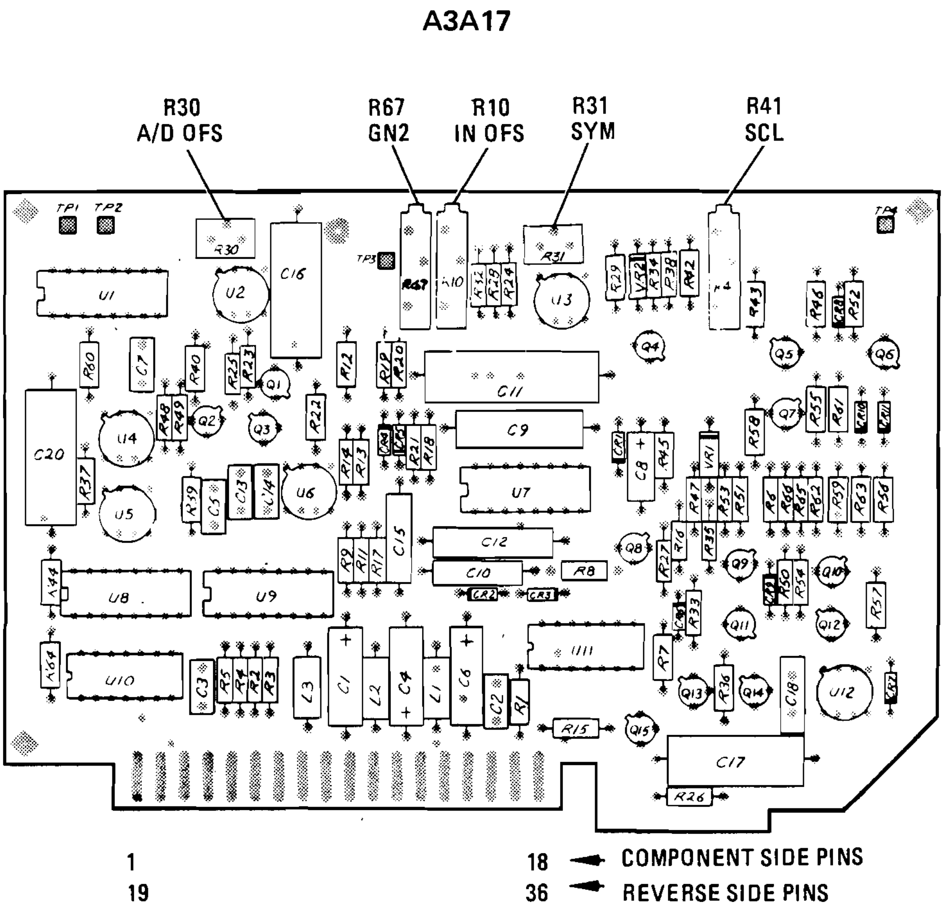
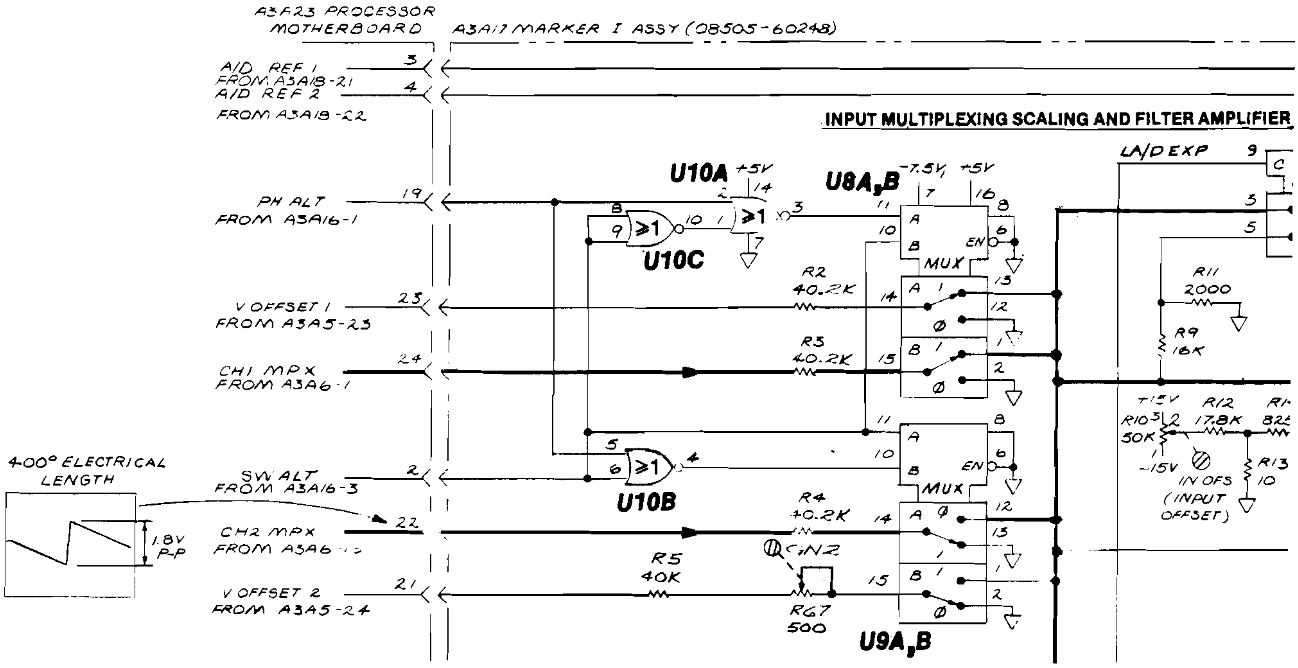


Figure D3-100. A3A17 Marker I, Parts Location (CHANGE 19)

CHANGE 19 (Cont'd)

Insert the partial schematic diagram supplied in this change sheet (Part of Figure D3-101 (CHANGE 19)), in the existing A3A17 schematic diagram.



Part of Figure D3-101. A3A17 Marker I, Schematic (CHANGE 19)

CHANGE 20

NOTE

HP Model 8505A instruments with Serial Number Prefixes ≥ 2211A have CRT labeling capability built into the standard instrument configuration. This was previously available as HP 8505A Option 007. HP Model 11864A, the 8501A/8505A Labeling Interface Kit, is currently available to add CRT labeling to HP 8505A units having Serial Number Prefixes <2211A. The HP Model 11864A is a field installable kit.

Page A1-1:
Add the following to Paragraph A1-6:

"When used with an HP Model 8501A Storage-Normalizer, the Model 8505A labeling interface circuits provide the capability of displaying CRT labels and graphics. The Model 8501A obtains front panel control settings, frequency, and Channel 1 and 2 marker measurement information from the Model 8505A, processes it, then displays it on the Model 8505A CRT. All information on the labeling interface circuits (Checkout Procedure, Replaceable Parts, and Service) is included in Chapter F of this manual."

CHANGE 20 (Cont'd)

Page A1-4:
Delete Paragraphs A1-30 and A1-31. Option 007 is now built into the standard configuration of the Model 8505A.

Page A3-1/A3-2:
Add the following to Paragraph A3-6:

"Operation of the CRT labeling feature is automatic when the Model 8505A is used with an HP Model 8501A Storage-Normalizer (and the Model 8501A "LABELS" switch in the "ON" position). Additional information on the operation of the CRT labeling feature is included in Chapter F of this manual."

Page A6-1:
Add the following to Paragraph A6-2:

"All service information relating to the CRT labeling interface is documented in Chapter F of this manual."

Page C2-37, Figure C2-2 (2 of 4):
Change item 66 to HP Part Number 08505-00158, CD1.

Page D2-41, Figure D2-1 (2 of 8):
Change item 108 to HP Part Number 08505-00159, CD2.

The following changes pertain specifically to Chapter F, 11864A 8501A/8505A Labaling Interface Operating and Service Manual.

Chapter F, at all occurances:
Delete all references to HP Model 8505A Option 007. Option 007 is now incorporated into the standard HP 8505A Network Analyzer instrument configuration.

Change all "11864A" references to "Model 8505A CRT Labeling Interface circuits". HP Model 11864A is documented in a separate manual for the purpose of explainig the field-installable CRT Labeling Interface Kit.

Chapter F, Title Page:
Change the **Manual Part No.** to **"Part of 08505-90072"**.
Change the **Microfiche Part No.** to **"Part of 08505-90073"**.

Chapter F, Page 2-1:
Delete all information in Section II, Installation, except Figures 2-2, 2-4, 2-6, 2-7, 2-9, and 2-10. These figures may still be used with the information supplied in Section VIII, Service, to help locate the installed assemblies that pertain to the CRT labeling interface circuits.

Section II contains information for field installation of the CRT Labeling Interface Kit into the Model 8505A. Since all Model 8505A Network Analyzers now have CRT labeling, the installation procedures given in this section are no longer needed. Note, however, that the factory installation is almost identical to the information supplied in this section. The only exception is that the Frequency Control and Signal Processor Adapter Plates, referred to in this section, have been deleted and are replaced by new rear panel assemblies that have mounting holes for the additional rear panel connectors.

CHANGE 20 (Cont'd)

Chapter F, Page 5-6, Table 5-3:
Replace the "**MISCELLANEOUS HARDWARE**" section of the Replaceable Parts List with the following:

Part of Table 5-3. 11864A Replaceable Parts (3 of 3) (CHANGE 20)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			MOUNTING HARDWARE FOR LABELING INTERFACE CONNECTORS		
	0380-0643	4	MOUNTING STUD, THREADED (METRIC)	28480	0380-0643
	2190-0006	4	WASHER-LK HLCL NO. 6 .141-IN-ID	28480	2190-0006
	2420-0002	4	NUT-HEX-DBL-CHAM 6-32-THD .109-IN-THK	28480	2420-0002
	1251-2942	4	LOCK-SUBMIN D CONN (Includes Nuts and Washers)	28480	1251-2942

CHANGE 21

Page A5-29, Figure A5-18:
Replace the existing A3A5 adjustment location diagram with the one supplied in this change sheet [P/O Figure A5-18. (CHANGE 21)].

Page A5-30, Paragraph A5-22:
Replace steps h through n with the following:

h. Set Channel 2 MODE switch to OFF and set Channel 1 MODE switch to PHASE. Press Channel 1 DISPLAY REF then CLR until REL light goes out (if lit).

i. Connect DVM to A3A5TP5 and adjust "P OFS 1" (Channel 1 phase offset) control A3A5R78 for a DVM reading of 0.000 ±0.005 Vdc.

j. Set Channel 1 MODE switch to OFF and set Channel 2 MODE switch to PHASE Press Channel 2 DISPLAY REF then CLR until REL light goes out (if lit).

k. With DVM at A3A5TP5, adjust "P OFS 2" (Channel 2 phase offset) control A3A5R27 for a DVM reading of 0.000 ±0.005 Vdc.

l. Set Channel 1 MODE to PHASE, and SCALE/DIV to 5 degrees. Set Channel 2 MODE to OFF.

m. Press DISPLAY MKR then ZRO to bring CRT trace to center graticule line.

n. Set ELECTRICAL LENGTH INPUT to A and MODE to PHASE x 10°/SCAN. Press ELECTRICAL LENGTH DISPLAY CLR pushbutton until REL light goes out (if lit).

o. Offset electrical length from +00 to −01 and adjust "LS" offset control A3A5R70 so that beginning of CRT trace does not move (left hand edge of CRT trace pivots about Reference Line).

p. Set electrical length offset to −01. Adjust "N GAIN" control A3A5R77 so that the end of the CRT trace is 10 ±1° above the Reference Line.

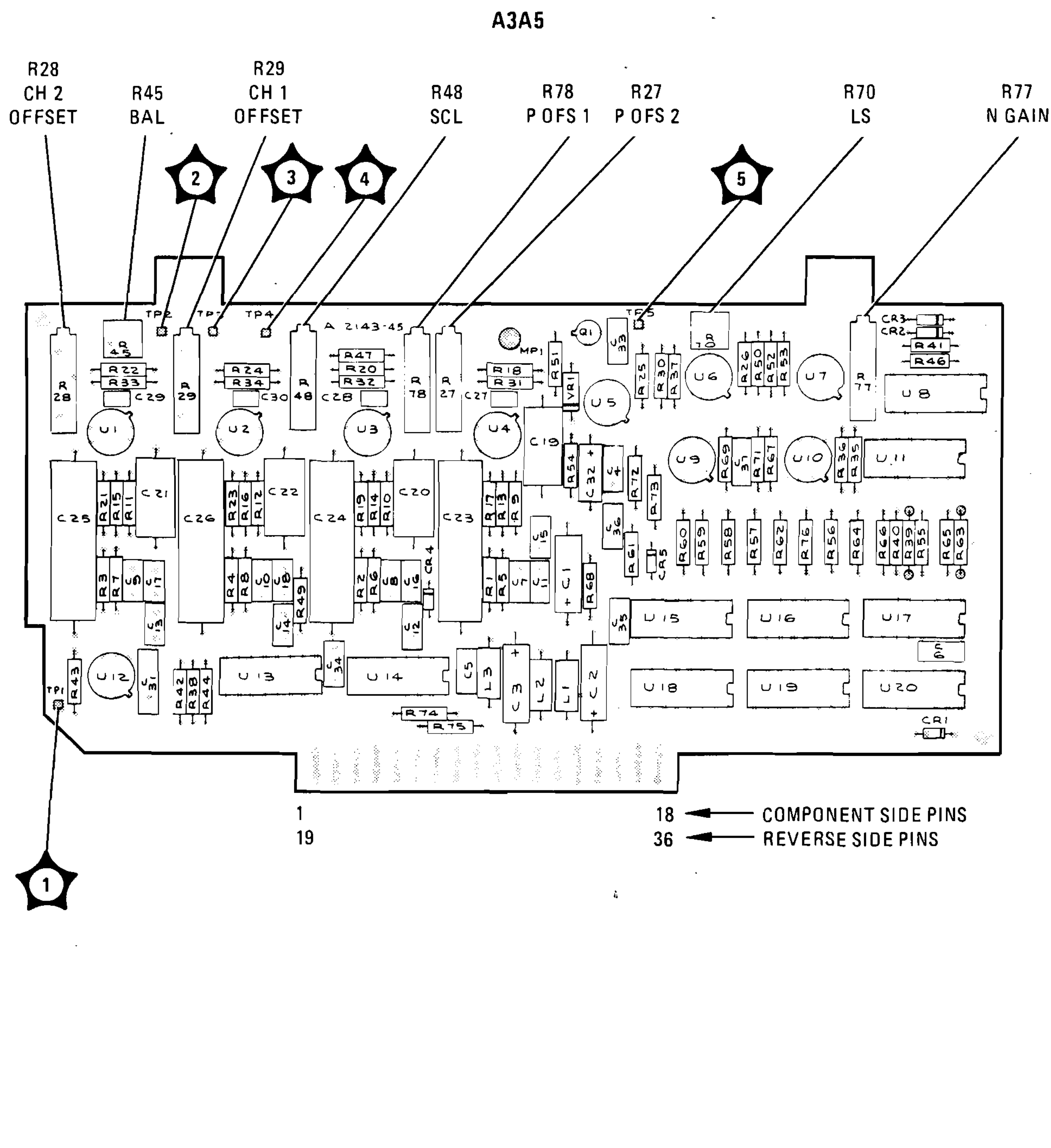


Figure A5-18. A3A5 Processor Digital-to-Analog Converter Adjustment Locations (CHANGE 21)

CHANGE 21 (Cont'd)

Page B2-6, Table B2-3:
Change A1A1S1 to HP Part Number 08505-20257, CD3.

Page C2-8, Table C2-3:
Change A2A1S1-5 to HP Part Number 08505-20256, CD2.

Page D2-7, Table D2-2:
Change A3A1S27–29 to HP Part Number 08505-20255, CD1.
Change A3A1S30–34 to HP Part Number 08505-20254, CD0.

Page D2-9, Table D2-2:
Change A3A5C7–14 to HP Part Number 0160-4535, CD4.
Change A3A5C15–18 to HP Part Number 0160-4441, CD1.

Page D2-10, Table D2-2:
Change A3A5R37 to A3A5R37*, HP Part Number 0757-6348, CD6, RESISTOR 3K 1% .125W F TC=0±100.
Change A3A5R76 to HP Part Number 0683-8827, CD8, RESISTOR 1M 5% .25W FC TC=–900/+1100.
Add A3A5R77, HP Part Number 2100-3122, CD9, RESISTOR-TRMR 100 10% C SIDE-ADJ17-TRN.

Page D2-115, Table D2-2:
Change A3A9C31 to HP Part Number 0160-4535, CAPACITOR-FXD 1.0 UF ±10% 50 VDC, CD4.

Page D3-111, Figure D3-71:
Change the value of A3A9C31 to 1.0 UF.

Page D3-99:
Replace the existing A3A5 foldout with the one in this change sheet containing Figure D3-56 (CHANGE 21) and Figure D3-57 (CHANGE 21).
On Figure D3-56 (CHANGE 21):
Add a jumper wire between the anode of CR3 and pin 8 of U11.
Add a jumper wire between U11 pin 8 and U11 pin 5.

CHANGE 22

Page C2-37, Table C2-3:
Change Item 90 to HP Part Number 08505-00154, CD7, PANEL, FRONT.
(Order FRONT PANEL REPLACEMENT KIT, HP Part Number 08505-60254, CD4).
Change Item 91 to HP Part Number 08505-00155, CD8, PANEL, SUB.
(Order FRONT PANEL REPLACEMENT KIT, HP Part Number 08505-60254, CD4).
Add Item 91A, HP Part Number 08510-1148, CD2, Rtnr, PO .140ID.

Page C2-38, Figure C2-2:
Add the Reference Designator 91A directly beneath Reference Designator 91 on the A2 FRONT PANEL pictorial.

CHANGE 23

Page B2-8, Table B2-3:
Change A1A4C2 to HP Part Number 0160-4535, CD4, CAPACITOR-FXD 1 UF ±20% 50VDC CER.

In the 11864A 8501A/8505A LABELING INTERFACE KIT OR 8505A OPTION 007 OPERATING AND SERVICE MANUAL:

Page 5-4, Table 5-3:
Change A2A17J1 to HP Part Number 1200-0565, CD9.

Page 5-5, Table 5-3:
Change A3A22J1 to HP Part Number 1200-0565, CD9. .

CHANGE 24

Page D2-19, Table D2-2:
Change A3A11C42 to HP Part Number 0160-4441, CD4.

Page D2-37, Table D2-2:
Change A3A27R55 to HP Part Number 0757-0447, CD4, R 16.2k 1% .12W.

CHANGE 25

Page A5-2, Table A5-1:
Change the table title to "Table A5-1. Adjustments in Reference Designator Order (1 of 6)".

Page A5-3, Table A5-1:
Change the table title to "Table A5-1. Adjustments in Reference Designator Order (2 of 6)".

Page A5-4, Table A5-1:
Change the table title to "Table A5-1. Adjustments in Reference Designator Order (3 of 6)".

Page A5-5, Table A5-1:
Replace Table A5-1 with the Table A5-1. Adjustments in Reference Designator Order (4 of 6) (Change 25), included in this Change Sheet.

Page A5-6, Table A5-1:
Replace Table A5-1 with the Table A5-1. Adjustments in Reference Designator Order (5 of 6) (Change 25), included in this Change Sheet.
Immediatly following Page A5-6, insert the page containing Table A5-1 entitled "Table A5-1. Adjustments in Reference Designator Order (6 of 6) (Change 25)", included in this Change Sheet.

Pages A5-42 through A5-46, A3A13 and A3A14 MAGNITUDE DETECTORS MAGNITUDE ADJUSTMENT:
Replace pages A5-42 through A5-46 with the pages containing paragraph A5-29, steps a through w included in this Change Sheet.

Page C2-10, Table C2-3:
Change A2A3 to HP Part Number 08505-60258, CD8.Change A2A3C9 and A2A3C17 to HP Part Number 0160-3877; CD5, CAPACITOR-FXD 100PF ±20% 200VDC CER
Delete A2A3C11 and A2A3C12.

CHANGE 25 (Cont'd)

Page C2-11, Table C2-3:
Add A2A3R42 and A2A3R43; both having HP Part Number 0698-7284; CD5, RESISTOR 100K 1% .05W F TC=0±100.
Change A2A3U2 to HP Part Number 1820-1528; CD0, IC CNTR CMOS BIN UP/DOWN SYNCHRO.

Page C2-12, Table C2-3:
Change U27 to HP Part Number 1820-1528; CD0, IC CNTR CMOS BIN UP/DOWN SYNCHRO.

Page C3-72; A2A3 MEMORY, CIRCUIT DESCRIPTION:
Replace COUNTERS circuit description with the following: The clock inputs to the Counters are connected in parallel; therefore the Counters are connected in a parallel counting mode. Counting operation of each counter is determined by the count enable (C/E) input which is connected to the carry-out (C/O) of the previous counter. The most significant digit (DIGIT 1) is determined by the output state of counters U2 and U27. Only the least significant bit (Q1) on counters U2 and U27 are used. A simplified schematic diagram of the Counter, along with timing waveforms, is shown in Figure C3-50.
Replace Figure C3-50. Counter Operation with the new Figure C3-50 included in this Change Sheet.
Replace Figure C3-51. 0000 MHz Stop Circuit Operation with the new Figure C3-51 included in this Change Sheet.

Page C3-81/82, Figure C3-58:
In POSN 1 COUNTER Block, replace the referenced components with the following: U2, U17-U19.
In POSN 2 COUNTER Block, replace the referenced components with the following: U27, U20-U22.

Page C3-83/84, Figure C3-59. A2A3 Memory Parts Location:
Replace the existing Figure C3-59. A2A3 Memory Parts Location diagram with the one supplied in this Change Sheet.

Page C3-83/84, Figure C3-60. A2A3 Memory Board, Schematic (1 of 2):
Insert the partial Schematic of Figure C3-60. A2A3 Memory Board, Schematic (1 of 2) with the one supplied in this Change Sheet.
In the upper left hand corner of the A2A3 Memory Board schematic, change the A2A3 Memory Board Assembly to HP Part Number 08505-60258.

Page C3-85, Figure C3-60:
In the upper left hand corner of the A2A3 Memory Board schematic, change the A2A3 Memory Board Assembly to HP Part Number 08505-60258.
Change the DC source for A2A3R34 to +5VA.
Change the Reference Designator of the NOR gate connected to pin 8 of A2A3U3C to U1D.
On A2A3U13C, open the connection between pin 13 and the junction of pins 11 and 12; pins 11 and 12 should remain connected.

CHANGE 25 (Cont'd)

Page D2-23, Table D2-2:

Change A3A13 to HP Part Number 08505-60242; CD0, BOARD ASSEMBLY, R MAGNITUDE DETECTOR

A3A13R111	0757-0465	6	RESISTOR 100K 1% .125W F TC=0±100
A3A13R112	0757-0438	3	RESISTOR 5.11K 1% .125W F TC=0±100
A3A13R113	0757-0279	0	RESISTOR 3.16K 1% .125W F TC=0±100
A3A13R114	0837-0119	7	THERMISTOR ROD 5K--OHM TC=0±.7%/C-DEG
A3A13R115	0698-8827	4	RESISTOR 1M 1% .125W F TC=0±100
A3A13R116	2100-3154	7	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN
A3A13R117	0698-8827	4	RESISTOR 1M 1% .125W F TC=0±100
A3A13U4	1826-0261	8	IC OP AMP LOW-NOISE TO-99
A3A14	08505-60242	0	BOARD ASSEMBLY, A,B MAGNITUDE DETECTOR SAME AS A3A13, USE PREFIX A3A14

Page D3-122; A3A13/A3A14 Magnitude Detector, Circuit Description:

Replace the **Rectifier** circuit description with the following: The Rectifier is basically an amplifier with a pair of diodes in the feedback loop as shown in the simplified schematic in Figure D3-85. Because the amplifier has a large gain, the feedback current (I_f) is equal to the input current (I_{in}).

The input stage to the amplifier in the Rectifier is Q13, a common-base stage. The output of Q13 is fed to an adjustable bandpass filter using L4(B) to align the amplifier response at low levels. The filter is buffered by emitter follower Q16 which drives the common emitter complimentary output stage (Q14, Q15). L5 establishes a zero volt dc bias on the output. The 100 kHz IF signal is then ac coupled into the two Schottky rectifier diodes CR12 and CR13. Capacitors C44 and C45 couple the ac signal back to the emitter of Q13, the amplifier's summing node.

A parallel resistance across the bandpass filter attenuates the signal reducing the gain for High Level input signals. Op-amp U4 senses the output level of the DC Logger and changes the attenuation when J-FET Q32 is turned off. This increases the rectifier open loop gain for signals below −60 dBm input level. R71(A) is used to establish the bottom level of the rectifier performance at approximately −120 dBm input level. The dc output from CR12 gets additionally filtered by C46 and C48 to remove residual ac components on the signal fed to the DC Logger.

Page D3-123/124:

Replace page D3-123/124 with the foldout containing Figures D3-86 and D3-87 supplied in this Change Sheet.

Page D3-125/126:

Replace page D3-125/126 with the foldout containing Figures D3-88 and D3-89 supplied in this Change Sheet.

CHANGE 25 (Cont'd)

Page D2-24, Table D2-2:
Change the following components as shown:

A3A13C9	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C10	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C11	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C12	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C26	0121-0527	4	CAPACITOR-V TRIMMER-POLYCARBONATE FILM
A3A13C34	0160-3076	6	CAPACITOR-FXD 470PF ±5% 200VDC CER
A3A13C43	0121-0527	4	CAPACITOR-V TRIMMER-POLYCARBONATE FILM

Add the following components as follows:

A3A13C50	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C51	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C52	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C53	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C54	0160-4535	4	CAPACITOR-FXD 1UF ±10% 50VDC CER
A3A13C55	0140-0195	2	CAPACITOR-FXD 130PF ±5% 300VDC MICA

Change A3A13L4 to HP Part Number 09140-0656; CD9, COIL-VAR 3.3MH-5.6MH PC-MTG
Add A3A13L6 HP Part Number 9100-2585; CD3, COIL-MLD 10MH 10% Q=40 .156DX.375LG-NOM

A3A13Q32	1855-0414	4	TRANSISTOR J-FET 2N4393 N-CHAN D-MODE
A3A13R20	0698-3160	8	RESISTOR 31.6K 1% .125W F TC=0±100
A3A13R21	0698-3160	8	RESISTOR 31.6K 1% .125W F TC=0±100
A3A13R36	0757-0442	9	RESISTOR 10K 1% .125W F TC=0±100
A3A13R71	2100-3103	6	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN
A3A13R72	0698-3157	3	RESISTOR 19.6K 1% .125W F TC=0±100
A3A13R91	2100-3109	2	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN
A3A13R107*	0698-8821	8	RESISTOR 5.62 1% .125W F TC=0±100
A3A13R108	0698-3159	5	RESISTOR 26.1K 1% .125W F TC=0±100
A3A13R109	0757-0465	6	RESISTOR 100K 1% .125W F TC=0±100
A3A13R110	0698-3446	3	RESISTOR 383 1% .125W F TC=0±100

Table A5-1. Adjustments in Reference Designator Order (4 of 6) (CHANGE 25)

Reference Designator	Name on Board	Function	Paragraph Number
A3A11R43	G	Gain	A5-34
A3A11R74	T	Delay Offset	A5-34
A3A11R75	M	Modulation Offset	A5-34
A3A11R79	F	Offset	A5-34
A3A12L7	R PHASE	A3A27 zero phase difference, Ref.	A5-31
A3A12L8	T PHASE	180 degree phase difference, Test	A5-31
A3A12L11	LS PHASE	Line stretcher zero phase	A5-31
A3A12R19	REF BAL 1	Nulls 200 kHz 2nd Harmonic in Ref.	A5-31
A3A12R20	TEST BAL 1	Nulls 200 kHz 2nd Harmonic in Test	A5-31
A3A12R31	REF BAL 2	Nulls 200 kHz 2nd Harmonic in Ref.	A5-31
A3A12R32	TEST BAL 2	Nulls 200 kHz 2nd Harmonic in Test	A5-31
A3A12R50	SCL	Scale	A5-31
A3A12R54	OFF	+0.9 Vdc to U7 Phase Det.	A5-31
A3A13C26	----	100 kHz Trim	A5-29
A3A13C43	----	100 dB Trim	A5-29
A3A13L3	PHASE	Adjusts Phase of 100 kHz Signal	A5-29
A3A13L4	B	Low End Peaking	A5-29
A3A13R54	AMP	Amplitude	A5-29
A3A13R71	A	Rectifier Feedback	A5-29
A3A13R91	SCL	Scale	A5-29 A5-30
A3A13R96	I OFF	Initial Offset	A5-29
A3A13R99	G OFF	Gain Offset	A5-29
A3A13R116	L BIAS	DC Logger Bias	A5-29

Table A5-1. Adjustments in Reference Designator Order (5 of 6) (CHANGE 25)

Reference Designator	Name on Board	Function	Paragraph Number
A3A14C26	----	100 kHz Trim	A5-29
A314C43	----	100 dB Trim	A5-29
A3A14L3	PHASE	Adjusts Phase of 100 kHz Signal	A5-29
A3A14L4	B	Low End Peaking	A5-29
A3A14R54	AMP	Amplitude	A5-29
A3A14R71	A	Rectifier Feedback	A5-29
A3A14R91	SCL	Scale	A5-29 A5-30
A3A14R96	I OFF	Initial Offset	A5-29
A3A14R99	G OFF	Gain Offset	A5-29
A3A14R116	L BIAS	DC Logger Bias	A5-29
A3A15R1	SWP WIDTH	X Sweep Width	A5-26
A3A15R8	INT	Intensity Limit	A5-26
A3A15R31	CH 2 Y	Channel 2 Y Gain	A5-26
A3A15R33	CH 1 Y	Channel 1 Y Gain	A5-26
A3A17R10	IN OFS	Input Offset (Marker)	A5-24
A3A17R30	A/D OFS	Analog-to-Digital Offset	A5-24
A3A17R31	SYM	Symmetry	A5-24
A3A17R41	SCL	Scale	A5-24
A3A25R8	X POSN	Adjust position of trace in Horizontal direction	Front Panel Control
A3A25R9	TRACE ALIGN	Adjusts alignment of trace to CRT graticule	Front Panel Control
A3A26R14	FOCUS LIM	Limit of Front Panel Focus Control	A5-35
A3A27C21	HF ADJ 2	High Frequency Adjust 2	A5-35

Table A5-1. Adjustments in Reference Designator Order (6 of 6) (CHANGE 25)

Reference Designator	Name on Board	Function	Paragraph Number
A3A27R12	HV ADJ	High Voltage Adjust	A5-35
A3A27R40	INT LIM	Intensity Limit	A5-35
A3A27R41	FG GRID	Flood Gun Grid	A5-35
A3A27R42	ASTIG	Astigmatism Adjust	A5-35
A3A27R45	HF ADJ 1	High Frequency Adjust	A5-35
A3A27R46	ORTH	Orthogonal Adjust	A5-35
A3A27R51	PATTERN	Trace Pattern	A5-35
A3A28R15	POS	Position	A5-27
A3A28R27	GAIN	Deflection Amp. Gain	A5-27
A3A28R29	HF ADJ	High Frequency Damping	A5-27
A3A19R15	POS	Position	A5-28
A3A19R27	GAIN	Deflection Amp. Gain	A5-28
A3A29R29	HF ADJ	High Frequency Damping	A5-28
A3A30R1*	None	Scale Illumination. Nominal Value 6.8 ohms.	A5-35
A3A30R8	None	Scale Illumination Adjust	A5-35

A5-28. A3A29 Y-DEFLECTION AMPLIFIER (Cont'd) *(CHANGE 25)*

On A3 Signal Processor
- Channel 1
  - INPUT .... R
  - MODE .... MAG
  - SCALE/DIV .... 5 dB
- Channel 2
  - MODE .... OFF
- Electrical Length
  - MODE .... OFF
- Display Section
  - BANDWIDTH kHz 10

b. Connect equipment as shown in Figure A5-22 and connect DVM to A3A15 TP2.

c. Ground A3A4TP9 and A3A4TP10 to put Processor in "TEST" mode.

d. Ground A3A6TP2.

e. Press Channel 1 DISPLAY REF then CLR pushbuttons.

f. Set CH1 REF LINE POSN control on Display panel for 0.000 Vdc ±0.005 Vdc indication on DVM and adjust "POS" control A3A29R15 to place CRT trace on center graticule line. (See Figure A5-23.)

g. Set CH1 REF LINE POSN control for +1.000 Vdc ±0.005 Vdc indication on DVM and adjust "GAIN" control A3A29R27 for a CRT trace deflection of four divisions above the center graticule line.

h. Set CH 1 REF LINE POSN control for −1.000 Vdc ±0.005 Vdc indication on DVM. The CRT trace should reflect four divisions below the center graticule line. If not, a slight adjustment of "GAIN" control A3A29R27 may be necessary.

High Frequency Adjustment

i. Connect pulse generator output to the monitor oscilloscope vertical input; terminate line in 50 Ohm load.

j. Adjust pulse generator offset and amplitude controls for a positive +1 Vp-p square wave, 100 kHz output with a 50% duty cycle pulse width. Disconnect from oscilloscope.

k. Remove Blanking Logic A3A16 and install 18-pin extender board in its place. Connect pulse generator output to pin 24 of extender board.

l. Connect monitor oscilloscope vertical input through a 10:1 divider probe to output pin 6 at top of A3A29 PC board. The displayed waveform should be approximately 25V p-p.

m. Adjust HF ADJ (high frequency adjust) A3A29R29 for best square wave pulse shape.

n. Remove extender and reinstall A3A29 and A3A16.

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS ADJUSTMENT *(CHANGE 25)*

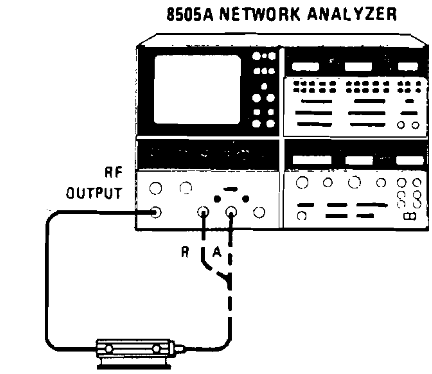


Figure A5-24. Magnitude Detector Adjustment Test Setup

EQUIPMENT:

Digital Voltmeter (DVM)	HP 3490A
Step Attenuator	HP 355D
Extender Board (15 pin)	HP 08505-60041
BNC Cables (2)	HP 11652-60002

SPECIAL TOOLS:

Plastic Adjustment Tool	HP 8710-0772

NOTE

The Processor Digital-to-Analog Converter Adjustment (Paragraph A5-22), the Resolution Control Adjustment (Paragraph A5-25), the Analog Display Multiplex Adjustment (Paragraph A5-26), and the Y-Deflection Amplifier Adjustment (Paragraph A5-28) must be checked before the magnitude detectors are adjusted in the following steps.

a. Set the 8505A controls as follows:

On Al Source/Converter

OUTPUT LEVEL dBm	−10
OUTPUT LEVEL Vernier	0
INPUT LEVEL dBm MAX	−10

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS ADJUSTMENT (Cont'd) *(CHANGE 25)*

On A2 Frequency Control

FREQUENCY RANGE MHz	.5-130
MODE	LIN EXPAND
WIDTH	CW $\pm\Delta$F
SCAN TIME SEC	.1-.01
TRIGGER	AUTO
CW FREQUENCY	30 MHz
ΔF FREQUENCY	00.00

On A3 Signal Processor

Channel 1

INPUT	R
MODE	MAG
SCALE/DIV.	10dB

Channel 2

MODE	OFF

CRT Display Panel

BANDWIDTH kHz	10
VIDEO FILTER	ON
REF LINE POSN	ON

Electrical Length

MODE	OFF

b. Connect the RF OUTPUT through a 12 inch BNC cable to Input Port "R". Monitor A1A14XA4 pin 9 (connector on the Source/Converter motherboard) with the DVM set to ac. Adjust "MAG ADJ" pot (A1A4R3) for 0.35 ±0.01 Vrms.

c. Repeat this adjustment for the "A" IF Amplifier using Input Port "A", A1A14XA5 pin 9 and A1A5R3.

d. Repeat this adjustment for the "B" IF Amplifier using Input Port "B", A1A14XA6 pin 9 and A1A6R3.

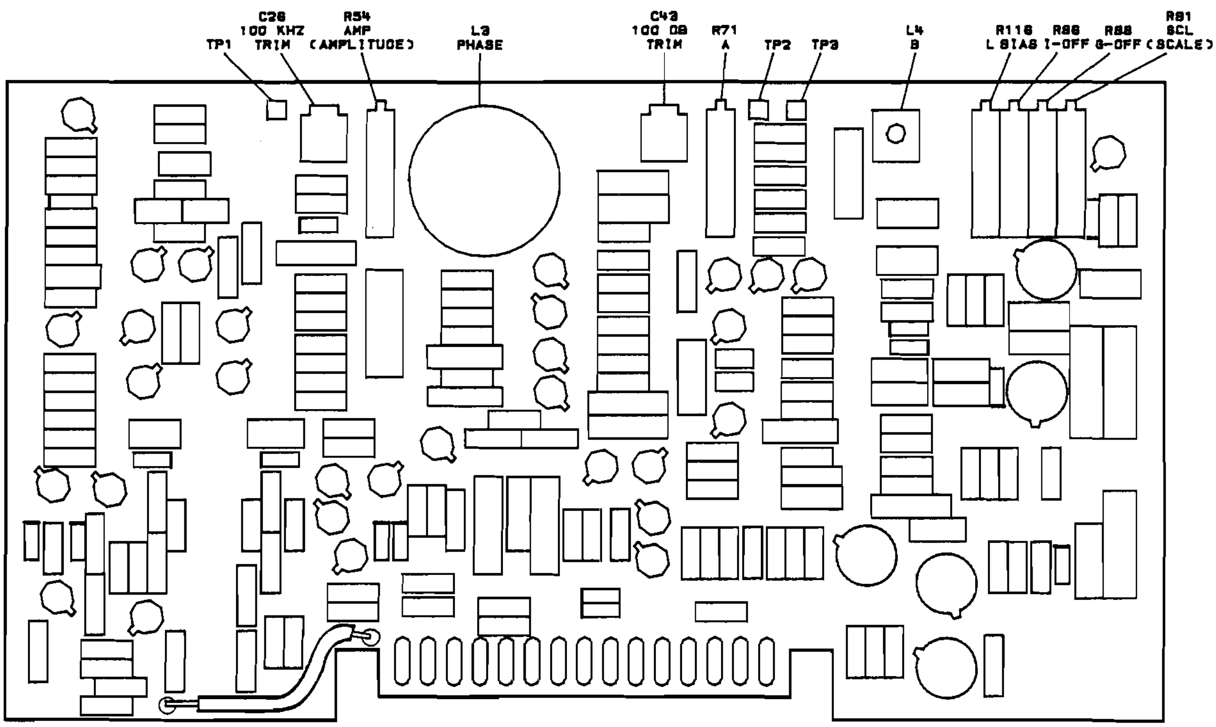
e. On the display, press REF LINE POSN. Adjust Channel 1 trace to center line, then press REF LINE POSN again for normal operation.

f. Clear all A3 Signal Processor offsets by momentarily shorting A3A3TP2 to ground.

g. Connect the equipment as shown in Figure A5-24 with the 355D Step Attenuator set to 30 dB and connected to RF Output and "R" Input Ports using 12 inch BNC cables. Switch RF OUTPUT LEVEL to 0 dBm.

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS ADJUSTMENT (Cont'd) *(CHANGE 25)*

A13 AND A14



A3

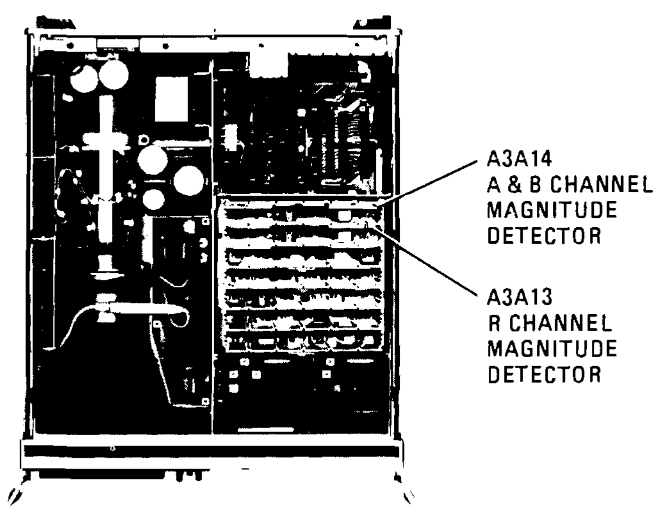


Figure A5-25. Magnitude Adjustments on A13 and A14 (CHANGE 25)

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS ADJUSTMENT (Cont'd) *(CHANGE 25)*

h. Remove the A3A13 magnitude detector aluminum cover and place A3A13 on an extender board. Center variable capacitors A3A13C26 (100 kHz Trim) and A3A13C43 (100 dB Trim). Adjust "L BIAS" pot (A3A13R116) full CCW.

i. Set the 8505A REF OFFSET to −30 dB. A trace should appear on the CRT near the center of the screen. Switch BW on the 8505A to 1 kHz and adjust "PHASE" coil (A3A13L3) for a peak response on the CRT. Switch Channel 1 SCALE/DIV. to .1 dB/DIV. and vary the 8505A REF OFFSET as necessary to observe the peak.

j. Change Channel 1 SCALE/DIV. to .5dB/DIV. Rotate 100 kHz Trim (A3A13C26) **one** revolution and check for two distinct dips. If two distinct dips are not visible readjust "PHASE" coil (A3A13L3). Insert the magnitude detector board into its cavity to temperature stabilize. Adjust 100 kHz Trim (A3A13C26) for a peak response on the CRT.

k. Change Channel 1 SCALE/DIV. to .1 dB/DIV. Switch the BW between 10 kHz and 1 kHz and adjust the "AMP" pot (A3A13R54) for no change on the CRT trace.

NOTE

The following four adjustments ("I OFF", "SCL", "B" coil and "A" pot) are highly interactive and will probably require many iterations to achieve the desired results. Remember that the "SCL" pot has the most effect from −10 to −70 dB. Pot "A" and coil "B" have the most effect from −70 to −120 dB. Any change made with the "A" pot or "B" coil requires a readjustment of the "I OFF" pot at −30 dBm and "SCL" pot at −50 dBm.

l. Set the 8505A REF OFFSET to −30 dB. Adjust "I OFF" pot (A3A13R96) to center the trace at .1 dB/DIV. with BW at 10 kHz.

NOTE

"I OFF" is only adjusted at −30 dBm. This pot adjusts the reference level for the magnitude detector board and is always set for a zero magnitude error at −30 dBm.

m. Change the 355D Step Attenuator and the 8505A REF OFFSET to −50 dB. Adjust the "SCL" pot (A3A13R91) to center the trace on the CRT. Repeat steps l. and m. as many times as necessary to get both traces approximately correct.

NOTE

The following "B" coil (A3A13L4) adjustment must be made using a Siemens plastic adjustment tool (HP Part Number 8710-0772, CD8. Due to the small size of the core slot, the use of a different adjustment tool may split the core.

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS ADJUSTMENT (Cont'd) *(CHANGE 25)*

n. Switch the 355D Step Attenuator and the 8505A REF OFFSET to −100 dB. Set Channel 1 SCALE/DIV. to 1 dB/DIV. Try to center the trace on the reference line using 100 dB Trim (A3A13C43). If the trace cannot be adjusted to the reference line with A3A13C43 (100 kHz Trim), lift the magnitude detector board from its cavity and adjust "B" coil (A3A13L4) to center the trace on the Reference Line. As soon as possible insert the magnitude detector board back into its cavity, install the A3A13 aluminum pc board cover and adjust 100 dB Trim (A3A13C43) to center the trace on the CRT.

o. Switch Channel 1 SCALE/DIV. to 5 dB/DIV. Switch the 355D Step Attenuator and vary REF OFFSET to −110 dB. Adjust the "A" pot (A3A13R71) to put the trace on the Reference Line. Repeat steps n. and o. as many times as necessary to get both traces approximately correct.

p. Repeat steps l. through o. until no further adjustments are required.

q. Switch the 355D Step Attenuator to 120 dB (with the 8505A REF OFFSET at −110 dB). Verify that the power level drops 8 to 10 dB. Disconnect the 355D Step Attenuator from Input Port "R". Verify that the noise floor falls between −120 and −130 dBm.

r. Switch BW to 1 kHz. Verify that the noise floor falls, but not below −135 dBm. If the noise floor falls below this level, adjust "L BIAS" pot (A3A13R116) clockwise until the noise floor is above −135 dBm and below the 10 kHz noise floor. Switch BW to 10 kHz and reconnect the 355D Step Attenuator to Input Port "R". Switch BW to 10 kHz.

NOTE

If there is a problem with any of the low end adjustments or the noise floor check, the "B" coil or the "L BIAS" pot may need to be readjusted. (If so, repeat steps l. through r.)

s. Change the SCALE/DIV to .1 dB/DIV. Using the 355D Step Attenuator and 8505A REF OFFSET, check all power levels from −10 to −110 dBm for proper calibration. Refer to Table A1-1, 8505A Network Analyzer Performance Specifications (Receiver Magnitude Characteristics) for magnitude detector Dynamic Accuracy Specifications.

NOTE

If the accuracy at the −10 dBm level is out of specification or close to being out, A3A13R107 (factory select resistor) may be changed to a different value. Increasing the value will lower the trace and decreasing the value will raise the trace. If R107 is changed, repeat steps l. through s.

t. When the entire range is properly adjusted for a 10 kHz BW, set both the 355D Step Attenuator and 8505A REF OFFSET to −40 dB. Observe the trace at .1 dB/DIV while switching the A1 Source/Converter Input Level Max switch from −10 to −30 dBm. Adjust the "G OFF" pot (A3A13R99) for no change in the CRT trace.

u. Switch Channel 1 Input Port to "A" and repeat steps f. through t. for the "A" magnitude detector.

A5-29. A3A13 AND A3A14 MAGNITUDE DETECTORS ADJUSTMENT (Cont'd) *(CHANGE 25)*

v. Remove the BNC cable from Input Port "A" and connect it to Input Port "B". Switch Channel 1 Input Port to "B". The "REL" enunciator should be off. Repeat step s. The accuracy should follow the same pattern as Input Port "A" although it may be offset by a slight amount (<.1 dB).

w. Change Channel 1 SCALE/DIV to 2 dB/DIV. Vary Channel 1 REF. OFFSET to center the trace on the CRT. While observing the noise floor on Input Port "B", connect a −10 dBm signal to the "A" Input Port. The Input Port "B" noise floor should not rise by more than 2 dB. Repeat for Channel "A" by observing Input Port "A" noise floor and connecting a −10dBm signal to the "B" Input Port.

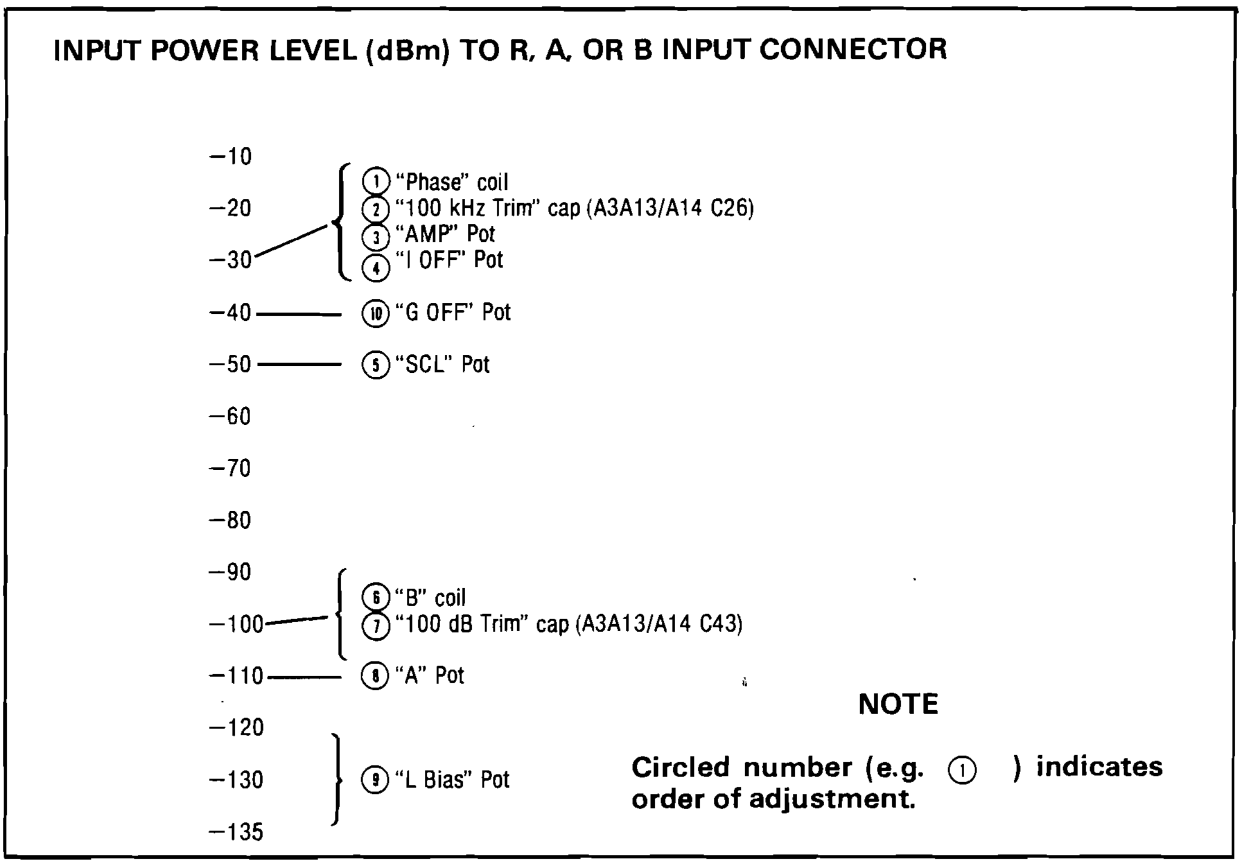


Figure A5-26. Graph of A3A13 and A3A14 Magnitude Detector Adjustments (CHANGE 25)

A5-30. ABSOLUTE MAGNITUDE CALIBRATION *(CHANGE 25)*

EQUIPMENT:

3-Way Power Splitter	HP 11850A
Matched Coaxial Cable Kit	HP 11851A

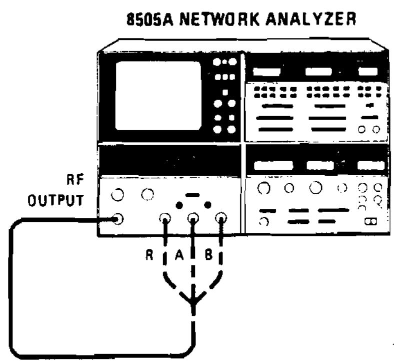


Figure A5-27. Absolute Magnitude Test Setup

a. Set 8505A controls as follows:

On A1 Source/Converter

OUTPUT LEVEL dBm 10 dB/step	−10
OUTPUT LEVEL Vernier	0
MAXIMUM INPUT dBm	−10

On A2 Frequency Control

FREQUENCY RANGE MHz	.5-130
MODE	LIN EXPAND
WIDTH	CW ±ΔF
SCAN TIME SEC	.1-.01
TRIGGER	AUTO
CW FREQUENCY	30 MHz
ΔF FREQUENCY	00.00 MHz

On A3 Signal Processor

Channel 1

INPUT	R
MODE	MAG
SCALE/DIV	.1 dB

Channel 2

MODE	OFF

Electrical Length

MODE	OFF

Display Panel

BANDWIDTH kHz	10
VIDEO FILTER	OFF

CHANGE 26

Page C2-7, Table C2-3:
Change A2A1A1DS1 through A2A1A1DS10 to HP Part Number 1990-0899, CD5.

Page C2-8, Table C2-3:
Change A2A1A1DS11 through A2A1A1DS14 to HP Part Number 1990-0899, CD5.

Page D2-6, Table D2-2:
Change A3A1DS20 through A3A1DS22, A3A1DS24 through A3A1DS26, and A3A1DS28 through A3A1DS29 to HP Part Number 1990-0899, CD5.

►CHANGE 27

Page C2-20, Table C2-3:
Add A2A8CR10 HP Part Number 1905-0539; CD3, DIODE-SCHOTTKY.

Page C2-21, Table C2-3:
Add A2A8VR2 HP Part Number 1902-3104; CD6, DIODE-ZNR 5.62V 5% PD=.4W.

Page C3-103, Figure C3-78:
Add the following components to the A2A8 Component Location Diagram:

1. A2A8CR10; directly above and parallel to A2A8R77 with cathode end pointed toward A2A8U7.
2. A2A8VR2; directly adjacent and parallel to A2A8CR1 with cathode end pointed toward A2A8TP2.

Page C3-103, Figure C3-79:
Insert the partial A2A8 Sweep Select Schematic diagram supplied in this change sheet into the existing Figure C3-79, A2A8 Sweep Select Schematic diagram.

►CHANGE 28

Page D2-7, Table D2-2:
Add A3A2C6, A3A2C7, and A3A2C8; each having HP Part Number 0160-2055; CD9, CAPACITOR-FXD .01UF +80−20% 100VDC CER.

Page D3-74, Figure D3-37:
Replace the A3A2 Auxiliary Front Panel Parts Location diagram with the A3A2 Auxiliary Front Panel Parts Location diagram supplied in this Change Sheet.

Page D3-75, Figure D3-38:
Add A3A2C6, .01 UF capacitor from A3A2U18 pin 16 (+5V) to ground.
Add A3A2C7, .01 UF capacitor from A3A2U19 pin 16 (+5V) to ground.
Add A3A2C8, .01UF capacitor from A3A2U20 pin 16 (+5V) to ground.

►CHANGE 29

Page D2-40, Figure D2-1:
Change Reference Designator 42 to HP Part Number 1220-0227; CD2.
Add Reference Designator 60A; HP Part Number 08569-20025; CD9; QTY 1; CRT-CLAMP SUPPORT.
Add Reference Designator 60B; HP Part Number 4320-0003; CD7; QTY 1; CHANNEL NEOPRENE, .25 FT. PER.

Page D3-13/D3-14:
Change the first sentence of step o. to read as follows: "Slide bezel 9 and display control unit out through front of frame."
Add the following as part of step r. immediately following the **CAUTION** notice in step q.: "Loosen the CRT support clamp (not shown in Figure D3-2) located between CRT Shield Clamp 3 and the CRT Rear Socket."

WARNING

Whenever replacing this part do not overtighten; the CRT neck may crack or shatter.

Change step s. to read: "The CRT and the metal shield surrounding it should be removed from the instrument together. Place CRT on a flat surface before removing the shield.".

►CHANGE 30

Page C2-21, Table C2-3:
Change A2A8U1, A2A8U2 and A2A8U3 to HP Part Number 1826-1058, CD3.

Page C2-24, Table C2-3:
Change A1A9U1 to HP Part Number 1826-1058, CD3.

Page C2-31, Table C2-3:
Change A1A15U12 to HP Part Number 1826-1058, CD3.

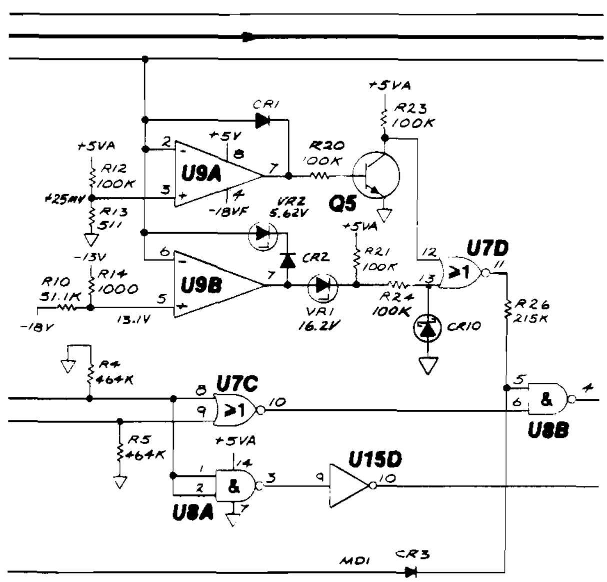
Page D2-10, Table D2-2:
Change A3A5U5 to HP Part Number 1826-1058, CD3.

Page D2-11, Table D2-2:
Change A3A5U6, A3A5U7 and A3A5U8 to HP Part Number 1826-1058, CD3.

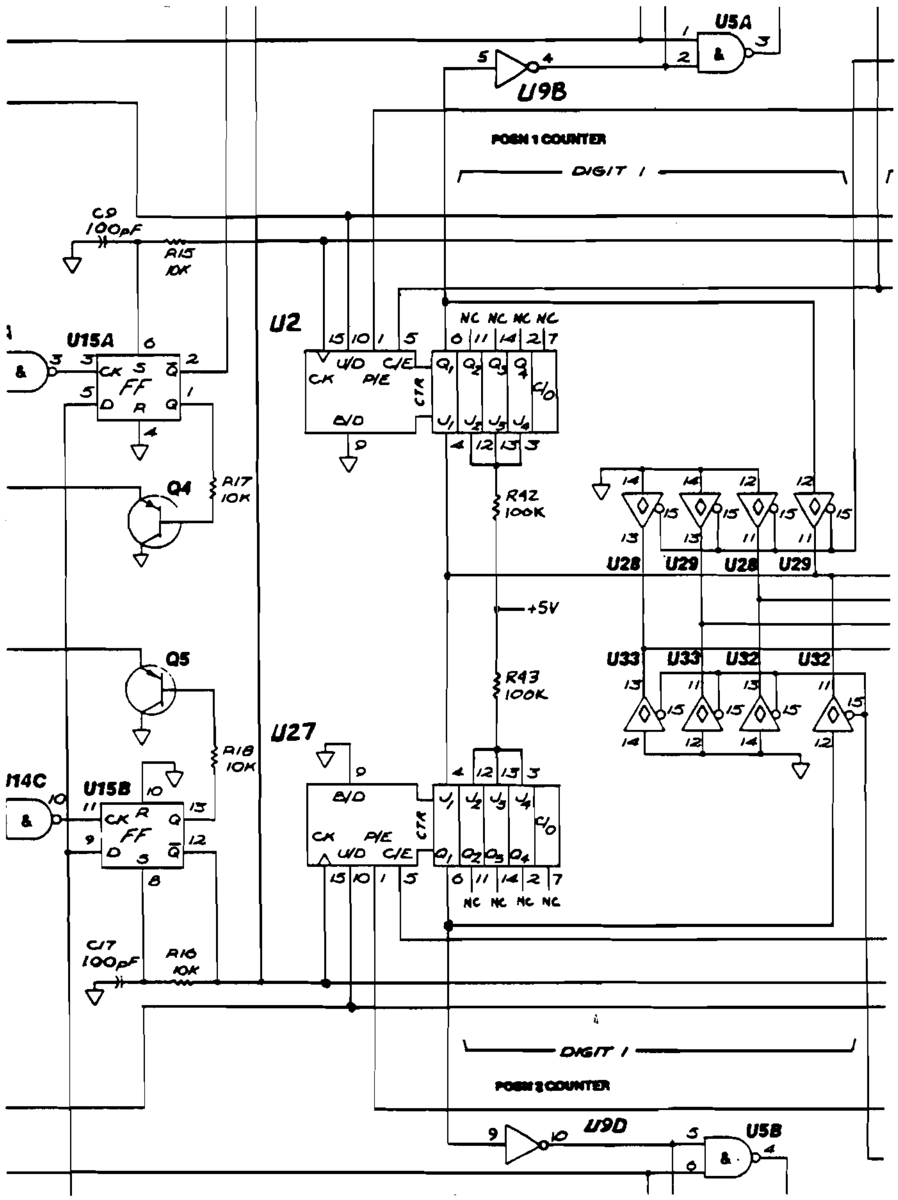
Page D2-23, Table D2-2:
Change A3A12U8 to HP Part Number 1826-1058, CD3.

Page D2-26, Table D2-2:
Change A3A13U4 to HP Part Number 1826-1058, CD3.

DISPLAY BLANKING CIRCUIT



Part of Figure C3-79. A2A8 Sweep Select Schematic (ERRATA)



P/O Figure C3-60. A2A3 Memory Board Schematic (1 of 2) (CHANGE 25)

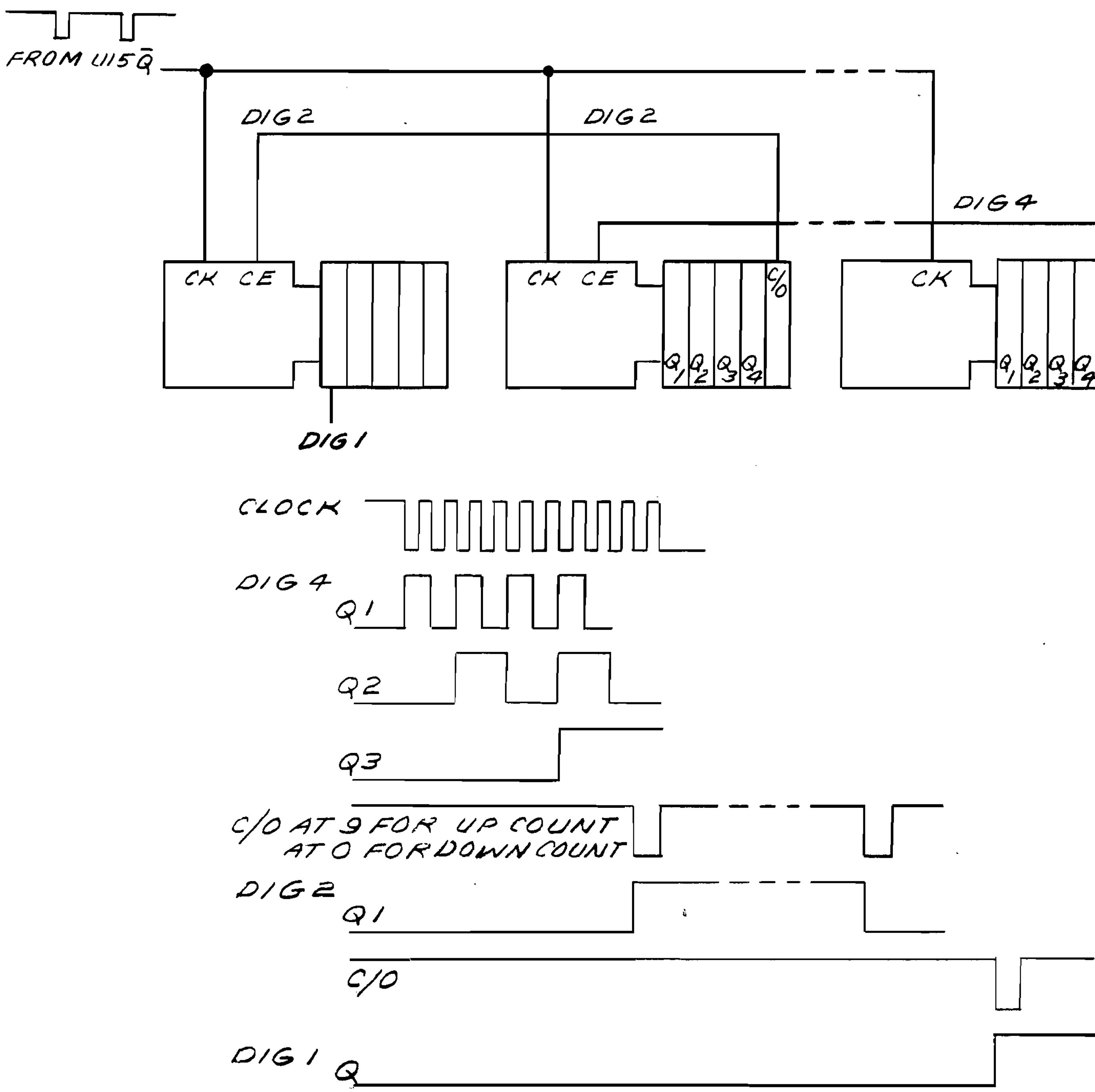


Figure C3-50. Counter Operation (CHANGE 25)

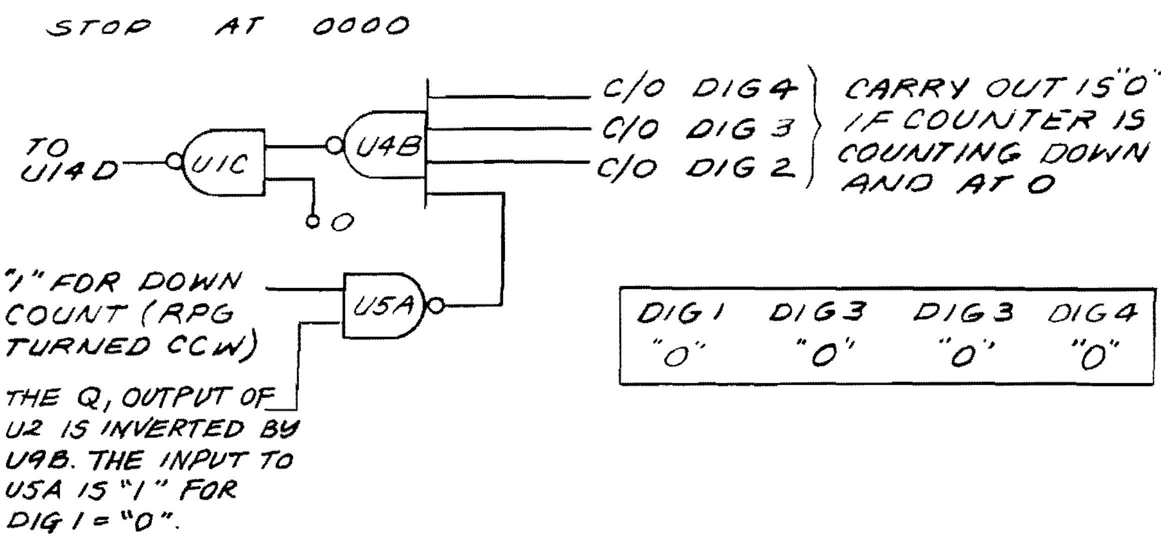


Figure C3-51. 0000MHz Stop Circuit Operation (CHANGE 25)

A2A3

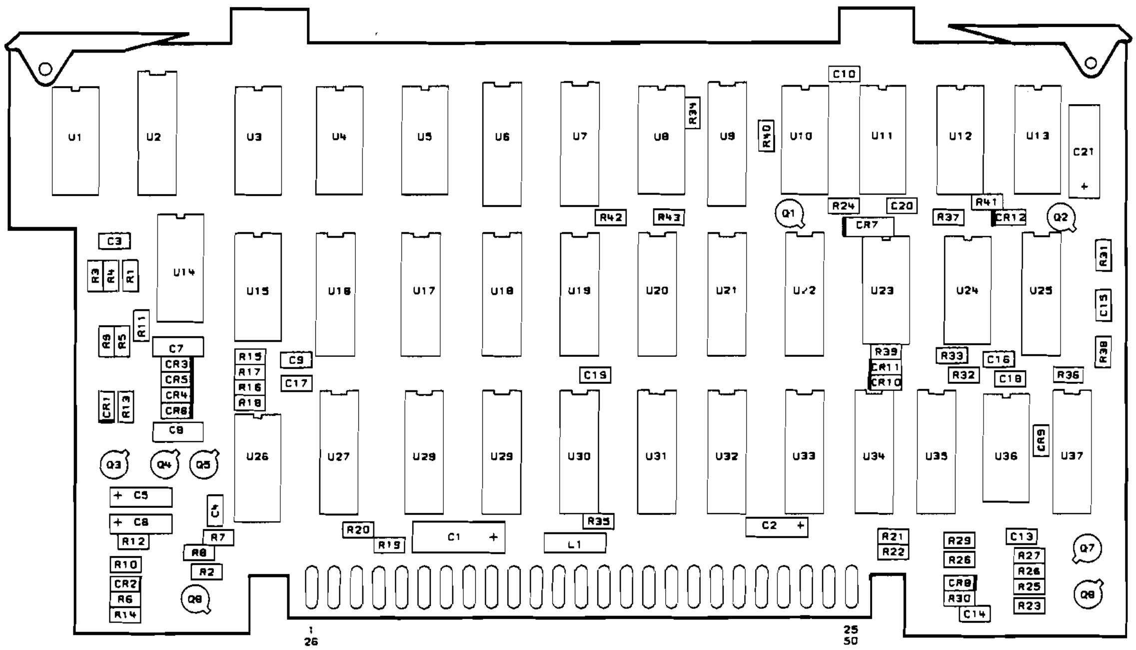
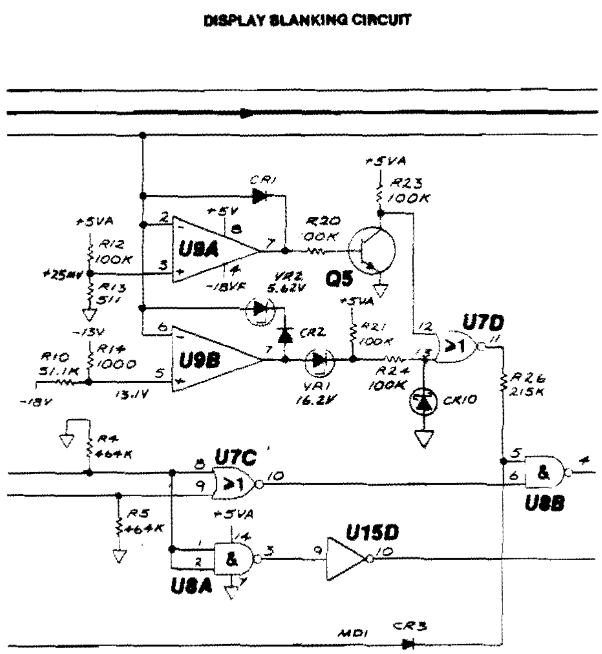


Figure C3-59. A2A3 Memory Parts Location (CHANGE 25)



Part of Figure C3-79. A2A8 Sweep Select Schematic (CHANGE 27)

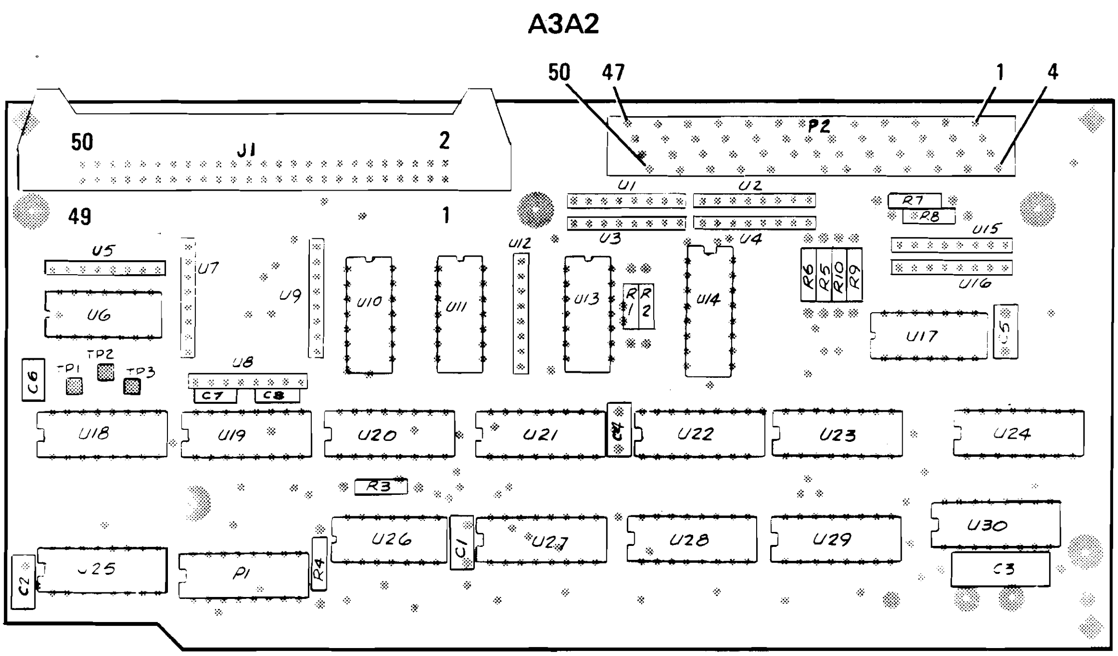


Figure D3-37. A3A2 Auxiliary Front Panel Parts Locations (CHANGE 28)

X-RAY RADIATION NOTICE

ACHTUNG Model 8505A **WARNING**

Während des Betriebs erzeugt dieses Gerät Röntgenstrahlung. Das Gerät ist so abgeschirmt, daß die Dosisleistung weniger als 36 pA/kg (0,5 mR/h) in 5cm Abstand von der Oberfläche der Katodenstrahlröhre beträgt. Somit sind die Sicherheitsbestimmungen verschiedener Länder, u.A. der deutschen Röntgenverordnung eingehalten.

Die Stärke der Röntgenstrahlung hängt im Wesentlichen von der Bauart der Katodenstrahlröhre ab, sowie von den Spannungen, welche an dieser anliegen. Um einen sicheren Betrieb zu gewährleisten, dürfen die Einstellungen der Niederspannungs- und des Hochspannungsnetzteils nur nach der Anleitung in Kapitel V des Handbuches vorgenommen werden.

Die Katodenstrahlröhre darf nur durch die gleiche Type ersetzt werden. (Siehe Kapitel Vi für HP — Ersatzteile).

Das Gerät ist in Deutschland zugelassen unter der Nummer: BW/49/79/Rö

When operating, this instrument emits x-rays; however, it is well shielded and meets safety and health requirements of various countries, such as the X-ray Radiation Act of Germany.

Radiation emitted by this instrument is less than 0.5 mR/hr at a distance of five (5) centimeters from the surface of the cathode-ray tube. The x-ray radiation primarily depends on the characteristics of the cathode-ray tube and its associated low-voltage and high-voltage circuitry. To ensure safe operation of the instrument, adjust both the low-voltage and high-voltage power supplies as outlined in Section V of this manual (if applicable).

Replace the cathode-ray tube with an identical CRT only. Refer to Section VI for proper HP part number.

Number of German License: BW/49/79/Rö

MINISTERIUM
FÜR ARBEIT, GESUNDHEIT UND SOZIALORDNUNG
BADEN-WÜRTTEMBERG

Ministerium für Arbeit, Gesundheit und Sozialordnung Baden-Württemberg
Postfach 1250 · 7000 Stuttgart 1

Firma
Hewlett-Packard GmbH
Herrenberger Str. 110

7030 Böblingen

Stuttgart, den 12. Januar 1981

P am Eingang 8
im Innenhof

Fernsprecher
Durchwahl (07 11) 66 73- 7357

Aktenzeichen: VII/6-3400.2.2/6/
(Bitte bei Antwort angeben)
Fa. Hewlett-Packard, Böblingen/81

Betr.: Durchführung der Röntgenverordnung (RöV)

Bezug: Ihr Antrag vom 20. November 1978 - US/iw -

Zulassungsschein Nr. BW/49 / 79/Rö

Hiermit wird Ihnen gemäß § 7 Abs. 2 der Röntgenverordnung vom 1. März 1973 (BGBl. I S. 173) die Zulassung der Bauart des nachstehend beschriebenen Störstrahlers erteilt:

Gegenstand:	Netzwerkanalysator mit Sichtgerät
Firmenbezeichnung:	Typ 8505 A
Kathodenstrahlröhre :	Hewlett Packard Typ: 5083-5778
Hersteller:	Hewlett-Packard, Santa Rosa Div., 1400 Fountain Grove Parkway, Santa Rosa, California 95404, USA
Betriebsbedingungen:	Hochspannung: max. 24,4 kV Strahlstrom: max. 7,5 µA

- 2 -

Dienstgebäude: Rotebühlplatz 30 (Abt. IV - Sozialversicherung, Rehabilitation - Sophienstraße 23 A
Abt. VII - Sicherheit in der Kerntechnik - Lange Straße 4 A)
Fernsprecher Vermittlung (0711) 66 73-0 · Telefax (0711) 66 73-70 42 (Rotebühlplatz 30), 66 73-73 28 (Lange Straße 4 A) · Telex 722 548

- 2 -

Bauartunterlagen:	Bauartzeichnungen: Nr. B-5083-5700-3 Rev. A vom 15.12.77, Nr. B-5061-0195-1 Rev. F vom 8.9.77, Nr. C-2000-0105-1 Rev. D vom 18.4.77, Nr. A-5060-9708-1 Rev. C vom 22.7.75, Operating and Service Manual: 08505-90002; Materialangaben vom 3.7.1979
Prüfungsschein:	Physikalisch-Technische Bundesanstalt Braunschweig Nr. 6.32-S 79 vom 18. September 1979

Die Zulassung wird befristet bis 12. Januar 1991. Auf § 8 Abs. 2 RöV wird hingewiesen.

Für den Strahlenschutz wesentliche Merkmale:

1. Die Art und Qualität der Kathodenstrahlröhre,
2. die der Hochspannungserzeugung und -stabilisierung dienenden Bauelemente.

Auflagen:

Die Zulassung wird gemäß § 8 Abs. 1 der RöV mit folgenden Auflagen verbunden:

1. Die Geräte sind einer Stückprüfung daraufhin zu unterziehen, ob sie bezüglich der für den Strahlenschutz wesentlichen Merkmale der Bauartzulassung entsprechen. Die Prüfung muß umfassen:

   a) Kontrolle der Hochspannung an jedem einzelnen Gerät,
   b) Dosisleistung nach näherer Angabe der Zulassungsbehörde.

   Die Ergebnisse der Dosisleistungsmessung sind, den Herstellnummern der Geräte zugeordnet, aufzuzeichnen, 3 Jahre aufzubewahren und der Zulassungsbehörde auf Verlangen einzusenden.

- 3 -

Die Zulassungsbehörde ist berechtigt, einzelne Geräte nach eigener Auswahl anzufordern, um das Vorliegen der für den Strahlenschutz wesentlichen Merkmale zu überprüfen oder überprüfen zu lassen. Die Geräte sind auf Verlangen im Originalzustand anzuliefern und angemessene Zeit zur Verfügung zu stellen.

2. Die Herstellung und die Stückprüfung sind durch einen von der Zulassungsbehörde bestimmten Sachverständigen überwachen zu lassen.

3. Die Geräte sind deutlich sichtbar und dauerhaft mit dem Kennzeichen

   <u>BW/49/79/Rö</u>

   zu versehen sowie mit einem Hinweis folgenden Mindestinhalts:

   "Die in diesem Gerät entstehende Röntgenstrahlung ist ausreichend abgeschirmt. Beschleunigungsspannung maximal 24,4 kV."

4. Jedem Erwerber eines Gerätes ist ein Abdruck des Zulassungsscheins auszuhändigen, auf dem das Ergebnis der Stückprüfung (Auflage 1) bestätigt sein muß.

   Jedem Gerät ist ferner eine Betriebsanleitung beizufügen, in der auf den in Auflage 3 genannten Hinweis aufmerksam gemacht wird und die die für die Durchführung von Reparaturmaßnahmen und Wartungsarbeiten notwendigen Sicherheitsmaßnahmen bezüglich des Strahlenschutzes enthält.

- 4 -

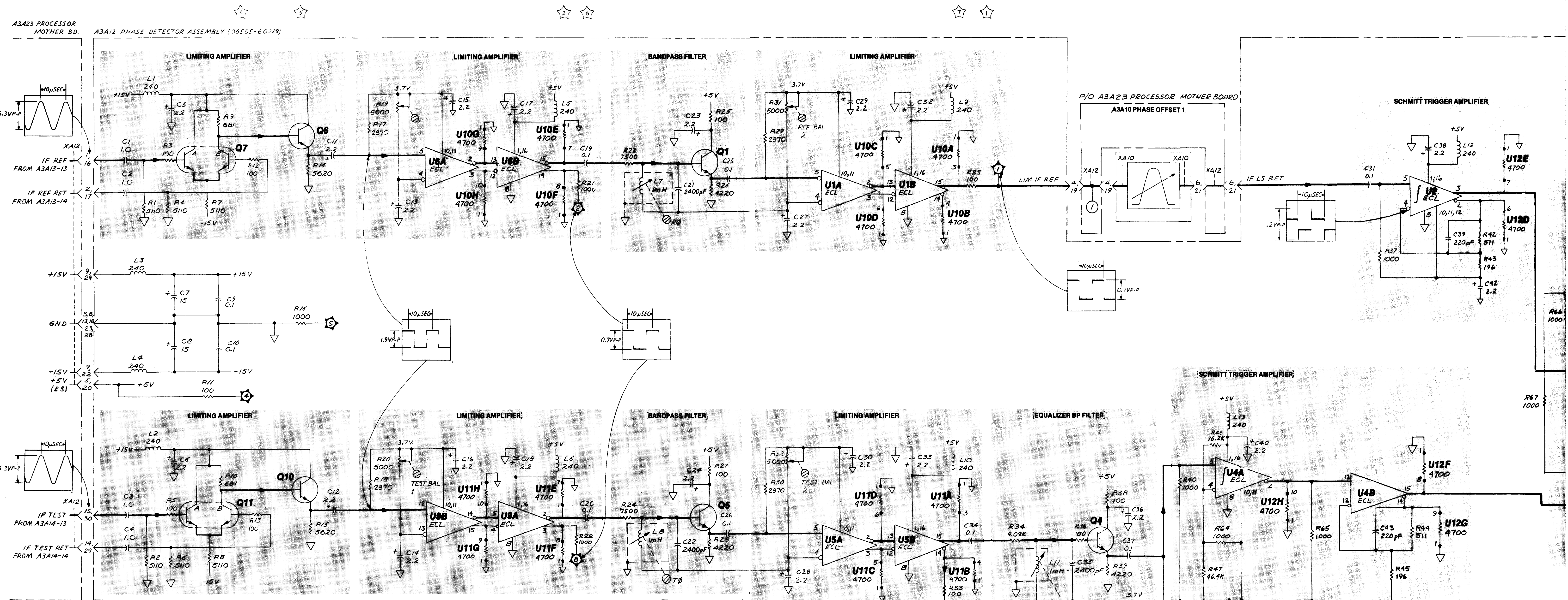
<u>Hinweis für den Benutzer des Geräts:</u>

Unsachgemäße Eingriffe, insbesondere Verändern der Hochspannung oder Auswechseln der Kathodenstrahlröhre, können dazu führen, daß Röntgenstrahlung in erheblicher Stärke auftritt. Ein so verändertes Gerät entspricht nicht mehr dieser Zulassung und darf infolgedessen nicht betrieben werden.

Dr. Dettling

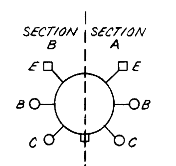
Dieses Gerät wurde nach den Auflagen der Zulassungsbehörde einer Stückprüfung unterzogen und entspricht in den für den Strahlenschutz wesentlichen Merkmalen der Bauartzulassung. Die Beschleunigungsspannung beträgt maximal 24,4 kV.

Hewlett-Packard, Santa Rosa Div.,
1400 Fountain Grove Parkway,
Santa Rosa, California 95404, USA



SERIAL PREFIX 2014A

NOTES:
1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR
2. UNLESS OTHERWISE INDICATED, RESISTANCE IN OHMS CAPACITANCE IN MICROFARADS INDUCTANCE IN MICROHENRIES
3. INDICATES PRIMARY SIGNAL FLOW PATH
   INDICATES LOCAL FEEDBACK PATH
4. U1, U2, U4, U5, U6 AND U9 ARE EMITTER COUPLED LOGIC (ECL) AMPLIFIERS HAVING 0.7V p-p OUTPUTS.

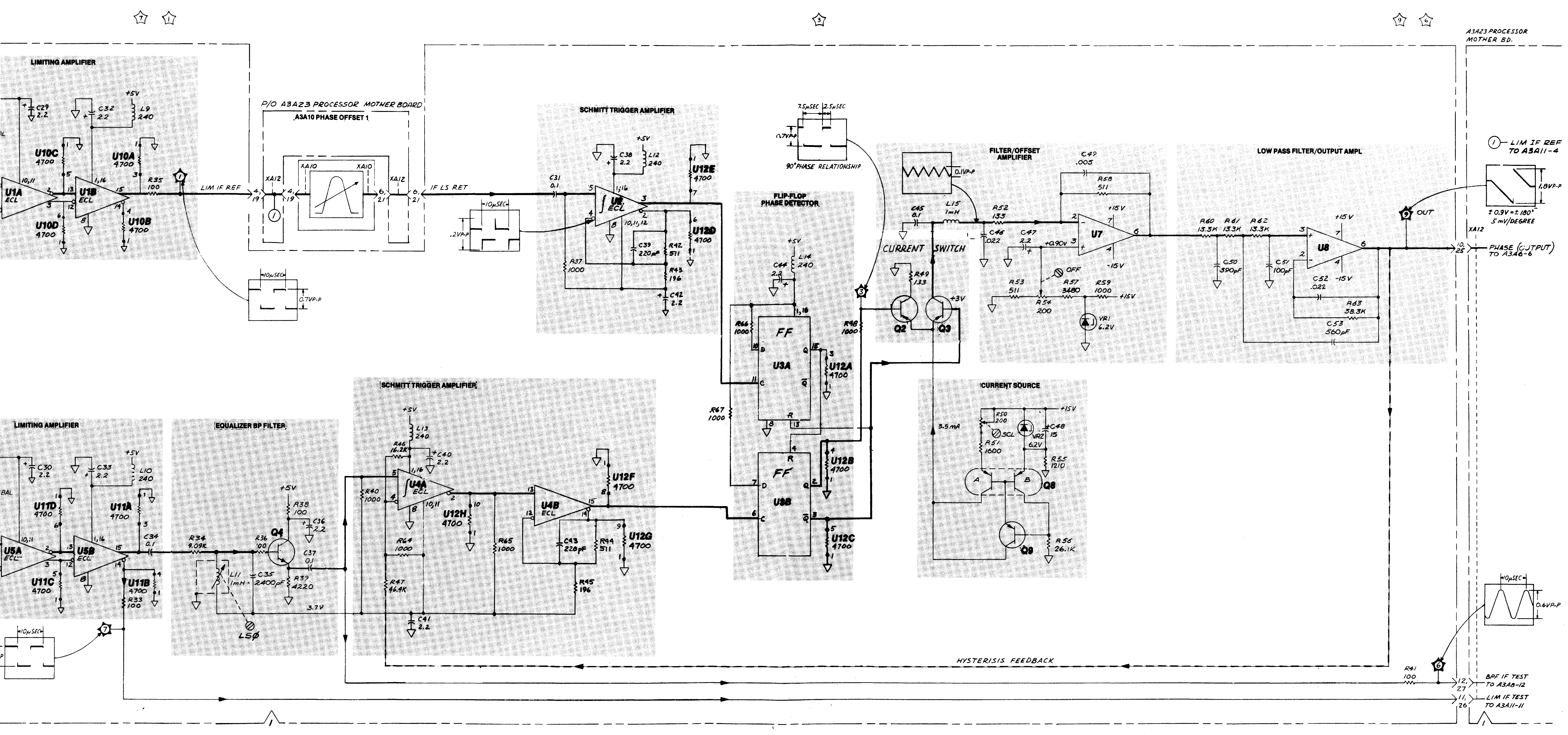


DUAL TRANSISTOR Q7, 8, AND 11 TERMINALS (TOP VIEW)

REFERENCE DESIGNATIONS

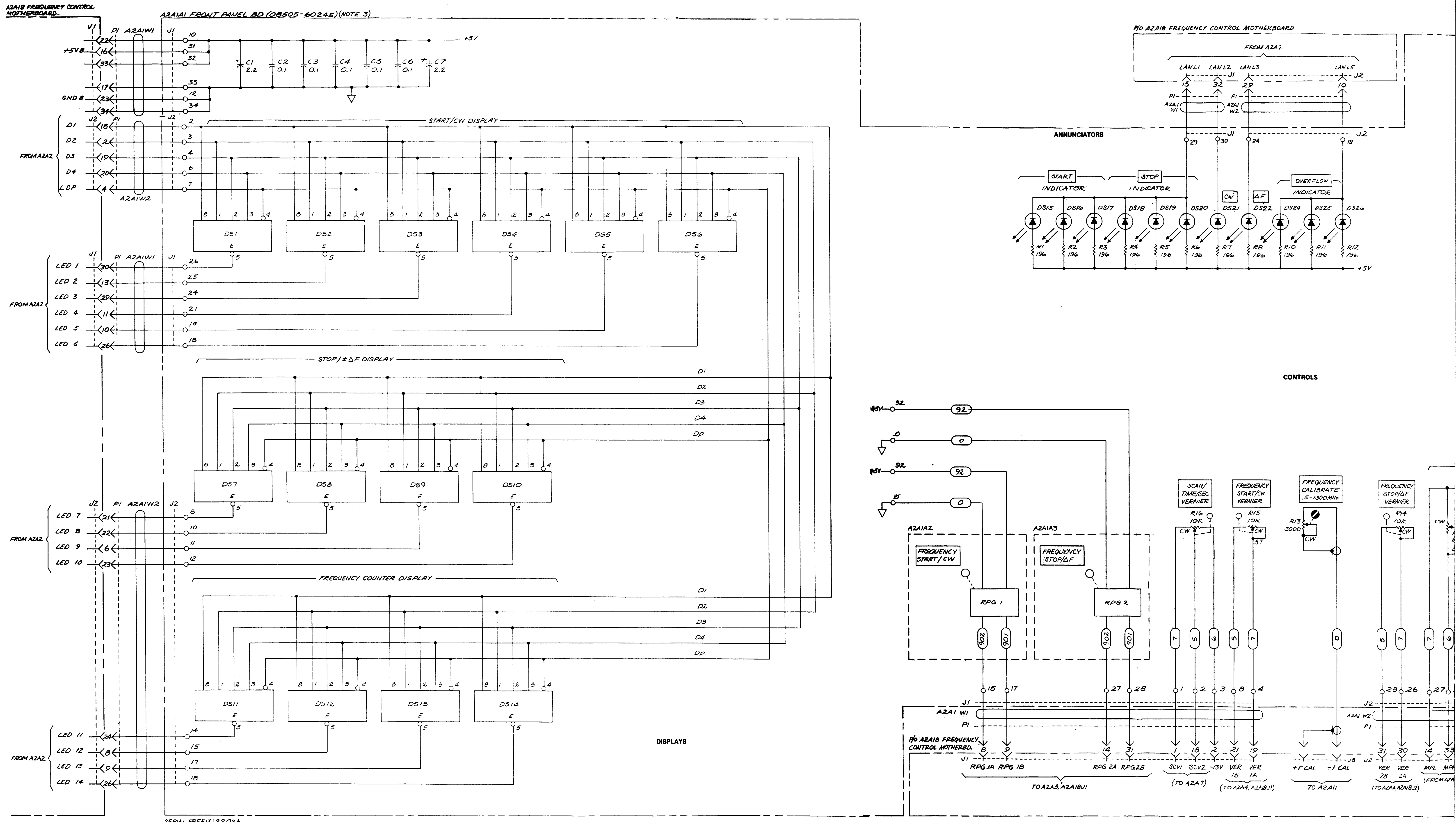
A3A12
C1 - 53
L1 - 15
Q1 - 11
R1 - 63
U1 - 9
VR1 - 2

TEST SETUP
CHANNEL 1 :
MODE : PHASE
INPUT : A/R
SCALE/DIV : 45 DEG
REF OFFSET :
AS REQUIRED FOR +90 DEG PHASE
ELECTRICAL LENGTH :
400°/SCAN FOR TP 9 ONLY
RF INPUT : -dBm FOR PORT A AND PORT R
CHANNEL 2 : OFF



A3A12

Figure D3-83. A3A12 Phase Detector, Schematic (Change 2)


A2A18 FREQUENCY CONTROL MOTHERBOARD
A2A1A1 FRONT PANEL BD (08505-60245)(NOTE 3)
P/O A2A18 FREQUENCY CONTROL MOTHERBOARD
FROM A2A2
ANNUNCIATORS
START INDICATOR
STOP INDICATOR
OVERFLOW INDICATOR
START/CW DISPLAY
STOP/±ΔF DISPLAY
FREQUENCY COUNTER DISPLAY
CONTROLS
FREQUENCY START/CW
FREQUENCY STOP/ΔF
SCAN/TIME/SEC VERNIER
FREQUENCY START/CW VERNIER
FREQUENCY CALIBRATE .5-1300MHz
FREQUENCY STOP/ΔF VERNIER
DISPLAYS
P/O A2A18 FREQUENCY CONTROL MOTHERBD.
TO A2A3, A2A18J1
(TO A2A7)
(TO A2A4, A2A18J1)
TO A2A11
SERIAL PREFIX: 2202A

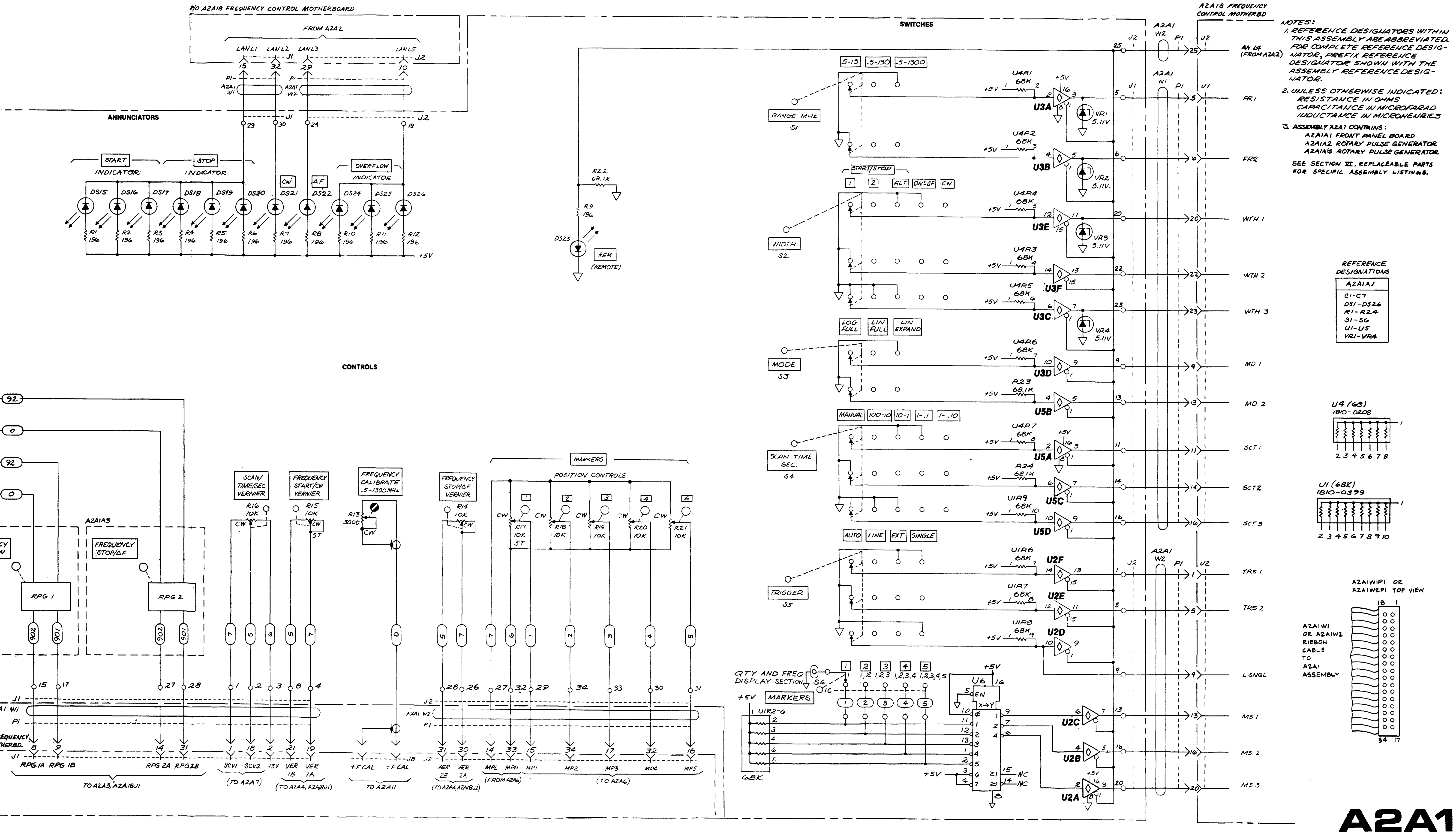


Figure C3-30. A2A1 Front Panel, Schematic **(CHANGE 15)**

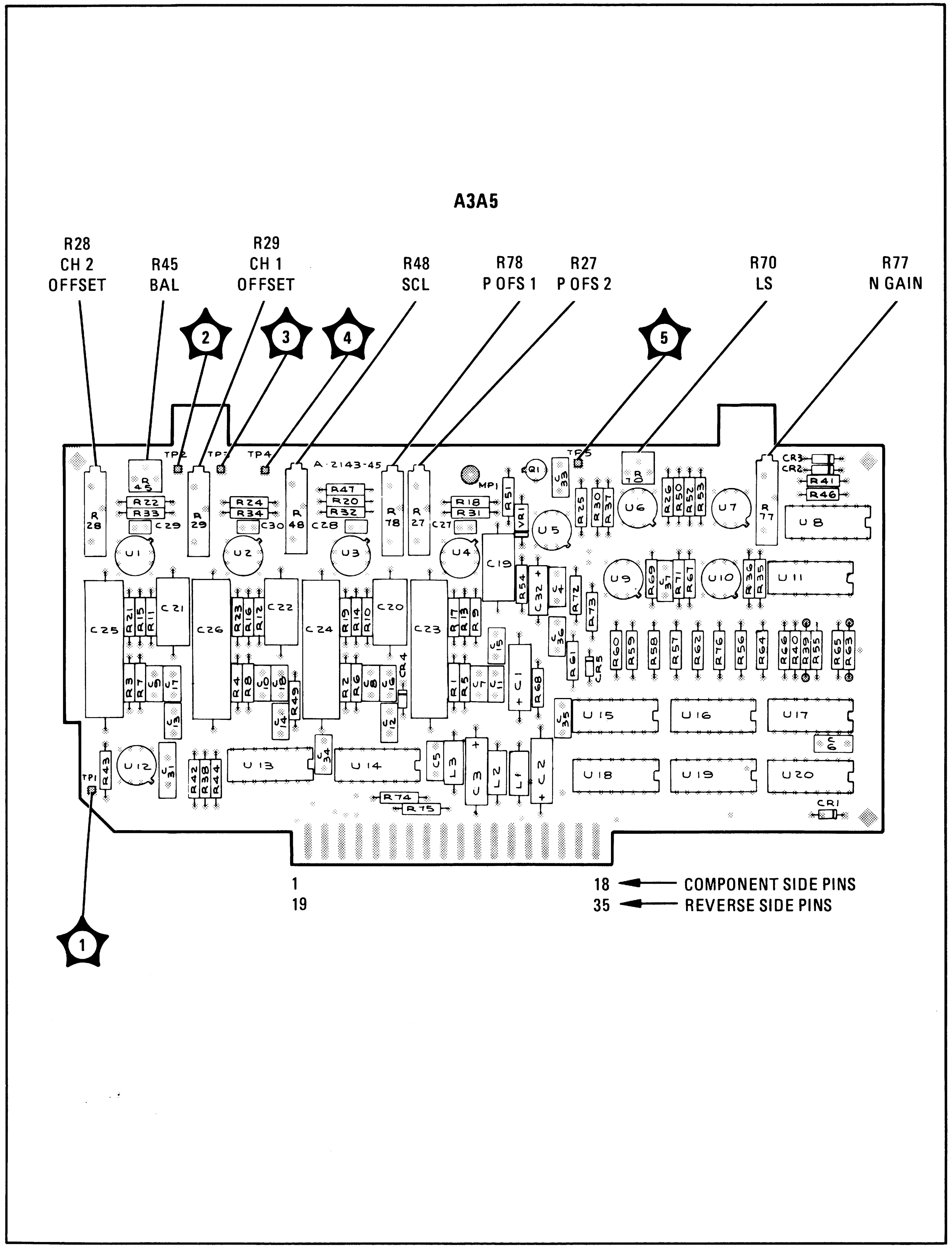
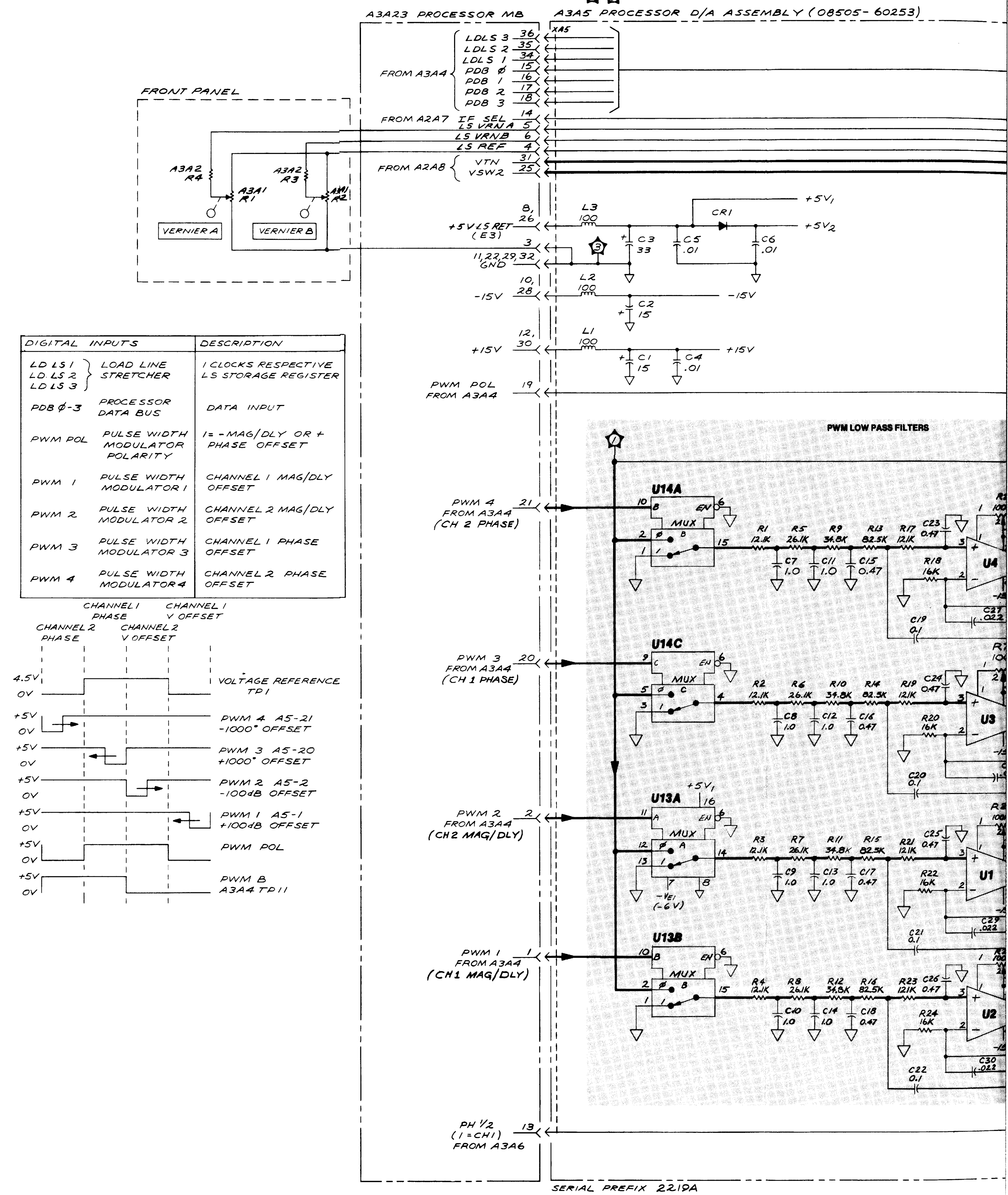
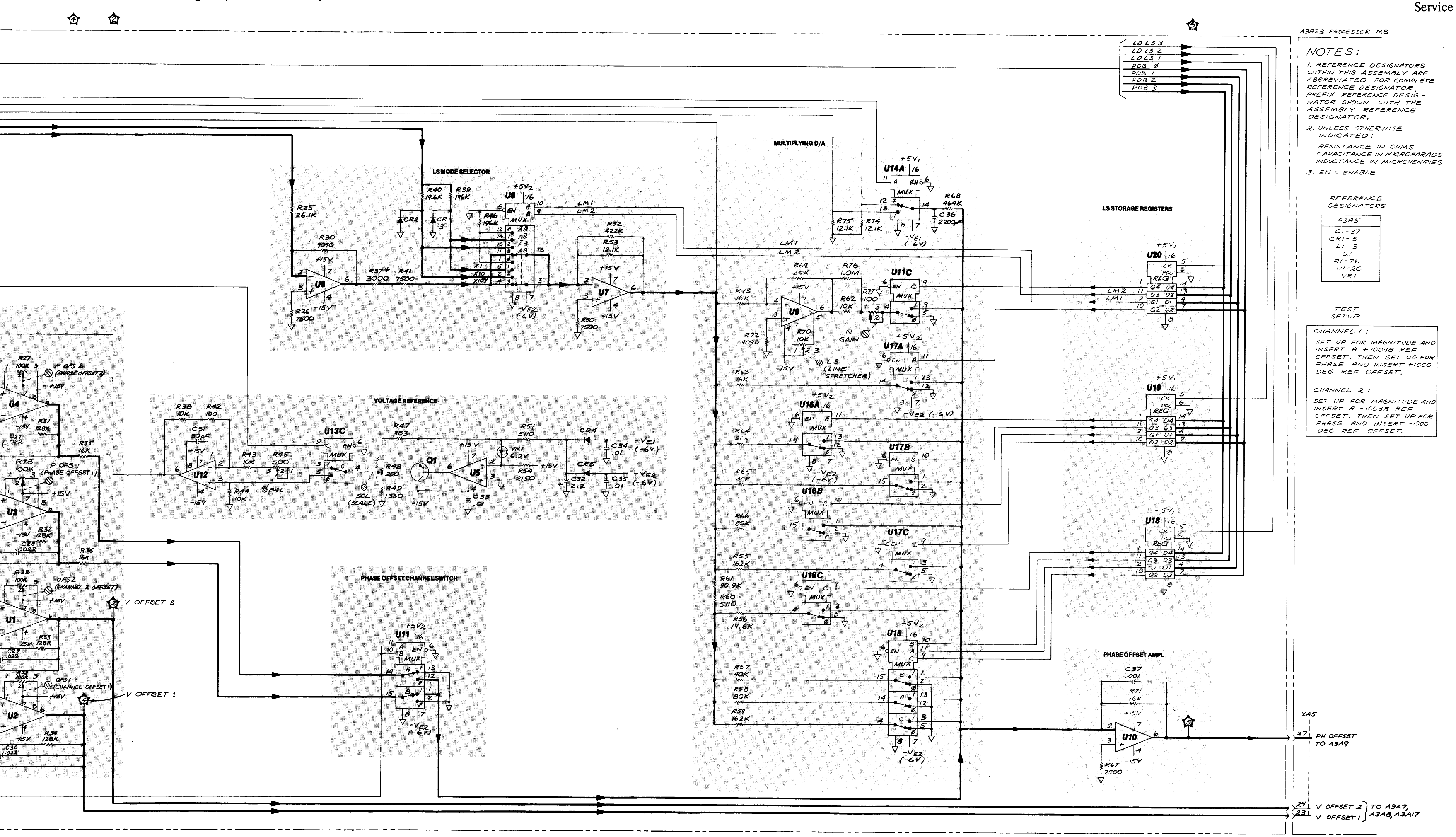


Figure D3-56. A3A5 Processor D/A Parts Location (CHANGE 21)

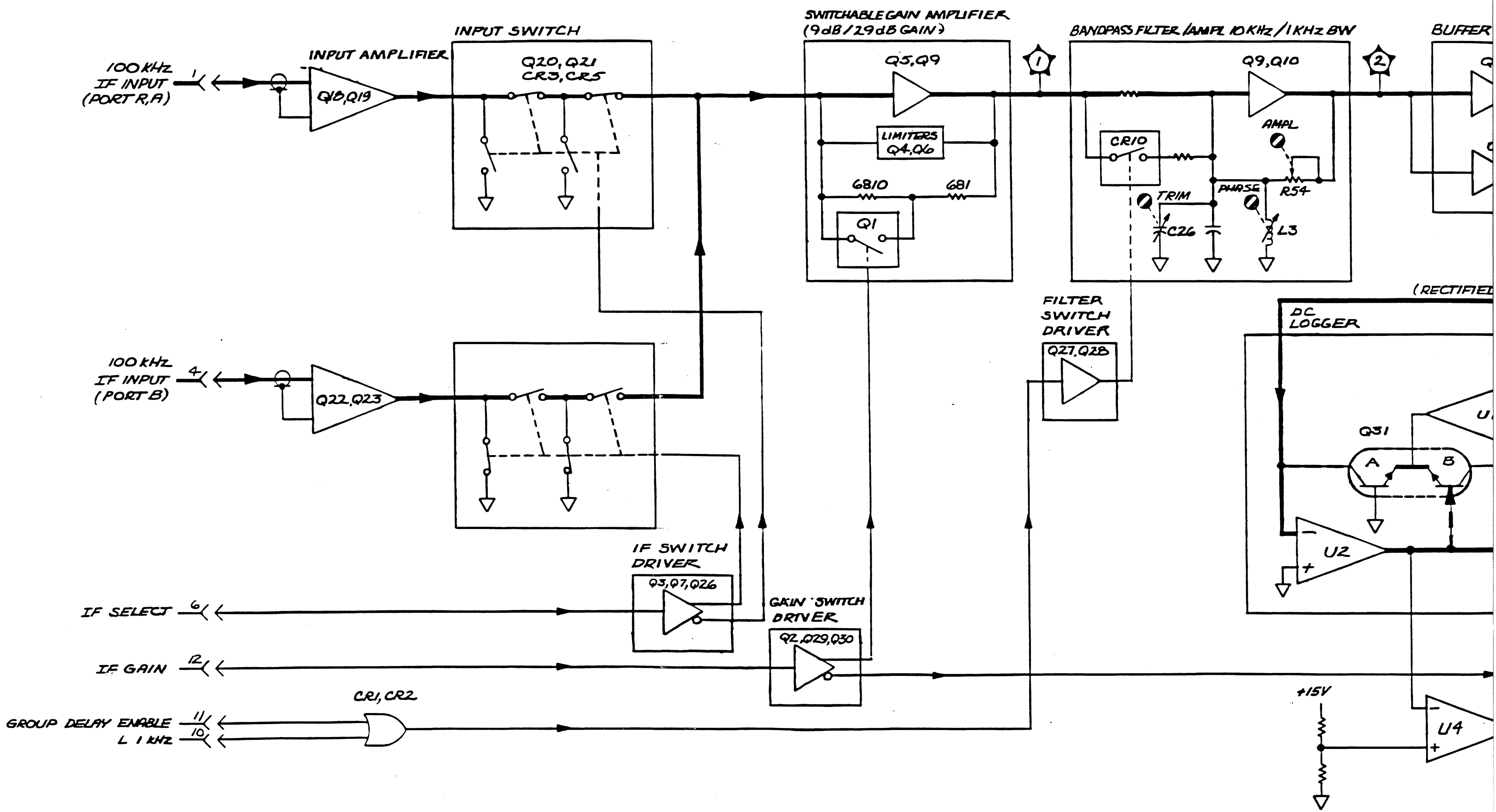


DIGITAL INPUTS		DESCRIPTION
LD LS 1, LD LS 2, LD LS 3	LOAD LINE STRETCHER	1 CLOCKS RESPECTIVE LS STORAGE REGISTER
PDB Ø-3	PROCESSOR DATA BUS	DATA INPUT
PWM POL	PULSE WIDTH MODULATOR POLARITY	1 = -MAG/DLY OR + PHASE OFFSET
PWM 1	PULSE WIDTH MODULATOR 1	CHANNEL 1 MAG/DLY OFFSET
PWM 2	PULSE WIDTH MODULATOR 2	CHANNEL 2 MAG/DLY OFFSET
PWM 3	PULSE WIDTH MODULATOR 3	CHANNEL 1 PHASE OFFSET
PWM 4	PULSE WIDTH MODULATOR 4	CHANNEL 2 PHASE OFFSET



A3A5

Figure D3-57. A3A5 Processor D/A, Schematic (CHANGE 21)


INPUT SWITCH
SWITCHABLE GAIN AMPLIFIER
(9dB/29dB GAIN)
BANDPASS FILTER/AMPL 10KHz/1KHz BW
BUFFER
INPUT AMPLIFIER
100 KHz
IF INPUT
(PORT R,A)
Q18,Q19
Q20,Q21
CR3,CR5
Q5,Q9
Q9,Q10
LIMITERS
Q4,Q6
681Ω
681
Q1
CR10
AMPL
R54
TRIM
PHASE
C26
L3
(RECTIFIED
FILTER
SWITCH
DRIVER
Q27,Q28
DC
LOGGER
100 kHz
IF INPUT
(PORT B)
Q22,Q23
Q31
A
B
U2
IF SWITCH
DRIVER
Q3,Q7,Q26
GAIN SWITCH
DRIVER
Q2,Q29,Q30
IF SELECT
IF GAIN
GROUP DELAY ENABLE
L 1 kHz
CR1,CR2
+15V
U4

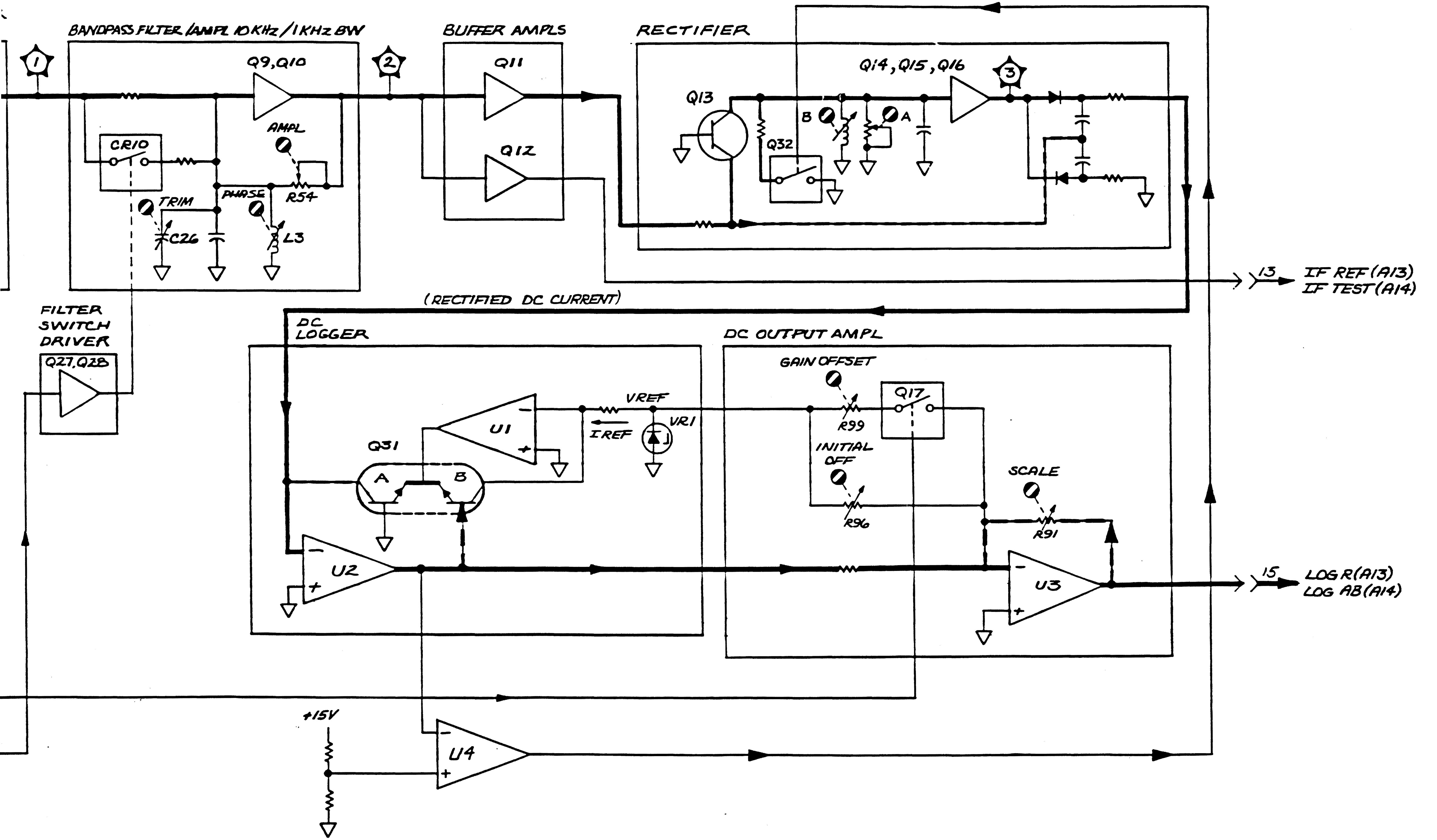
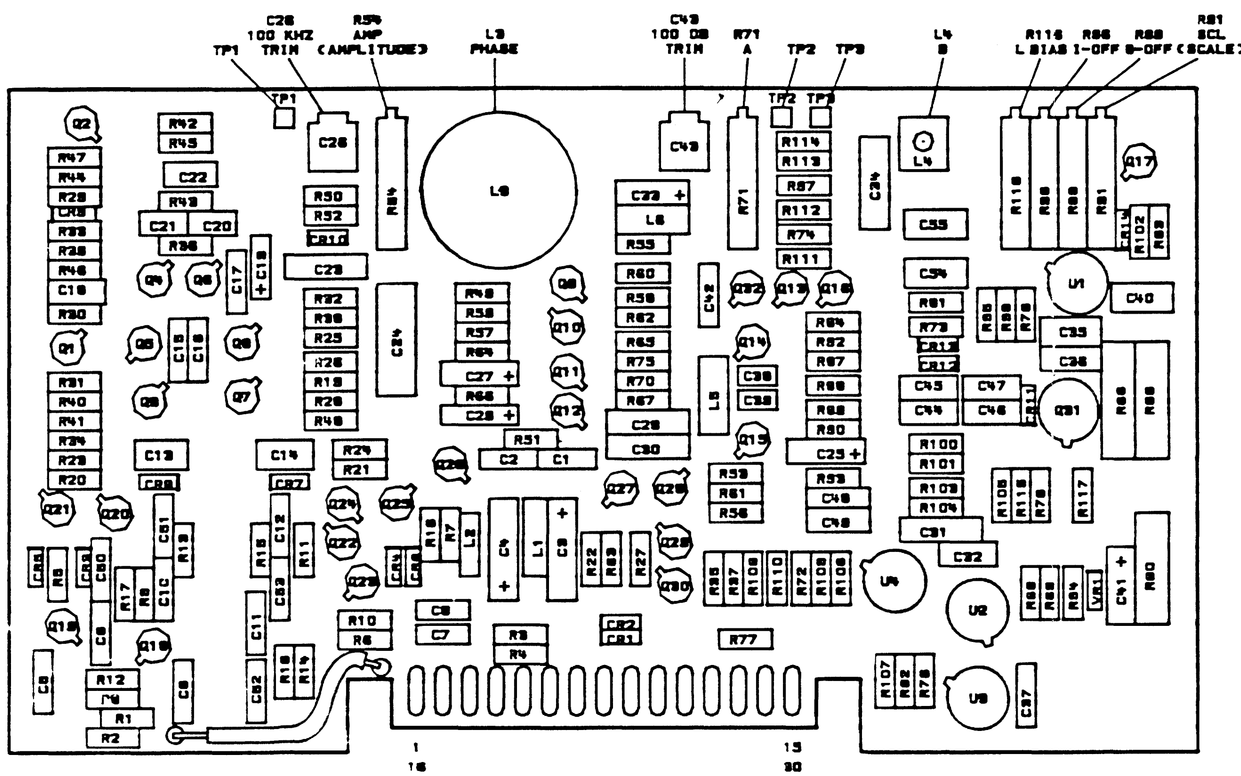


Figure D3-86. A3A13/A14 Magnitude Detector, Block Diagram (Change 25)

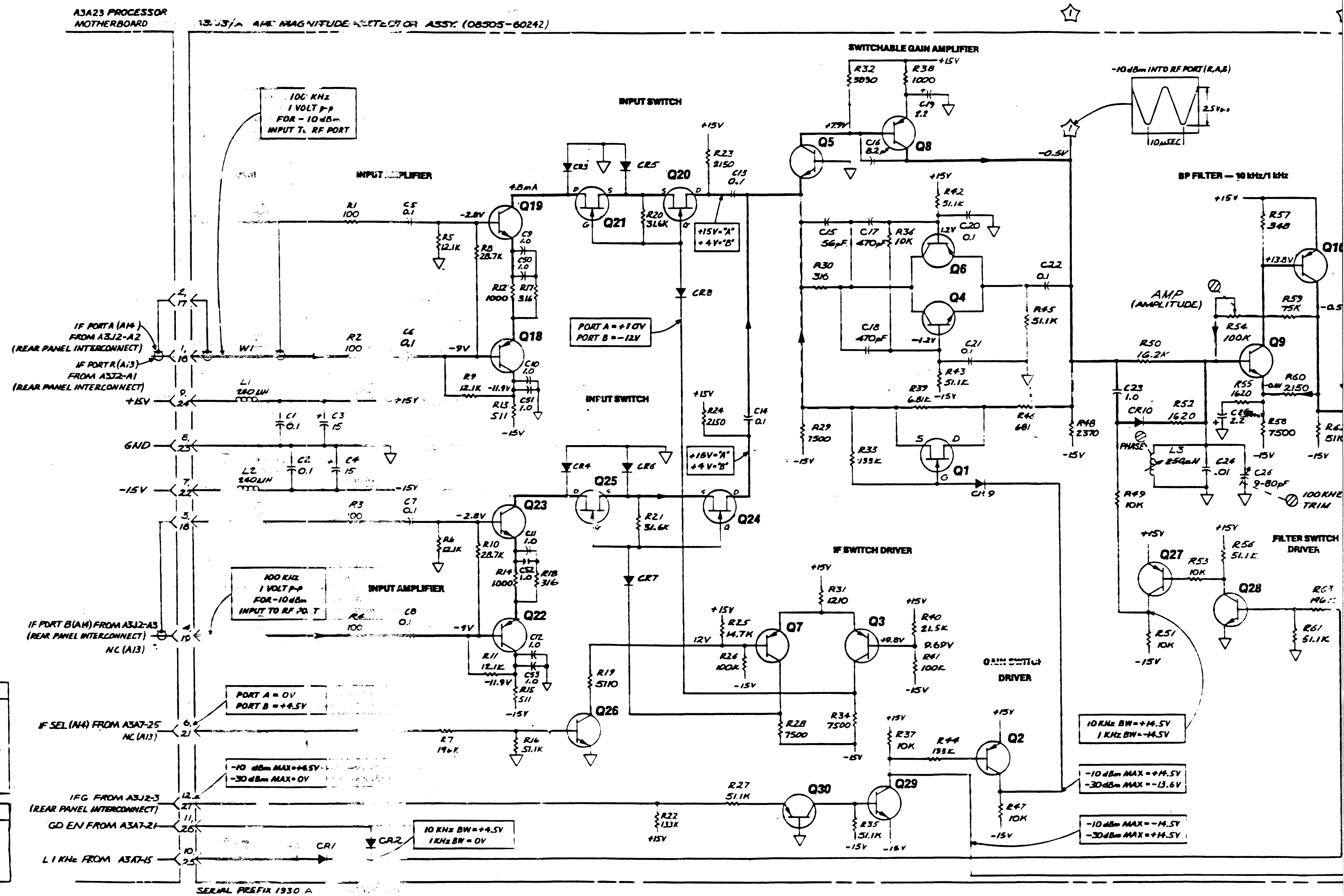
A3A13/A14



A3Q13/14 Component Locator Table (CHANGE 25)

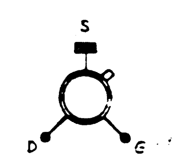
Ref. Des.	Location	Ref. Des.	Location	Ref. Des.	Location	Ref. Des.	Location	Ref. Des.	Location	Ref. Des.	Location
C1	D5	C42	E4	Q1	A4	R9	B6	R50	C4	R91	F4
C2	D5	C43	D4	Q2	B4	R10	C6	R51	D5	R92	E4
C3	D5	C44	F5	Q3	B5	R11	C5	R52	C4	R93	E5
C4	D5	C45	F5	Q5	B4	R12	B6	R53	D5	R94	G6
C5	A6	C46	F5	Q5	B5	R13	B6	R54	C4	R95	F5
C6	B6	C47	F5	Q6	B4	R14	C6	R55	E4	R96	F4
C7	C6	C48	E5	Q7	B5	R15	B5	R56	E5	R97	D4
C8	C6	C49	E5	Q8	B5	R16	C5	R57	C5	R98	G5
C9	B6	C50	B6	Q9	D4	R17	B6	R58	D4	R99	F4
C10	B6	C51	B5	Q10	D4	R18	C6	R59	C4	R100	F5
C11	B6	C52	B6	Q11	D5	R19	C5	R60	D4	R101	F5
C12	C6	C53	B6	Q12	D5	R20	B5	R61	E5	R102	G4
C13	B5	C54	F4	Q13	E4	R21	C5	R62	D4	R103	F5
C14	C5	C55	F4	Q14	E5	R22	D5	R63	D6	R104	F5
C15	B5			Q15	E5	R23	B5	R64	C5	R105	F5
C16	B5			Q16	E4	R24	C5	R65	D4	R106	E6
C17	B4	CR1	D6	Q17	F4	R25	C5	R66	C5	R107	E6
C18	B4	CR2	D6	Q18	B6	R26	C5	R67	D5	R108	E6
C19	B4	CR3	B6	Q19	A6	R27	D5	R68	F6	R109	E6
C20	B4	CR4	C6	Q20	B5	R28	C5	R69	F6	R110	E6
C21	B4	CR5	A6	Q21	A5	R29	B4	R70	D4	R111	E4
C22	B4	CR6	C6	Q22	C5	R30	B4	R71	E4	R112	E4
C23	C4	CR	C5	Q23	C6	R31	B5	R72	E6	R113	E4
C24	C5	CR8	B5	Q24	C5	R32	C4	R73	E4	R114	E4
C25	E4	CR9	B4	Q25	C5	R33	B4	R74	E4	R115	F5
C26	C4	CR10	C4	Q26	C5	R34	B5	R75	D5	R116	F4
C27	C5	CR11	F5	Q27	D5	R35	E6	R76	F6	R117	F5
C28	D5	CR12	F4	Q28	D5	R36	B4	R77	E6		
C29	C5	CR13	F4	Q29	D5	R37	E6	R78	F5		
C30	D5	CR14	F4	Q30	D6	R38	C4	R79	E6	U1	F4
C31	F5			Q31	F5	R39	B4	R80	F6	U2	F6
C32	F5			Q32	E4	R40	B5	R81	F4	U3	F6
C33	E4	L1	D5			R41	B5	R82	E6	U4	E5
C34	E4	L2	C5	R1	B6	R42	B4	R83	G4		
C35	F5	L3	C4	R2	B6	R43	B4	R84	E5		
C36	F5	L4	E4	R3	D6	R44	B4	R85	F5	VR1	F6
C37	F6	L5	D5	R4	D6	R45	B4	R86	F5		
C38	E5	L6	D4	R5	A6	R46	B4	R87	E5		
C39	E5			R6	C6	R47	B4	R88	E5	W1	B6/C6
C40	F4			R7	C5	R48	C5	R89	E5		
C41	F6			R8	B6	R49	C4	R90	E5		

Figure D3-87. A3A13/A14 Magnitude Detector Parts Location (Change 25)



NOTES

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. FOR COMPLETE REFERENCE DESIGNATOR, PREFIX REFERENCE DESIGNATOR SHOWN WITH THE ASSEMBLY REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED ALL RESISTOR VALUES IN OHMS. ALL CAPACITOR VALUES IN MICROFARADS.
3. R80 IS TEMP. COMP.—RESISTOR. ±3400 PPM/°C.
4. R114 IS TEMP. COMP.—RESISTOR, +7000 PPM/°C.
5. → INDICATES PRIMARY SIGNAL FLOW PATH; ← INDICATES PRIMARY FEEDBACK PATH.



FIELD EFFECT TRANSISTOR TERMINALS TOP VIEW

A3A13/14
C1 - 49
CR1 - 14
L1 - 5
Q1 - 31
R1 - 107
U1 - 3
VR1
W1

CONTROL INPUTS	DESCRIPTION
IF SEL	0 SELECTS PORT A INPUT
IFG	1 FOR -10dBm MAX INPUT LEVEL
GD EN	1 WHEN OPERATING IN GROUP DELAY MODE
L 1KHz	0 WHEN 1KHz BW SELECTED

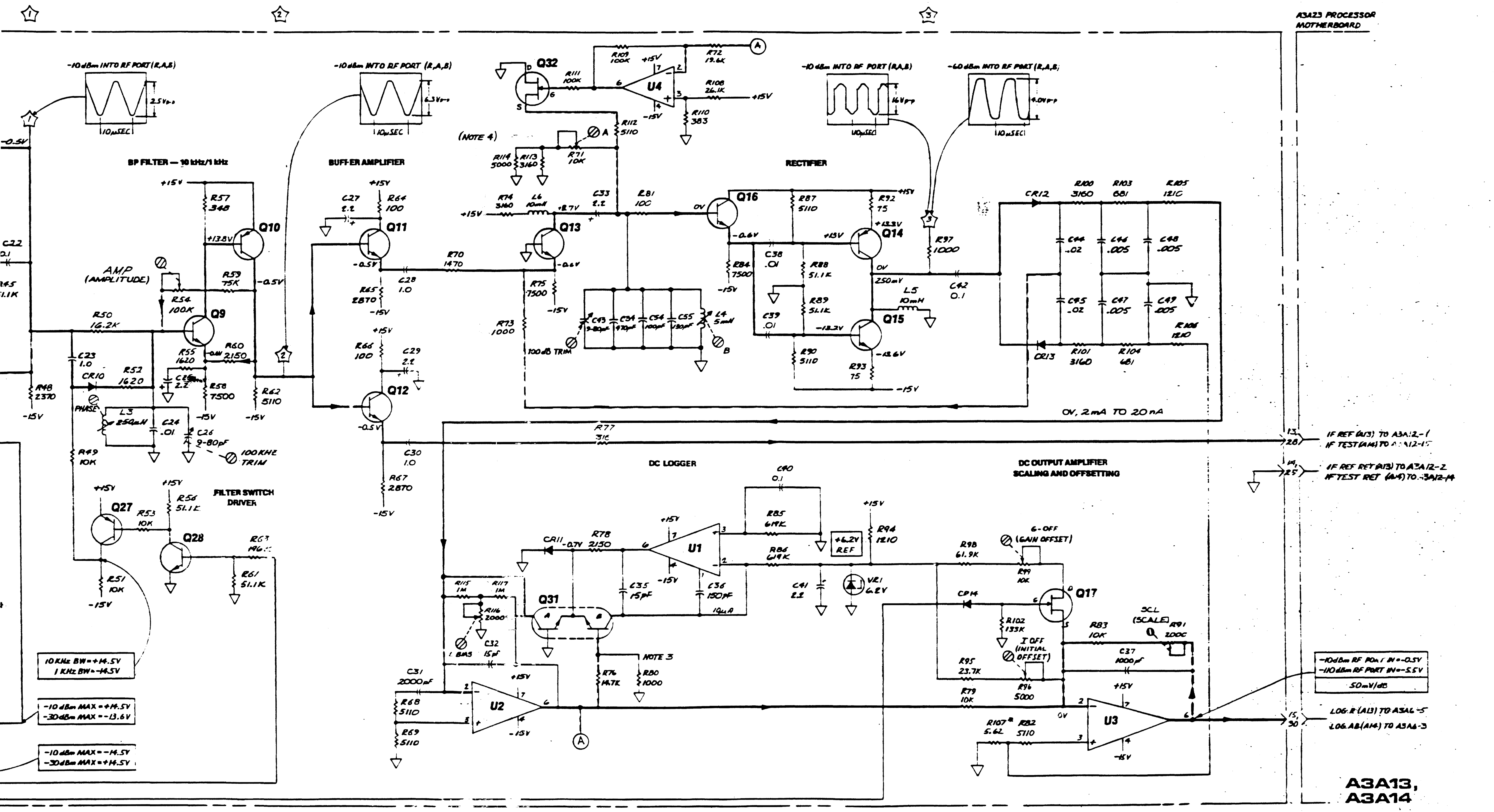


Figure D3-88. A3A13/A14 Magnitude Detector, Schematic (Change 25)

A3A15 ANALOG MULTIPLEXER

General Description

The A3A15 Analog Multiplexer processes several X and Y axis input signals to provide the correct X and Y axis deflection voltages for either a rectangular or polar CRT display. The differences in signal flow for rectangular and polar displays are shown in Figure D3-89 and explained as follows:

Rectangular Display: The Y summing amplifiers (U2, U3) sum and invert the respective channel input signal (CH 1 FILT, CH 2 FILT) with the front panel reference line position offsets (RECT POSN 1, RECT POSN 2) and the diamond marker Y-axis deflection voltage (DIA Y) to develop the CRT display Y-axis deflection voltages for each channel (Y CH 1, Y CH 2). The sweep ramp input (VSW 2) is summed with the front panel horizontal position offset (RECT X POSN) in the X Sweep Amplifier (U5) and then summed with the diamond marker X-axis deflection voltage to develop the swept horizontal CRT deflection voltage. The Z-Axis Summing Amplifier (Q1) provides some CRT trace intensity control and is used to increase the trace intensity when drawing a diamond marker.

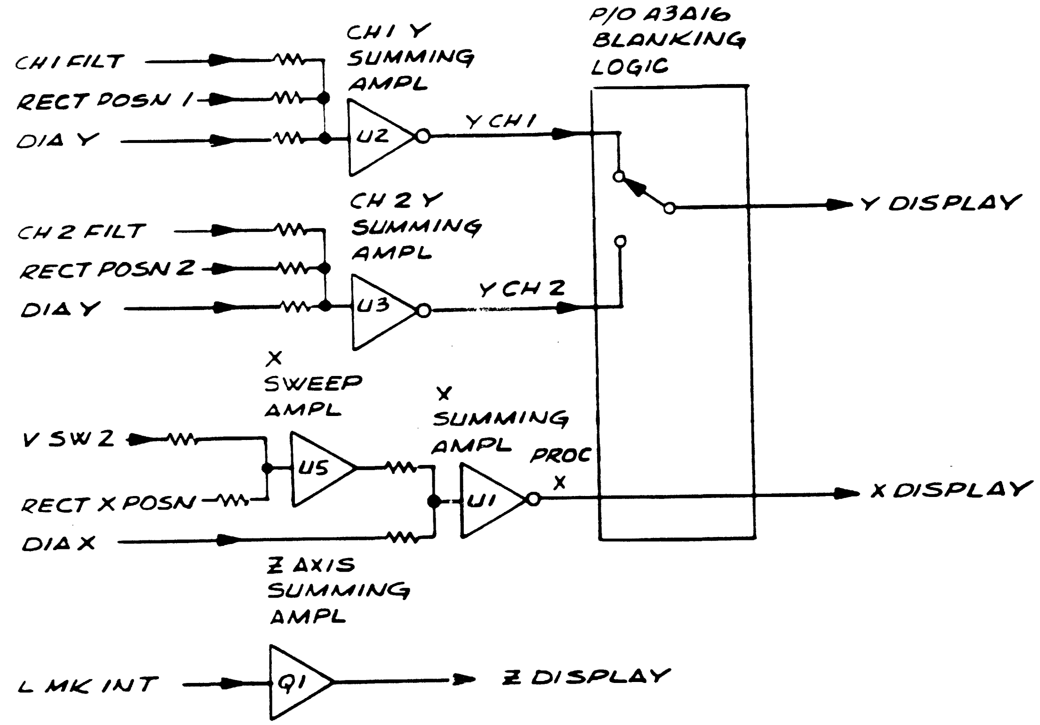
Polar Display: The polar Y-axis input signal is carried on the CH 1 FILT line and the polar X-axis input is carried on the CH 2 FILT input line. When both Channel 1 and Channel 2 are displayed, the Channel 1 and Channel 2 display signals are processed on alternate sweeps. The CH 1 Y Summing Amplifier (U2) sums the CH 1 FILT input with the front panel BEAM CTR Y offset and the diamond marker Y-axis deflection voltage (Y CH 1). The X Summing Amplifier (U1) sums the CH 2 FILT Input with the front panel BEAM CTR X offset and the diamond marker X-axis deflection voltage to obtain the polar display X-axis deflection voltage (PROC X). The Z-Axis Summing Amplifier (Q1) provides some CRT trace intensity control and is used to increase the trace intensity when drawing a diamond marker.

CH 1 Y Summing Amplifier

Rectangular Display: CH 1 FILT is a dc voltage representing the Channel 1 magnitude, phase or group delay measurement and is the primary input to the CH 1 Y Summing Amplifier (U2). The CH 1 FILT Input and the diamond marker Y-axis deflection voltage (DIA Y) are summed through resistors R14 and R19. The Low Polar Alternate (L POL ALT) control input to switch U6B is high (+5V) selecting the Channel 1 position offset (RECT POSN 1) as the third input to the CH 1 Y Summing Amplifier (U2). This RECT POSN 1 input is used to set the Reference Line Position of the Channel 1 CRT trace from the CRT Display Section front panel. Summing amplifier U2 sums and inverts these inputs to provide the Channnel 1 CRT Y-axis deflection voltage (Y CH 1). The CH 1 Y adjustment (R31) sets the gain of summing amplifier U2 and is adjusted for a Y CH 1 output of −0.25 volts/division below the center CRT graticule. Diodes CR8 and CR11 limit the Y CH 11 output to approximately ±1.5 volts to avoid overdriving the CRT Y-axis deflection amplifier. PLOT Y 1 is an auxiliary output to the rear panel CHAN 1 connector A3J4

Polar Display: The CH 1 FILT input carries the polar Y-axis information for the channel being displayed on the CRT. When both channels are displayed, the Channel 1 and Channel 2 polar Y-axis inputs are carried on the CH 1 FILT Input during alternate sweeps. The CH 1 FILT Input is summed with the diamond marker Y-axis deflection voltage (DIA Y) through resistors R14 and R19 and fed to the inverting input of summing amplifier U2. The third input to summing amplifier U2 is the polar Y-axis position offset (LBEAM CTR Y) from the CRT Display Section Front Panel. This signal is selected by switch U6C when the **L POL ALT** control input goes low (0 volts) and is used for centering the polar display in the Y-axis. The three inputs to amplifier U2 are summed and inverted to provide the CRT polar Y-axis deflection voltage (Y CH1).

Rectangular CRT Display



Polar CRT Display

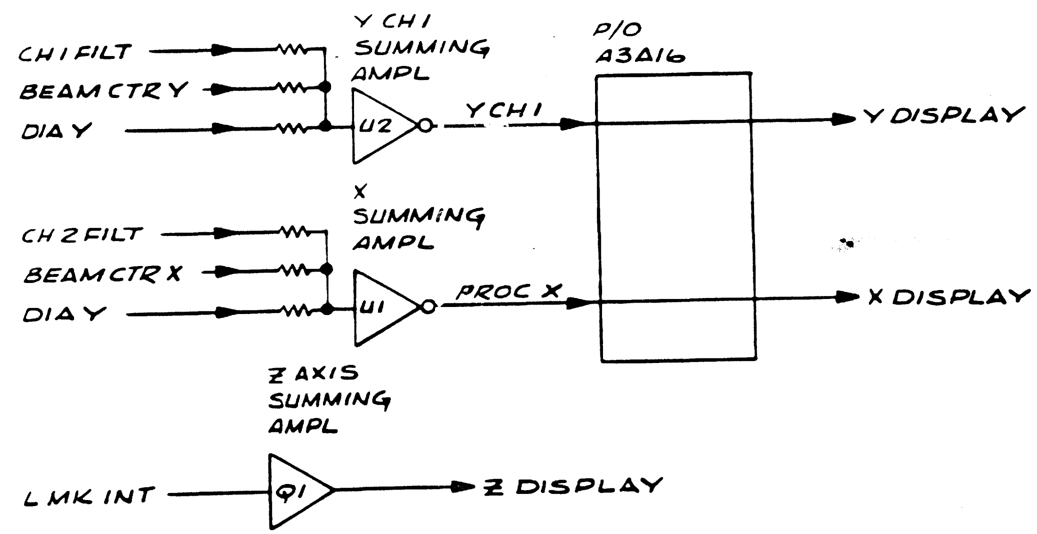
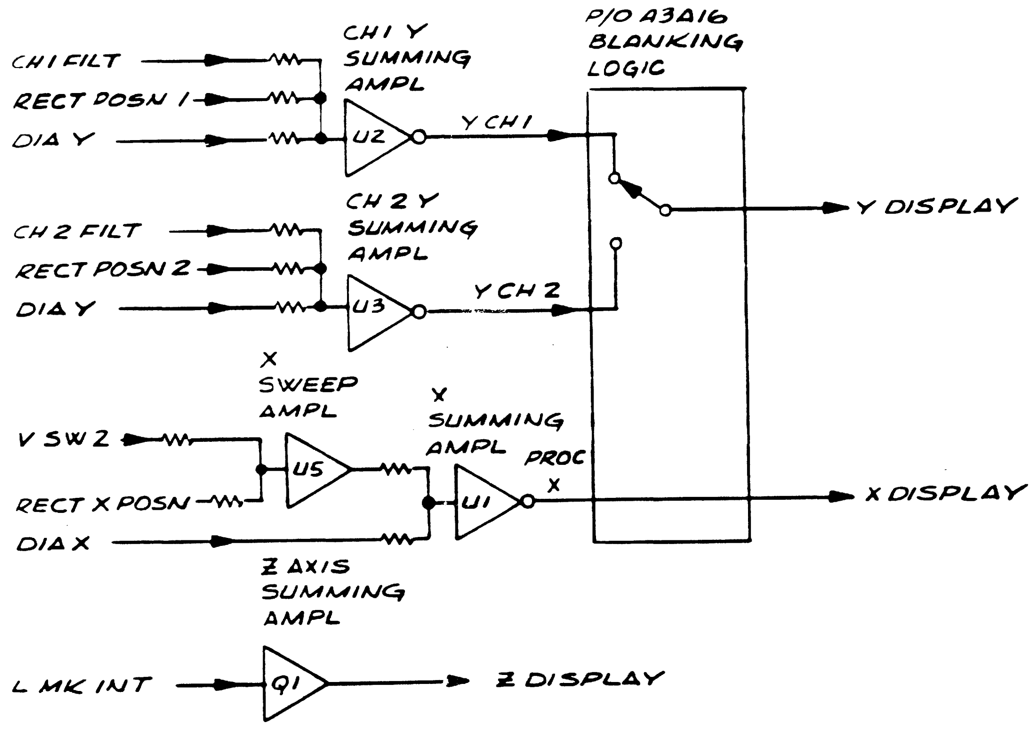


Figure D3-89. A3A15 Analog Multiplexer Simplified Block Diagrams for Rectangular and Polar CRT Displays

Rectangular CRT Display



Polar CRT Display

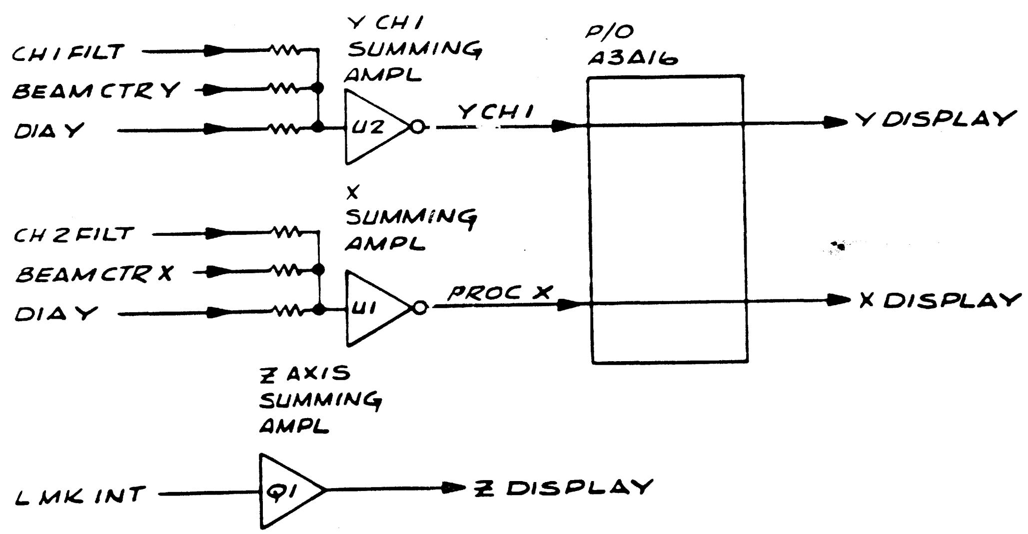


Figure D3-89. A3A15 Analog Multiplexer Simplified Block Diagrams for Rectangular and Polar CRT Displays

CH 2 Y Summing Amplifier (Rectangular Display Only)

CH 2 FILT is a dc voltage representing the Channel 2 magnitude, phase or group delay measurement and is the primary input to the CH 2 Y Summing Amplifier (U3). The CH 2 FILT, marker diamond Y-axis deflection voltage (DIA Y, and the Channel 2 position offset (RECT POSN 2) are summed through resistors R22, R23, and R24 and then applied to the inverting input of amplifier U3. The Channel 2 DIA Y summing resistor (R22) is greater in value than the Channel 1 DIA Y summing resistor (R19) so the diamond marker is noticeably smaller on the Channel 2 CRT trace. CH 2 Y Summing Amplifier (U3) inverts the combined input and diodes CR9 and CR12 limit the Y CH 2 output to approximately ±1.5 volts. The CH 2 Y adjustment (R33) sets the gain of summing amplifier U3 for a Y CH 2 output of −0.25 volts/division below the center CRT graticule. PLOT Y 2 is an auxiliary output to the rear panel CHAN 2 connector A3J5.

X Sweep Amplifier (Rectangular Display Only)

The Level Sweep Enable (LEV SW EN) control input to U4C is normally held high by +5 volts through resistor R11 to select the VSW2 sweep ramp as the primary input to summing amplifier U5. The Level Sweep (LEV SW) input to U4C can only be selected when the LEV SW EN control input from the rear panel TEST SET connector A3J3 is grounded. The SWP WIDTH adjustment (R1) controls the size of the VSWP ramp input to U5 and is used to adjust the width of the CRT trace. The other summing input to U5 is the RECT X POSN line from the CRT Display Section front panel and controlled by the X POSN screwdriver adjustment. This adjustment is used to center the horizontal position of the CRT trace. Amplifier U5 sums and inverts these inputs to provide an inverted sweep ramp with a dc offset determined by the CRT Display Section front panel X POSN adjustment.