Errata

Title & Document Type: **8640A Signal Generator Operating and Service Manual**

Manual Part Number: **08640-90114**

Revision Date: **October 1976**

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, life sciences, and chemical analysis businesses are now part of Agilent Technologies. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A. We have made no changes to this manual copy.

Support for Your Product

Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

www.agilent.com

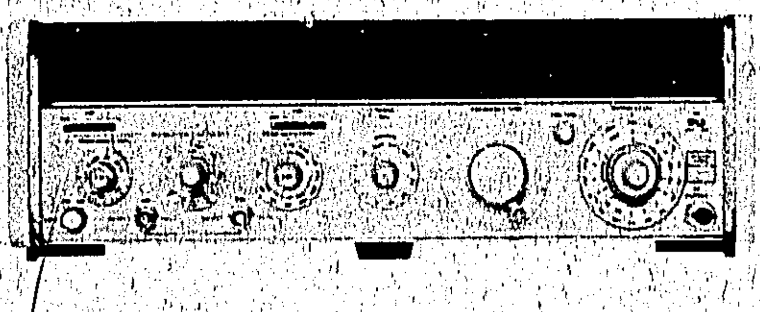
Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

Agilent Technologies

HP 8640A

OPERATING AND SERVICE MANUAL

8640A
SIGNAL GENERATOR



HEWLETT hp PACKARD

HP 8640A

CERTIFICATION

The Hewlett-Packard Company certifies that this instrument met its published specifications at the time of shipment from the factory. Hewlett-Packard Company 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.

WARRANTY AND ASSISTANCE

This Hewlett-Packard product is warranted against defects in materials and workmanship for a period of one year from the date of shipment. Hewlett-Packard will, at its option, repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard, and provided the preventive maintenance procedures in the manual are followed. Repairs necessitated by misuse of the product are not covered by this warranty. NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. HEWLETT-PACKARD IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES.

Service contracts or customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

HEWLETT PACKARD

OPERATING AND SERVICE MANUAL

8640A
SIGNAL GENERATOR
(Including Options 001, 002, and 003)

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1602A and 1624U.

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

1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA U.S.A.

MANUAL PART NO. 08640-90114
Operating Information Supplement Part No. 08640-90115
Microfiche Part No. 08640-90116

Printed: OCTOBER 1976

CONTENTS

CONTENTS (Cont'd)

ILLUSTRATIONS

ILLUSTRATIONS (Cont'd)

ILLUSTRATIONS (Cont'd)

SERVICE SHEETS

TABLES

SAFETY CONSIDERATIONS

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product has been manufactured and tested in accordance with HP Standards.

SAFETY SYMBOLS

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

Indicates hazardous voltages.

Indicates earth terminal (sometimes used in manual to indicate circuit common 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 personal injury. 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 product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

SAFETY EARTH GROUND

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

BEFORE APPLYING POWER

Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

If this product is to be energized via an auto-transformer (for voltage reduction) make sure the common terminal is connected to the earth terminal of the main power source.

SERVICING

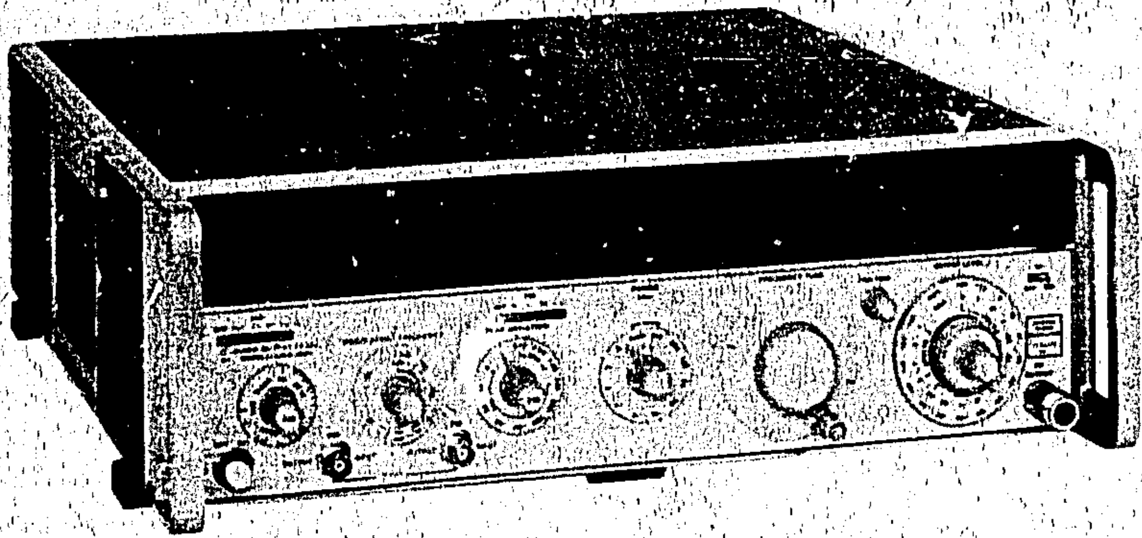
WARNINGS

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

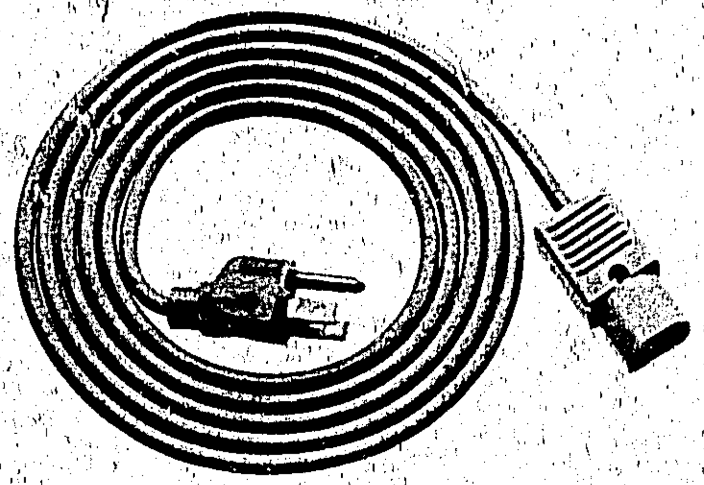
Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from its power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.



MODEL 8640A



LINE POWER CABLE

Figure 1-1. HP Model 8640A Signal Generator (Options 001, 002, and 003) and Accessories Supplied

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This manual contains the operating and service information for the Hewlett-Packard Model 8640A Signal Generator. The Signal Generator (with variable modulation oscillator Option 001, internal doubler Option 002, and reverse power protection Option 003) is shown in Figure 1-1 with all of its externally supplied accessories. Options 001, 002, and 003 are documented in this manual. 8640B Option 004 is an avionics option available only with the 8640B Signal Generator and is not documented in this manual.

1-3. This section of the manual describes the instruments documented by this manual and covers instrument description, options, accessories, specifications and other basic information. The other sections contain the following information:

Section II, Installation: provides information about initial inspection, preparation for use, and storage and shipment.

Section III, Operation: provides information about panel features, and provides operating checks, instructions, and maintenance information.

Section IV, Performance Tests: provides information required to check the performance of the instrument against the critical specifications in Table 1-1.

Section V, Adjustments: provides the information required to properly adjust and align the instrument.

Section VI, Replaceable Parts: provides ordering information for all replaceable parts and assemblies.

Section VII, Manual Changes: this section is reserved to provide manual change information in future revisions of this manual.

Section VIII, Service: provides the information required to repair the instrument.

1-4. Packaged with this manual is an Operating Information Supplement. This is simply a copy of the first three sections of this manual, and should stay with the instrument for use by the operator. Additional copies can be ordered through your nearest Hewlett-Packard Sales and Service office; the part number is listed on the title page of this manual and on the rear cover of the supplement.

1-5. Also listed on the title page of this manual is a "Microfiche" part number. This number can be used to order 4 x 6 inch microfilm transparencies of the manual. Each microfiche contains up to 60 photo duplicates of the manual's pages. The microfiche package also includes the latest Manual Changes supplement as well as all pertinent Service Notes.

1-6. SPECIFICATIONS

1-7. Instrument specifications are listed in Table 1-1. These specifications are the performance standards or limits against which the instrument can be tested. Paragraph 1-18 lists some supplemental performance characteristics. Supplemental characteristics are not specifications but are typical characteristics included as additional information for the user.

1-8. INSTRUMENTS COVERED BY MANUAL

1-9. This instrument has a two-part serial number. The first four digits and the letter constitute the serial number prefix. The last five digits form the sequential suffix that is unique to each instrument. The contents of this manual apply directly to instruments having the same serial number prefix as listed under SERIAL NUMBERS on the title page.

1-10. An instrument manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. This unlisted serial prefix indicates that the instrument is different from those documented in this manual. The manual for this instrument is supplied with a Manual Changes supplement that contains "change information" that documents the differences.

1-11. In addition to change information, the supplement may contain information for correct-

INSTRUMENTS COVERED BY MANUAL (Cont'd)

ing errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is keyed to this manual's print date and part number, both of which appear on the title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-12. For information concerning a serial number prefix not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

1-13. GENERAL DESCRIPTION

1-14. The Model 8640A Signal Generator covers the frequency range 500 kHz to 512 MHz (450 kHz to 550 MHz with over-range) and can be extended to 1100 MHz with an external doubler or optional internal doubler. An optional variable audio oscillator is also available to extend the CW output range of the generator down to 20 Hz. This broad coverage, together with calibrated output and modulation, permits complete RF and IF performance tests on virtually any type of HF, VHF, or UHF receiver. Protection against RF power accidentally applied into the generator output is also available.

1-15. This solid-state generator has an output level range of +19 to −145 dBm (2V to 0.013 μV) from 500 kHz to 512 MHz and is calibrated and metered. In the standard instrument, the output is leveled to within ±0.5 dB across the full frequency range. In the Option 002, the output is leveled to within ±0.5 dB from 500 kHz to 64 MHz, within ±1.0 dB from 64 to 512 MHz, and within ±1.5 dB on the doubled range (512 to 1024 MHz). Maximum output is +13 dBm on this range.

1-16. The generator also provides AM, FM, and pulse modulation for a wide range of receiver test applications. AM and FM can be performed independently or simultaneously in either the internal or external modes. This modulation is calibrated and metered for direct readout under all operating conditions. External pulse modulation capability is also provided.

1-17. Other significant features are extremely low noise, and front panel controls designed for operating convenience and flexibility.

1-18. PERFORMANCE CHARACTERISTICS

1-19. Spectral Purity

1-20. The basic frequency source of the Signal Generator is a mechanically tuned high-Q cavity oscillator that operates over the frequency range 230–550 MHz. This oscillator has an inherent stability of better than 10 ppm/10 min and exceptionally low noise characteristics. The lower 9 frequency ranges are obtained by dividing the basic oscillator frequency and filtering the unwanted harmonics. Using this technique, sub-harmonic and non-harmonic spurious signals are virutally eliminated. A band over-range of +7% and −10% adds convenience when operating near the nominal band edges. In the Option 002, an internal doubler extends the frequency range to 1100 MHz.

1-21. Frequency tuning within a selected range is accomplished with an 8-turn FREQUENCY TUNE control (see Figure 3-2) for fast selection of the desired output frequency. A mechanical FINE TUNE control has a tuning range of 1000 ppm for precise frequency setting.

1-22. Restabilization time is short when tuning the frequency across any one range. The total frequency excursion after any frequency change is typically <20 ppm and within 15 minutes the output has restabilized to the specified 10 ppm/10 min. No restabilization time is required when switching frequency bands for a fixed position on the FREQUENCY TUNE control.

1-23. Noise performance of the generator is state-of-the-art for a solid-state generator. The high-Q cavity oscillator has been optimized by use of a low noise microwave transistor for a spectrally pure output signal. Figure 1-2 shows the typical measured single-sideband noise performance in a 1 Hz bandwidth for various offsets from a (256 and 512 MHz) carrier. The low close-in noise characteristic is ideally suited for the stringent adjacent channel tests that are commonly made on a wide variety of communication receivers.

1-24. Figure 1-3 gives a plot of the guaranteed SSB noise performance for a 20 kHz offset from the carrier for the 256–512 MHz range. From 230 to 450 MHz, noise is > 130 dB/$\sqrt{Hz}$ below the carrier level and rises to 122 dB/$\sqrt{Hz}$ at 550 MHz. This signal-to-noise ratio decreases by approximately 6 dB for each division of the output frequency down to the broadband noise floor of better than 140 dB/$\sqrt{Hz}$, and increases 6 dB for the Option 002

Spectral Purity (Cont'd)

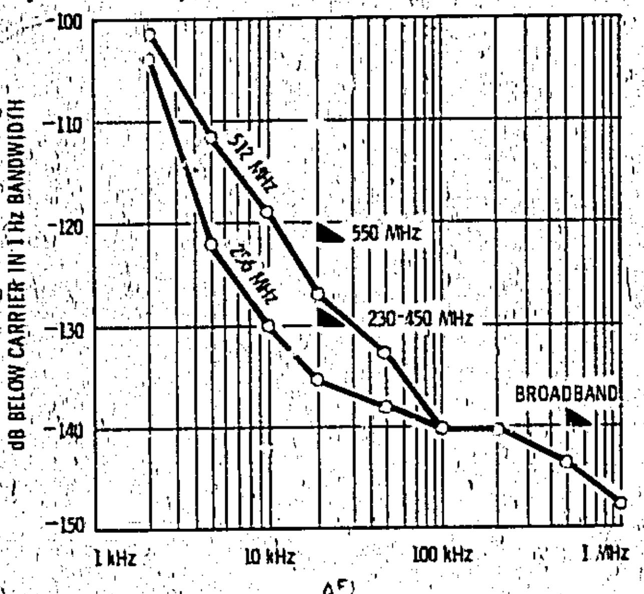


Figure 1-2. Measured Single Sideband Noise vs Offset from Carrier (stated in a 1 Hz bandwidth at 256 and 512 MHz carrier frequencies on 256–512 MHz Range). Markers indicate specified limits.

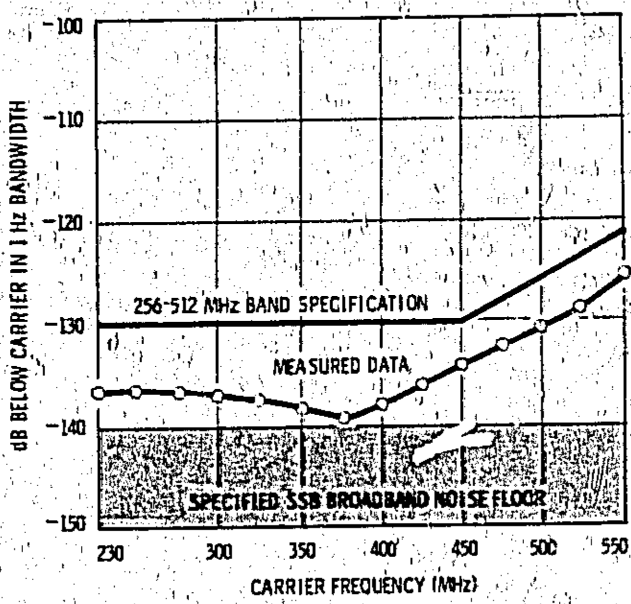


Figure 1-3. Specified Signal-to-Phase-Noise Ratio at 20 kHz Offset vs Carrier Frequency (stated in a 1 Hz bandwidth). For lower frequencies, phase noise decreases approximately 6 dB per frequency division down to the broadband noise floor and increases 6 dB for the Option 002 doubled range.

doubler range. This exceptional noise performance is also preserved during FM.

1-25. Amplitude Modulation

1-26. AM is variable from 0 to 100% with the bandwidth, accuracy, and low incidental FM required for the most stringent AM applications. The front panel meter gives a direct readout of AM% in either the internal or external mode.

1-27. AM at rates up to 60 kHz is possible depending on carrier frequency and modulation depths. Distortion is specified at 400 Hz and 1000 Hz to be <1% up to 50% AM, <3% to 90% AM (AM is degraded on the Option 002 doubler range). Figure 1-4 shows measured AM distortion characteristics for other modulation frequencies. Note that for 0–50% AM, distortion is <1% to approximately 50 kHz for an output frequency of 200 MHz.

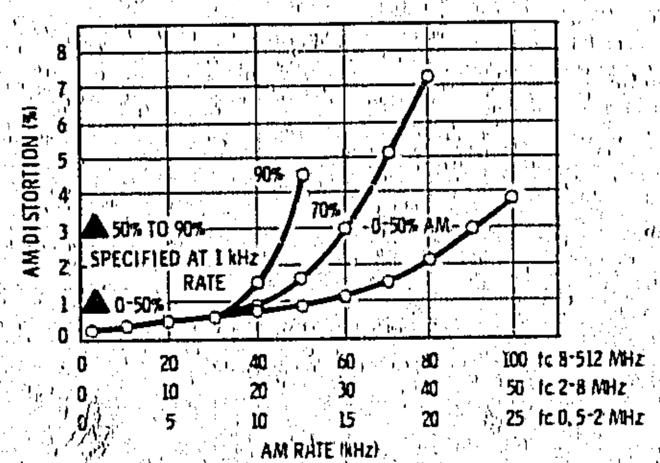


Figure 1-4. AM Distortion vs AM Rate Measured at 200 MHz and +13 dBm (but applies to all ranges). (Supplemental information only.)

1-28. Pulse Modulation

1-29. Also included on the AM function switch is a position for external PULSE modulation. In this mode, pulse inputs with repetition rates to 500 kHz and widths down to 2 μs can be applied to modulate the RF carrier. Rise and fall times vary with output frequency down to <1 μs from 8 to 512 MHz. With the internal doubler, rise and fall times are typically <1 μs on the 512–1024 MHz range.

1-30. Pulse inputs turn the RF on. Hence with no pulse input the RF will read approximately zero on the built-in level meter. For pulse inputs greater

Pulse Modulation (Cont'd)

than 0.5V, the RF output is on, level calibration is preserved, and the level meter reads the pulse-on power of the RF output. For repetition rates below that specified, the pulsed RF output is still available but the pulse-on level is no longer calibrated or metered.

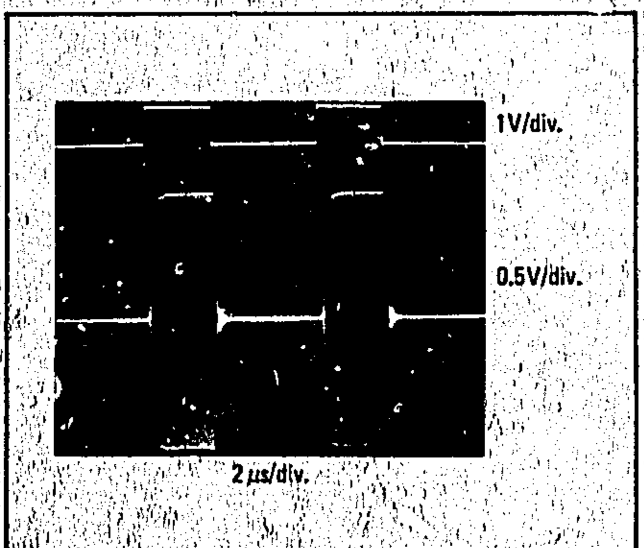


Figure 1-5. Pulsed RF 20 MHz Carrier

1-31. Frequency Modulation

1-32. FM is calibrated, metered, and constant with RF frequency and range changes. Peak deviations to at least 0.5% of carrier frequency are available (i.e., 1% of the minimum frequency in each octave range). On the 256–512 MHz range, for example, the maximum deviation is 2.56 MHz peak or 5.12 MHz peak-to-peak. With this capability, it is possible to sweep the generator using the dc coupled FM mode and a saw-tooth input, to test and align IF filters and discriminators.

1-33. For narrowband FM applications, a minimum full-scale deviation of 5 kHz is provided on the meter and the PEAK DEVIATION range switch. When switching from the CW to FM mode, there is negligible shift in carrier frequency and no degradation in spectral purity. It is possible to modulate at rates from dc to 250 kHz with a carrier drift stability of <10 ppm/10 min.

1-34. Standard and Optional Audio Oscillators

1-35. Standard tones for internal modulation are 400 Hz and 1000 Hz. These tones are also available at the front panel and can be varied in output level from 1 μV to 1V into 600Ω.

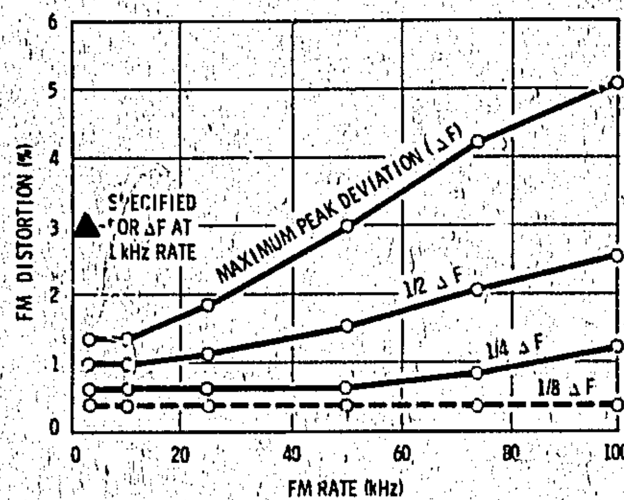


Figure 1-6. FM Distortion vs FM Rate, Measured on the 8–16 MHz Range (but applies to all ranges). (Supplemental information only.)

1-36. Optionally available on the Signal Generator is a built-in variable frequency oscillator covering the range 20 Hz to 600 kHz (fixed tones of 400 Hz and 1000 Hz are also provided). This internal oscillator has a wide range of standard modulation frequencies and is useful for testing receiver audio bandwidths. The output from this modulation source is available separately at the front panel and is continuously variable from >20 mV to 3V into 600Ω. This audio oscillator, Option 001, extends the usable CW range of the generator down to 20 Hz.

1-37. Multi-Function Meter and Annunciators

1-38. The panel meter on the Signal Generator monitors the RF output level in dBm and volts, the AM percentage, and the FM peak deviation in kHz or MHz. Pushbuttons select the meter function, and scale lights indicate the range on which the meter should be read.

1-39. Three front panel annunciators indicate when certain settings of RF level and modulation controls exceed specified limits. Besides alerting the operator to invalid control settings, the annunciators indicate how to return the instrument to proper operation.

1-40. The REDUCE PEAK POWER annunciator lights whenever the combined settings of RF output and AM modulation levels exceed allowable limits. In the standard instrument, the specification allows for up to 100% AM at all RF output levels except the +20 dBm range. On the +20 dBm range, peak envelope levels of +19 dBm are allowed

Multi-Function Meter and Annunciators (Cont'd)
before the annunciator will light. In the Option 002, the RF output is limited to +13 dBm and the peak envelope power (carrier plus AM depth) may not exceed the maximum level of any output level range. For example, if output level control is set to the −20 dBm position, (maximum output level is −17 dBm) the peak envelope power may not exceed −17 dBm. The REDUCE PEAK POWER annunciator lights when peak envelope power has been exceeded. When the annunciator lights it is necessary to reduce either the output level or the AM modulation.

1-41. The REDUCE PEAK DEVIATION annunciator lights whenever the PEAK DEVIATION RANGE switch has been set to exceed the allowable limits for any output FREQUENCY RANGE. The specification allows for a maximum peak deviation of 1% of the minimum frequency in each range (e.g., 2.56 MHz on the 256–512 MHz range). When the annunciator lights, the FM is automatically turned off and the FM meter reads zero.

1-42. The REDUCE FM VERNIER annunciator lights whenever the FM input and FM vernier setting combine to exceed the 1 volt drive level required for maximum deviation indicated on the PEAK DEVIATION range switch. When this occurs, either the FM vernier or the amplitude of the incoming modulation signal should be reduced to obtain specified FM performance.

1-43. Output Level

1-44. The wide output range of the generator is achieved with a 10 dB step attenuator and a concentric vernier. Output levels are read on the meter. Meter scales are selected automatically.

1-45. The maximum output level of +19 dBm permits high level tests on receiver IFs, amplifiers, and mixers without additional power amplification. At the same time, extremely low leakage enables receiver sensitivity measurements down to levels of 0.03 μV in a shielded system.

1-46. OPTIONS

1-47. Option 001. Option 001 (documented in this manual) provides a modulation oscillator that is continuously adjustable from 20 Hz to 600 kHz. The oscillator can also be set for 400 Hz or 1 kHz fixed tones. Option 001 may be retrofitted.

1-48. Option 002. Option 002 (documented in this manual) provides an internal, active frequency doubler that extends the frequency range of the generator to 1024 MHz (to 1100 MHz with overrange). Option 002 is available only as a factory installed option.

1-49. Option 003. Option 003 (documented in this manual) protects the generator's output circuits from accidental applications of reverse power up to 50 watts. Option 003 may be retrofitted.

1-50. ACCESSORIES SUPPLIED

1-51. The Model 8640A is supplied with the following accessories:

- Line Power Cable (refer to paragraph 2-12)
- 1.25 Amp Fuse (HP 2110-0094)
- Combination Wrench (HP 08640-00027, mounted inside chassis).

1-52. EQUIPMENT AVAILABLE

1-53. Down Converter. The HP Model 11710A Down Converter is a self-contained unit that extends the frequency range of the generator down to 5 kHz. This is accomplished by heterodyning a 5.0 to 5.5 MHz output from the generator with a 5 MHz local oscillator. Output level and modulation calibration of the Signal Generator are preserved, and the output frequency is that displayed by the generator minus 5 MHz. For convenience the output of the Down Converter can be switched to provide direct output from the Signal Generator.

1-54. Variable Frequency Modulation Oscillator Retrofit Kit (HP 08640-60076). This kit contains all the necessary components and full instructions for installation of the variable-frequency modulation oscillator. After installation and calibration, performance will be identical to the 8640A Option 001 specifications.

1-55. Reverse Power Protection Retrofit Kit. The HP Model 11699A Reverse Power Protection Retrofit Kit contains all the necessary components and full instruction for installation of the reverse power protection. Installation of the kit is very simple and minimum recalibration is required. After installation and calibration, performance will be identical to the 8640A Option 003 specifications.

1-56. Termination. The HP Model 11507A Termination maintains the generator's output level cali-

EQUIPMENT AVAILABLE (Cont'd)

bration when the output is connected to load impedances other than 50 ohms. It can provide source impedances of 25 and 5 ohms, and can simulate a broadcast-band dummy antenna. The frequency range is 50 kHz to 65 MHz.

1-57. 75-Ohm Adapter. The HP Model 11687A 50-to-75 Ohm Adapter connects to the generator's output to provide a source impedance of 75 ohms.

1-58. Doubler. The HP Model 11690A Doubler extends the usable frequency range of the generator without Option 002 one octave to 1024 MHz (actually to 1100 MHz with 7% frequency overrange). Conversion loss in the doubler is typically <13 dB.

1-59. Bandpass Filters. For Option 002, the HP Models 11697A, B, and C Bandpass Filters connect to the RF OUTPUT jack to eliminate harmonic and subharmonic related signals. Figures 1-7 and 1-8 illustrate the advantage of using these bandpass filters. However, a small insertion loss (typically less than 1.1 dB), and impedance mismatch error (typically less than ±0.2 dB) will be introduced into the measurement system which will affect output power, and level accuracy. (Mismatch error is maximum at maximum RF output but can be substantially reduced by increasing the generator's output attenuation.)

Filter	Pass Band
HP 11697A	512–674 MHz
HP 11697B	674–890 MHz
HP 11697C	800–1100 MHz

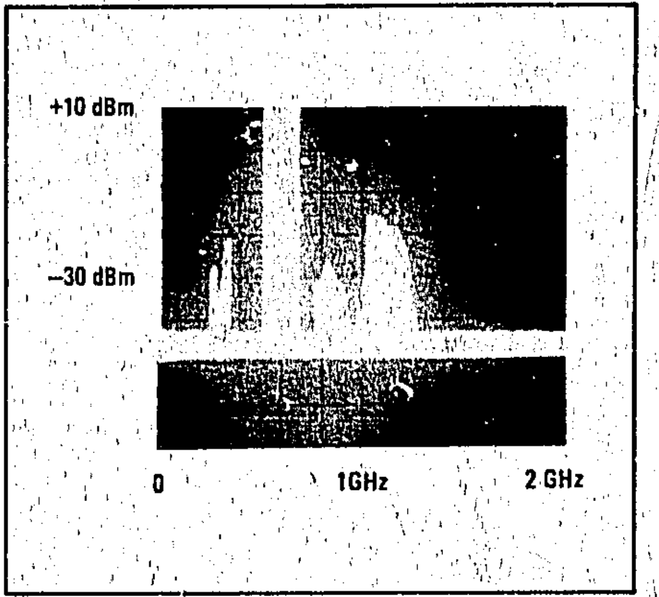


Figure 1-7. RF Output, 512–674 MHz, Without Bandpass Filter (Option 002)

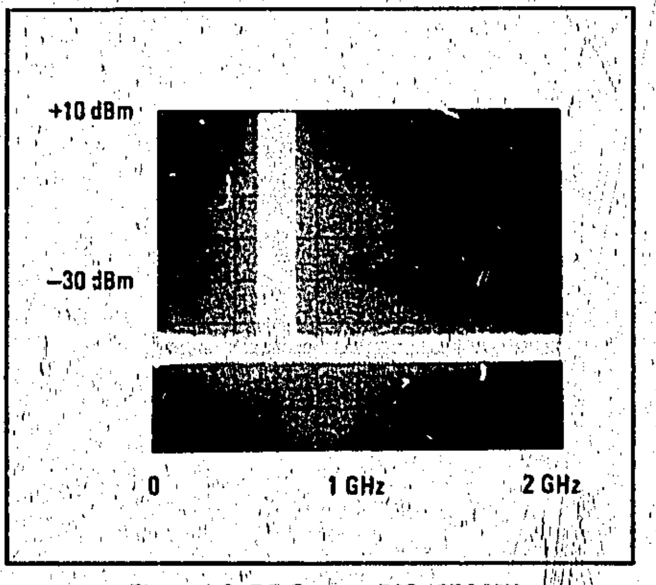


Figure 1-8. RF Output, 512–674 MHz With HP 11697A Bandpass Filter (Option 002)

1-60. SERVICE AND USER AIDS

1-61. Video Tapes. Video tapes covering instrument use, application, and service are available. Contact the nearest Hewlett-Packard Sales and Service Office for a list of presently available tapes.

1-62. Application Notes. Informative notes concerning the use of signal generators are also available from the nearest Hewlett-Packard Sales and Service Office.

1-63. Service Notes. Hewlett-Packard makes design improvements to its current line of instruments on a continuing basis. Many of these improvements can be incorporated in instruments produced earlier. Modification and general service information is passed on in the form of Service Notes. To obtain the Service Notes contact the nearest Hewlett-Packard Sales and Service Office.

1-64. WARRANTY

1-65. The Signal Generator is warranted and certified as indicated on the inner front cover of this manual. For further information, contact the nearest Hewlett-Packard Sales and Service Office; addresses are provided at the back of this manual.

1-66. TEST EQUIPMENT REQUIRED

1-67. Tables 1-2 and 1-3 list the test equipment and accessories required to check, adjust and repair the Signal Generator, including Options 001, 002, and 003. (Table 4-1 is a separate list of relatively inexpensive, commonly available test equipment for the Basic Functional Checks only). If substitute equipment is used it must meet the listed critical specifications.

NOTE

The safety classification of this instrument is Safety Class I. It has been designed and tested according to IEC Publication 348, SAFETY REQUIREMENTS FOR ELECTRONIC MEASURING APPARATUS, and has been supplied in safe condition. The instruction manual contains information, warnings, and cautions which must be followed by the user to ensure safe operation and to retain the instrument in safe condition.

Table 1-1. Specifications (1 of 7)

(All specifications apply over the nominal Frequency Ranges and over the top 10 dB of the output level vernier range unless otherwise specified.)

FREQUENCY CHARACTERISTICS

Range: 500 kHz to 512 MHz in 10 octave ranges.

Option 002 (Internal Doubler): 500 kHz to 1024 MHz in 11 octave ranges.

Ranges and Range Overlap: Ranges extend approximately 10% below and 7% above the nominal Frequency Ranges shown below.

Frequency Ranges (MHz)	Frequency Ranges (MHz) (with overlap)
0.5–1	0.45–1.07
1–2	0.90–2.14
2–4	1.80–4.29
4–8	3.60–8.59
8–16	7.20–17.1
16–32	14.4–34.3
32–64	28.8–68.7
64–128	57.5–137
128–256	115–275
256–512	230–550
512–1024[1] (Option 002)	460–1100

Dial Resolution:

Accuracy: better than ± 1%.

Resettability: better than 0.1% (when approaching from below).

Fine Tuning:

>1000 ppm total range.

Stability:

Time (after 2 h warm-up): <10 ppm/10 min.

Temperature: <50 ppm/°C.

Line Voltage[2] (+5% to − 10% line voltage change): <1 ppm.

Load (with any passive load change): <1 ppm.

Level Change (10 dB on output level vernier): <1 ppm.

Mode Change (CW to FM): <1% of selected peak deviation or <200 Hz (400 Hz for Option 002) whichever is greater.

Restabilization Time:

After frequency change: <15 min.

After range change: none.

[1] 512–1024 MHz can also be obtained using an external doubler Model 11690A.

[2] This specification is for short term transient line changes.

Table 1-1. Specifications (2 of 7)

SPECTRAL PURITY

Harmonics (at 1 volt, +10 dBm output range and below):
0.5 to 512 MHz: >30 dB below carrier (dBc).
512 to 1024 MHz (Option 002): >12 dBc.

Spurious Output Signals (excluding frequencies within 15 kHz of the signal whose effects are specified in residual AM and FM):

Frequency Range (MHz)	Subharmonically Related[1] (dBc)	Non-harmonically Related (dBc)
0.5 to 512	None detectable	None detectable
512 to 1024 (Option 002)	>20	None detectable

Noise: (averaged rms noise level below carrier stated in a 1 Hz bandwidth):

SSB Phase Noise at 20 kHz offset from carrier.
512 to 1024 MHz (Option 002): >124 dBc from 460 to 900 MHz increasing linearly to >116 dBc at 1100 MHz.

256 to 512 MHz: >130 dBc from 230 to 450 MHz increasing linearly to >122 dBc at 550 MHz.

0.5 to 256 MHz: decreases approximately 6 dB for each divided frequency range until it reaches SSB Broadband Noise Floor of > 140 dBc.

SSB Broadband Noise Floor at maximum output vernier and offset greater than 500 kHz from carrier.

512 to 1024 MHz (Option 002): >137 dBc.
0.5 to 512 MHz: >140 dBc.

Residual AM (averaged rms):

Post-Detection Noise Bandwidth	
300 Hz to 3 kHz	20 Hz to 15 kHz
>85 dBc	>78 dBc

Residual FM (averaged rms):

Frequency Range (MHz)	Post-Detection Noise Bandwidth			
	CW and up to 1/8 maximum allowable deviation		Up to maximum allowable peak deviation	
	300 Hz to 3 kHz	20 Hz to 15 kHz	300 Hz to 3 kHz	20 Hz to 15 kHz
256 to 512	<5 Hz	<15Hz	<15Hz	<30Hz
512 to 1024 (Option 002)	<10 Hz	<30Hz	<30Hz	<60Hz

Note: Residual FM for ranges below 256—512 MHz decreases by approximately ½ for each divided frequency range until limited by the broadband noise floor. This limit for 300 Hz to 3 kHz bandwidth is ≈ 1 Hz and for 20 Hz to 15 kHz bandwidth is ≈ 4 Hz.

[1] In the 512—1024 MHz range (Option 002), subharmonically related signals are 1/2F, (i.e., oscillator fundamental), 3/3F, 5/2F, etc.

Table 1-1. Specifications (3 of 7)

OUTPUT CHARACTERISTICS

Range: 10 dB steps and 18 dB vernier provide the following output power settings into 50Ω.

Frequency Range (MHz)	8640A	With Options 002	003	002/003
0.5–512	+19 to −145 dBm (2V to 0.013 μV)	+18.5to −145 dBm (1.9V to 0.013 μV)	+18.5 to −145 dBm (1.9V to 0.013 μV)	+18 to −145 dBm (1.8V to 0.013 μV)
512–1024 (Option 002)	–	+13 to −145 dBm (1V to 0.013 μV)	–	+12 to −145 dBm (0.9V to 0.013 μV)

Reverse Power Damage Level (without Reverse Power Protection, Option 003):
40 Vdc maximum or RF power level shown below:

Frequency Range (MHz)	Output Range 3V	1V	0.3V	All Others
0.5–512	100 mW (20 dBm)	100 mW (20 dBm)	500 mW (27 dBm)	500 mW (27 dBm)
512–1024 (Option 002)	20 mW (13 dBm)	20 mW (13 dBm)	200 mW (23 dBm)	500 mW (27 dBm)

Reverse Power Protection (Option 003): Protects Signal Generator from accidental application of up to 50W (+47 dBm) of RF power (between dc and 1100 MHz) into generator output.

Leakage (with all unused outputs terminated properly):
Leakage limits are below those specified in MIL-I-6181D. Furthermore, less than 3 μV is induced in a 2-turn, 1-inch diameter loop one inch away from any surface and measured into a 50Ω receiver. This permits receiver sensitivity measurements to at least <0.03 μV in a shielded system.

Auxiliary Output: Rear panel BNC output is > −5 dBm into 50Ω, source impedance is approximately 500Ω. This output is not doubled on the 512–1024 MHz range (Option 002).

Level Flatness (referred to output at 50 MHz and applies to 1V range and for top 10 dB of vernier range):

Frequency Range (MHz)	Option Combination Standard	002	003	002/003
0.5–64	±0.5 dB	±0.5 dB	+0.75 dB −1.25 dB	+1.0 dB −2.0 dB
64–512		±1.0 dB		
512–1024 (Option 002)	–	±1.5 dB	–	±2.0 dB

Table 1-1. Specifications (4 of 7)

OUTPUT CHARACTERISTICS (Cont'd)

Impedance: 50Ω, ac coupled, SWR less than:

Frequency Range (MHz)	Output Level Range	Option Combination			
		Standard SWR	002 SWR	003 SWR	002/003 SWR
0.5–512	3V and 1V	2.0	2.5	2.5	2.5
	0.3V and below	1.3	1.3	1.5	1.7
512–1024 (Option 002)	1V	–	2.5	–	2.5
	0.3V and below	–	1.5	–	1.7

Level Accuracy (total accuracy as indicated on Level Meter):[1]

Frequency Range (MHz)	Output Level (dBm)			
	Using Top 10 dB of Vernier Range[2]			With Reverse Power Protection (Option 003)
	+19 to −7	−7 to −47	−47 to −137	+18.5 to −137
0.5–512	±1.5 dB	±2.0 dB	±2.5 dB	Add +0.25 dB −0.75 dB

With Internal Doubler (Option 002):

Frequency Ranges (MHz)	Output Level (dBm)			
	Using Top 10 dB of Vernier Range[2]			With Reverse Power Protection (Option 003)
	+18.5 to −7	−7 to −47	−47 to −137	+18 to −137
0.5–64	±1.5 dB	±2.0 dB	±2.5 dB	Add +0.5 dB −1.5 dB
64–512	±2.0 dB	±2.5 dB	±3.0 dB	Add +0.0 dB −1.0 dB
512–1024	±3.0 dB (+13 to −7 dBm)	±3.5 dB	±4.0 dB (−47 to −127 dBm)	Add ±0.5 dB (+12 to −128 dBm)

[1]Level Accuracy error consists of allowances for: meter accuracy, detector linearity, temperature, flatness, attenuator accuracy, and twice the measurement error. All but the attenuator accuracy and the measurement error can be calibrated out with a power meter at a fixed setting. See HP Application Note 170-1.

[2]When below top 10 dB of Vernier Range, add ± 0.5 dB.

Table 1-1. Specifications (5 of 7)

MODULATION CHARACTERISTICS

General

Types: Internal AM and FM.
External AM, FM, and PULSE.
Simultaneous AM and FM or PULSE and FM.

Internal Modulation Sources (independently adjustable output is available at front panel):

Standard:
Frequency: fixed 400 Hz and 1 kHz ±3%.
Output Level: indicated 1 mV to 1 Vrms into 600Ω.

Optional (Internal Variable Audio Oscillator Option 001):
Frequency: variable 20 Hz to 600 kHz ±15% in 5 continuous decade ranges plus fixed 400 Hz and 1 kHz ±3%.
Output Level: indicated 1 mV to 3V into 600Ω.
Total Harmonic Distortion:
<0.5 % 400 Hz and 1 kHz fixed tones.
<0.5 % 20 Hz to 2 kHz.
<1.0 % 2 kHz to 200 kHz.
<2.0 % 200 kHz to 600 kHz

Amplitude Modulation

(AM specifications apply to the top 10 dB of output vernier range unless otherwise specified.)

Depth:
0.5 to 512 MHz: 0 to 100% for output levels of +13 dBm and below.[1]
512 to 1024 MHz (Option 002): 0 to 100% for output levels of +7 dBm and below, for 6 dB to 16 dB down on vernier range.[2]

AM Rate: Internal and External ac; 20 Hz to AM 3-dB bandwidth. External dc; dc to AM 3-dB bandwidth.

AM 3-dB Bandwidth:

Frequency Ranges (MHz)	0 to 50% AM	50 to 90% AM
0.5–2	20 kHz	12.5 kHz
2–8	40 kHz	25 kHz
8–512	60 kHz	50 kHz
512–1024 (Option 002)	60 kHz	50 kHz

AM Distortion (at 400 Hz and 1 kHz rates):

Frequency Ranges (MHz)	0 to 50% AM	50 to 90% AM
0.5–512	<1%	<3%
Frequency Range (MHz)	**0 to 30% AM**	**30 to 90% AM**
512–1024 (Option 002)	<10%	<20%

External AM Sensitivity (400 Hz and 1 kHz rates):
0.5 to 512 MHz: (0.1 ±0.005)% AM per mV peak into 600Ω with AM vernier at fully cw position.
512 to 1024 MHz (Option 002):
Nominal 0.1% AM per mV peak into 600Ω with AM vernier at fully cw position.

Indicated AM Accuracy (400 Hz and 1 kHz rates using internal meter):
0.5 to 512 MHz: ± (5.5% of reading +1.5% full scale) from 0 to 50°C.
512 to 1024 MHz (Option 002):
Not specified; each generator can be individually calibrated using operating manual procedure.

Peak Incidental Phase Modulation (at 30% AM):
0.5 to 128 MHz: <0.15 radians.
128 to 512 MHz: <0.3 radians.
512 to 1024 MHz (Option 002): <0.6 radians.

Peak Incidental Frequency Deviation: Equals peak incidental phase modulation X modulation rate.

[1] AM is possible above +13 dBm as long as the peak envelope power (carrier output plus AM depth) does not exceed +19 dBm (+18.5 dBm with Option 003).

[2] AM is possible above +7 dBm as long as the peak envelope power (carrier output plus AM depth) does not exceed +13 dBm (+12 dBm with Option 002/003). Also, the peak envelope power (carrier plus AM depth) may not exceed the maximum level of any output level range. For example, if the output level control is set to the −20 dBm position (maximum output level is −17 dBm), the peak envelope power may not exceed −17 dBm. The REDUCE PEAK POWER annunciator lights when peak envelope power has been exceeded.

Table 1-1. Specifications (6 of 7)

MODULATION CHARACTERISTICS (Cont'd)

Pulse Modulation

(Specifications apply for top 10 dB of output vernier range)

Frequency Ranges (MHz)	0.5 to 1	1 to 2	2 to 8	8 to 32	32 to 512	512 to 1024 (Option 002)
Rise and Fall Times	<9 µs	<4 µs	<2 µs	<1 µs		<1 µs typical
Pulse Repetition Rate	50 Hz to 50 kHz		50 Hz to 100 kHz	50 Hz to 250 kHz	50 Hz to 500 kHz	
Pulse Width Minimum for Level Accuracy Within 1 dB of CW (>0.1% duty cycle)	10 µs		5 µs	2 µs		
Pulse ON/OFF Ratio at Maximum Vernier	>40 dB					>60 dB
Peak Input Required	Nominally >+0.5V (5V max.) sinewave or pulse return to zero into 50Ω.					

Frequency Modulation

Deviation: Maximum allowable deviation equals 1% of lowest frequency in each range as shown below.

Frequency Range (MHz)	Maximum Peak Deviation (kHz)
0.5 – 1	5
1 – 2	10
2 – 4	20
4 – 8	40
8 – 16	80
16 – 32	160
32 – 64	320
64 – 128	640
128 – 256	1280
256 – 512	2560
512 – 1024 (Option 002)	5120

FM 3-dB Bandwidth:
Internal and External ac; 20 Hz to 250 kHz.
External dc; dc to 250 kHz.

FM Distortion (at 400 Hz and 1 kHz rates):
<1% for deviations up to 1/8 maximum allowable.
<3% for deviations up to maximum allowable.

External FM Sensitivity: 1 volt peak yields maximum deviation indicated on PEAK DEVIATION switch with FM vernier at fully cw position.

External FM Sensitivity Accuracy (400 Hz and 1 kHz rates from 15° to 35°C):
Excluding maximum peak deviation position: ±6%.
Maximum peak deviation position: ±9% typically.

Indicated FM Accuracy (400 Hz and 1 kHz rates from 15° to 35°C, using internal meter):
Excluding maximum peak deviation position: ± (7% of reading +1.5% full scale).
Maximum peak deviation position: ± (10% of reading +1.5% full scale), typically.

Incidental AM (at 400 Hz and 1 kHz rates):
0.5 to 512 MHz:
<0.5% AM for FM deviations up to 1/8 maximum allowable.
<1.0% AM for FM deviations up to maximum allowable.
512 to 1024 MHz (Option 002):
<1.0% AM for FM deviations up to 1/8 maximum allowable.
<7% AM for FM deviations up to maximum allowable.

Table 1-1. Specifications (7 of 7)

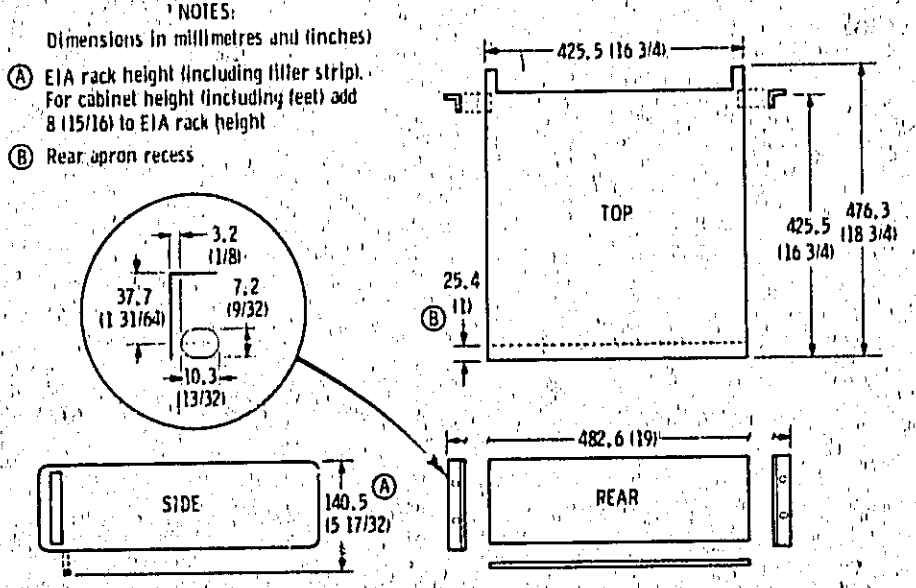
GENERAL CHARACTERISTICS

Operating Temperature Range: 0°to 55°C.

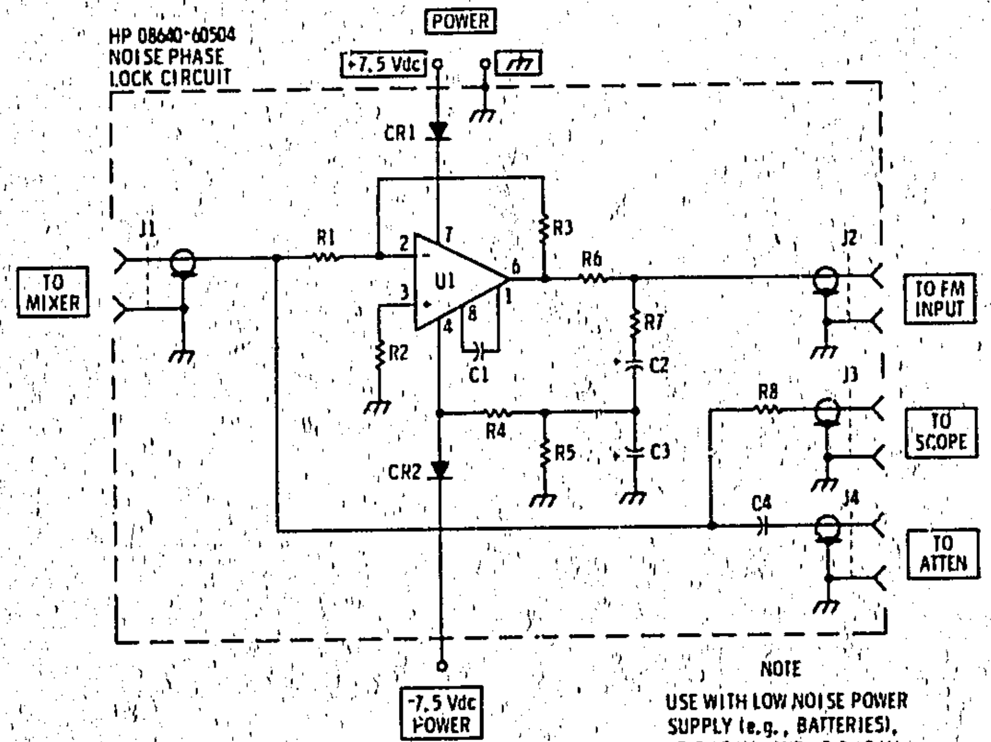
Power Requirements: 100, 120, 220, or 240 volts , +5%, – 10%, 48 to 440 Hz; 175 VA max (Option 002: 190 VA max). 2.29 m (7½ ft) power cable furnished with mains plug to match destination requirements.

Weight:
Net 19.6 kg (43 lb., 14 oz.).

Dimensions:[1]

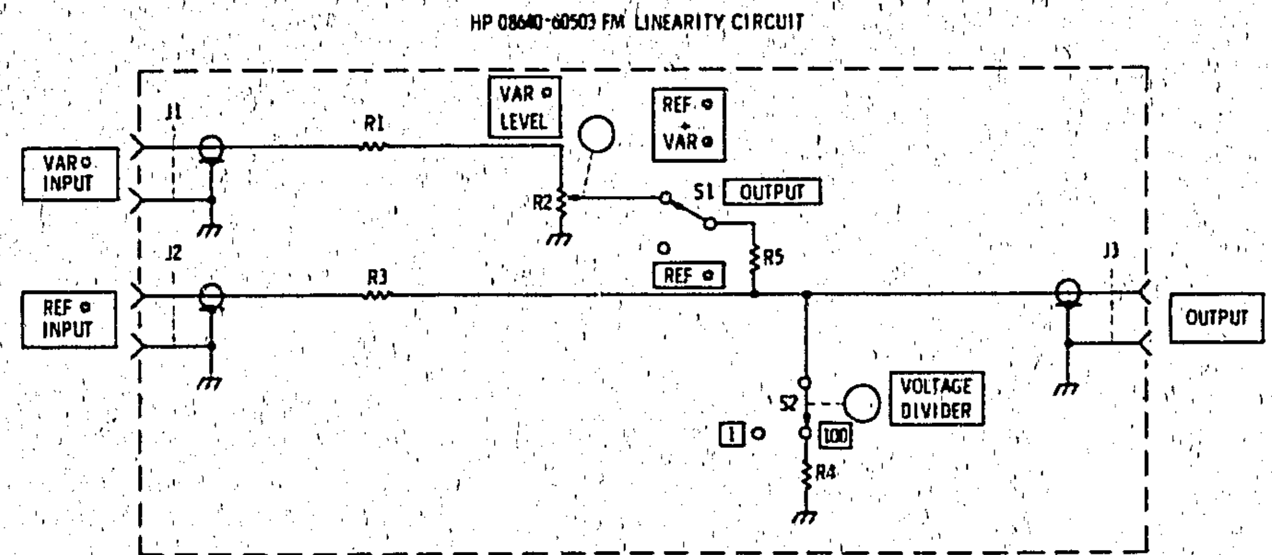


[1] Dimensions are for general information only. If dimensions are required for building special enclosures, contact your HP office. Dimensions for Option 908 Rack Mount Kit are also shown.



C1	30 pF (HP 0160-2199)
C2,3	350 µF 15V (HP 0180-2216)
C4	0.27 µF (HP 0160-2406)
CR1,2	DIODE (HP 1901-0033)
J1-4	BNC FEMALE CONN (HP 1250-0083)
R1,2	511Ω (HP 0757-0416)
R3	31.6 kΩ (HP 0698-3160)
R4,5,8	10.0 KΩ (HP 0757-0442)
R6	619Ω (HP 0757-0418)
R7	31.6Ω (HP 0757-0418)
U1	I.C., LINEAR (HP 1820-0223)
	BOX AND LID

Figure 1-9. Noise Phase Lock Circuit



R1	178Ω 1/4 WATT (HP 0698-3439)	R5	20kΩ 1/4 WATT (HP 0757-0449)
R2	250Ω VARIABLE (HP 2100-2726)	S1,2	SPST SWITCH (HP 3101-1655)
R3	20kΩ 1/4 WATT (HP 0757-0449)	J1-3	BNC FEMALE CONNECTOR (HP 1250-0083)
R4	100Ω 1/4 WATT (HP 0757-0401)		BOX AND LID

Figure 1-10. FM Linearity Circuit

Table 1-2. Recommended Test Equipment (1 of 4)

Instrument Type	Critical Specifications	Suggested Model	Use*
20 dB Amplifier (2 required)	Range: 0.5–520 MHz Gain: 20 to 25 dB Flatness over Range: ±2 dB Impedance: 50Ω Noise Figure: <5 dB	HP 8447A	P
20 dB Amplifier (2 required for Opt. 002 only, otherwise one required)	Range: .4–1200 MHz Gain: >20 dB Flatness: ±2 dB Impedance: 50Ω Noise Figure: <5 dB to 1 GHz	HP 8447B	P
40 dB Amplifier	Range: 5 Hz to 100 kHz Gain: 20 and 40 dB ±1 dB Input Impedance: >5kΩ Output Impedance: 50Ω Noise: <25 μVrms referred to input Output: >1 Vrms into 50Ω	HP 465A	P, A
40 dB Amplifier	Range: 20 Hz to 100 kHz Gain: 40 ± 1 dB Input Impedance: 50Ω Noise Figure: <3 dB when driven from 50Ω Output Level: >100 mV in 50Ω	HP 08640-60506	P
One-Inch Loop Antenna	To ensure measurement accuracy, no substitution is possible. Fabrication depends upon machining and assembling to close tolerances.	HP 08640-60501	P
10 dB Step Attenuator	Attenuation: 0–120 dB in 10 dB steps Range: 0.45–1 GHz Accuracy: ± 1.5 dB to 90 dB, ±0.3 dB to 120 dB (below 1 kHz)	HP 355D	P, A
10 dB Attenuator (required for Opt. 003 only)	Accuracy: ±0.5 dB to 1.2 GHz	HP 8491A Opt 010	A
Crystal Detector	Range: 0.45–1200 MHz Low Level Sensitivity: >0.35 mV/μW No internal dc return	HP 8471A	P, A
Digital Multimeter	DC Accuracy: ±(0.01% of reading +0.02% of range) AC Accuracy: ±0.1% of reading Ohms Range: to 1 kΩ	HP 3490A	P, A, T

*P = Performance; A = Adjustments; T = Troubleshooting

Table 1-2. Recommended Test Equipment (2 of 4)

Instrument Type	Critical Specifications	Suggested Model	Use*
Distortion Analyzer	Range: 20 Hz to 600 kHz Distortion Range: <0.1% Minimum Input: <300 mVrms	HP 331A	P
15 kHz Low-Pass Filter	15 kHz low-pass (7 pole) Impedance: 50Ω Ripple: <±0.2 dB	CIR-Q-TEL FLT/21B-15K-7/50-3A/3B	P
Frequency Counter	Range: to 550 MHz Input Sensitivity: <100 mV Inputs: 50Ω and high impedance (1 MΩ) Accuracy: <100 ppm	HP 5327C	P, A
Frequency Meter	Ranges: 100 kHz to 10 MHz Linearity: <0.05% Analog Output: 1V for full scale	HP 5210A	P, A
Filter Kit	Output Low-Pass Filters for Frequency Meter (20 kHz and 1 MHz Butterworth filters)	HP 10531A	
FM Linearity Circuit (see paragraph 5-41 for possible requirement)	See Figure 1-10	HP 08640-60503	A
Mixer	Double Balanced Range: 0.45-550 MHz	HP 10514A	P, A
Noise Phase Lock Circuit	See Figure 1-9	HP 08640-60504	P
Oscilloscope	50 MHz Real Time Sensitivity: 5 mV/division Internal/External Sweep and Triggering	HP 180C/1801A/1820C	P, A, T
Power Meter	Accuracy: ±1% of reading Range: 0.45-1200 MHz	HP 435A	P, A, T
Power Sensor	Input Level: -20 to +20 dBm VSWR: <1.2:1	HP 8482A	
Pulse Generator	Range: 50 Hz to 500 kHz Output: >1V into 50Ω Pulse Width: down to 1 μs Transition Time: <50 ns	HP 8003A	P, A, T

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

Table 1-2. Recommended Test Equipment (3 of 4)

Instrument Type	Critical Specifications	Suggested Model	Use*
RMS Voltmeter	Range: 10 Hz to 100 kHz Reading: True rms (ac only) Voltage Range: 1 mV to 10V full scale Accuracy: 1% of full scale 50 Hz to 50 kHz Scale: Voltage and dB	HP 3400A	P
Signal Generator	Range: 0.45–550 MHz Output: >13 dBm into 50Ω Drift: <20 ppm/10 min. SSB Phase Noise: >130 dB down from 230 to 450 MHz increasing linearly to >122 dB down at 550 MHz (stated in a 1 Hz bandwidth at 20 kHz offset from carrier) and decreasing approximately 6 dB/octave for each divided down range – but need not be less than 140 dB down. Residual FM: <15 Hz rms in 20 Hz to 15 kHz post-detection noise bandwidth. Aux RF Out: >−5 dBm. Leakage: <3 μV induced in a 2-turn, 1-inch diameter loop 1 inch away from any surface and measured into a 50Ω receiver. FM: dc coupled; at least 40 kHz deviation for 1V input.	HP 8640A	P, A
Audio Spectrum Analyzer	Range: 20–200 kHz Amplitude Calibration: Display Accuracy: ±0.25 dB/dB but not more than 1.5 dB over 70 dB dynamic range. Flatness: ±0.2 dB Vertical Reference Scale: 10 dB/division log, 2 dB/division (or less) log, and linear display calibration. Average Noise Level: <−120 dBm (50Ω) with 1 kHz IF bandwidth. Spurious Responses: >−60 dB down for nominal specified inputs. Tracking Generator: Flatness: ±0.25 dB Level: >3 Vrms into 600Ω	HP 8556A/8552B/ 141T	P, A
RF Spectrum Analyzer	Range: 0.5–1250 MHz Amplitude Calibration: Display Accuracy: ±0.25 dB/dB but not more than 1.5 dB over 70 dB dynamic range. Flatness: ±1 dB IF Gain Step Accuracy: ±0.2 dB	HP 8554B/8552B/ 141T	P, A, T

*P = Performance; A = Adjustments; T = Troubleshooting

Table 1-2. Recommended Test Equipment (4 of 4)

Instrument Type	Critical Specifications	Suggested Model	Use*
RF Spectrum Analyzer (Continued)	Amplitude Calibration (continued): Vertical Reference Scale: 10 dB/division log, 2 dB/division (or less) log, and linear display calibration. Average Noise Level: < −102 dBm with 10 kHz IF bandwidth Spurious Responses: >60 dB down for inputs of −40 dBm or less Span Width: 0–1 GHz Compatible with Tracking Generator		
Test Oscillator	Range: 10 Hz to 10 MHz Output Impedance: 600Ω and 50Ω Distortion: >40 dB down Output Level: >3 Vrms	HP 651B	P, A, T
Test Oscillator (required for Opt. 003 only)	Frequency: 600 kHz Output Impedance: 600Ω Output: >10 Vrms into 600Ω	HP 200CD	T
Tracking Generator	Output: to 0 dBm (50Ω) Flatness: ±0.5 dB Compatible with Spectrum Analyzer (HP 8554B/8552B/141T)	HP 8444A	A
Variable Phase Oscillator (see para. 5-41 for possible requirements)	Frequency: 1 kHz Level: >1V into 600Ω Phase Variability: 0 to 360°	HP 203A	A
VSWR Bridge (required for Opt. 003 only)	Range: 0.45–1200 MHz Directivity: >40 dB Connectors: Type N	Wiltron Model 60N50	A

*P = Performance; A = Adjustments; T = Troubleshooting

Table 1-3. Recommended Test Accessories

Accessory Type	Suggested Model
Adapter (Type N Male and BNC Female connectors)	HP 1250-0067
Adapter (BNC Male and dual Banana post connectors)	HP 10110A
Adapter (two SMC Male connectors)	HP 1250-0827
Adapter (Type N Male to GR 874)	HP 1250-0847
Double Shielded Cable (BNC Male connectors, coaxial)	HP 08708-6033
Nine-inch Cable (BNC Male connectors, coaxial)	HP 10502A
Test Cable (48-inch, BNC Male connectors, coaxial)	HP 10503A
Test Cable (SMC Male and BNC Male connectors) (2 required)	HP 11592-60001
600 Ohm Feedthrough	HP 11095A
50 Ohm Load (Male, BNC, coaxial)	HP 11593A
50 Ohm Load (Male Type N)	HP 908A
Coaxial Short (Male Type N) (required for Opt. 003 only)	HP 11512A
Tee (Coaxial, BNC, one Male and two Female connectors)	HP 1250-0781
Voltage Probe (1:1)	HP 10025A
Extender Board (30 pins)	HP 08640-60036
Extender Board (20 pins)	HP 5060-0256
Bumpers (2) for Extender Board	HP 0403-0115
1 kΩ Resistor	HP 0757-0280
100Ω Resistor	HP 0757-0401
Blocking Capacitor	HP 10217A
Cable Assembly	HP 10020-61601
Divider 10:1	HP 10020-67703
Ground Clip	HP 10213-62102

INSTALLATION

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section explains how to prepare the Model 8640A Signal Generator for use. It explains how to connect the instrument to accept available line voltage, and it also describes bench operation, rack mounting, storage, and shipment.

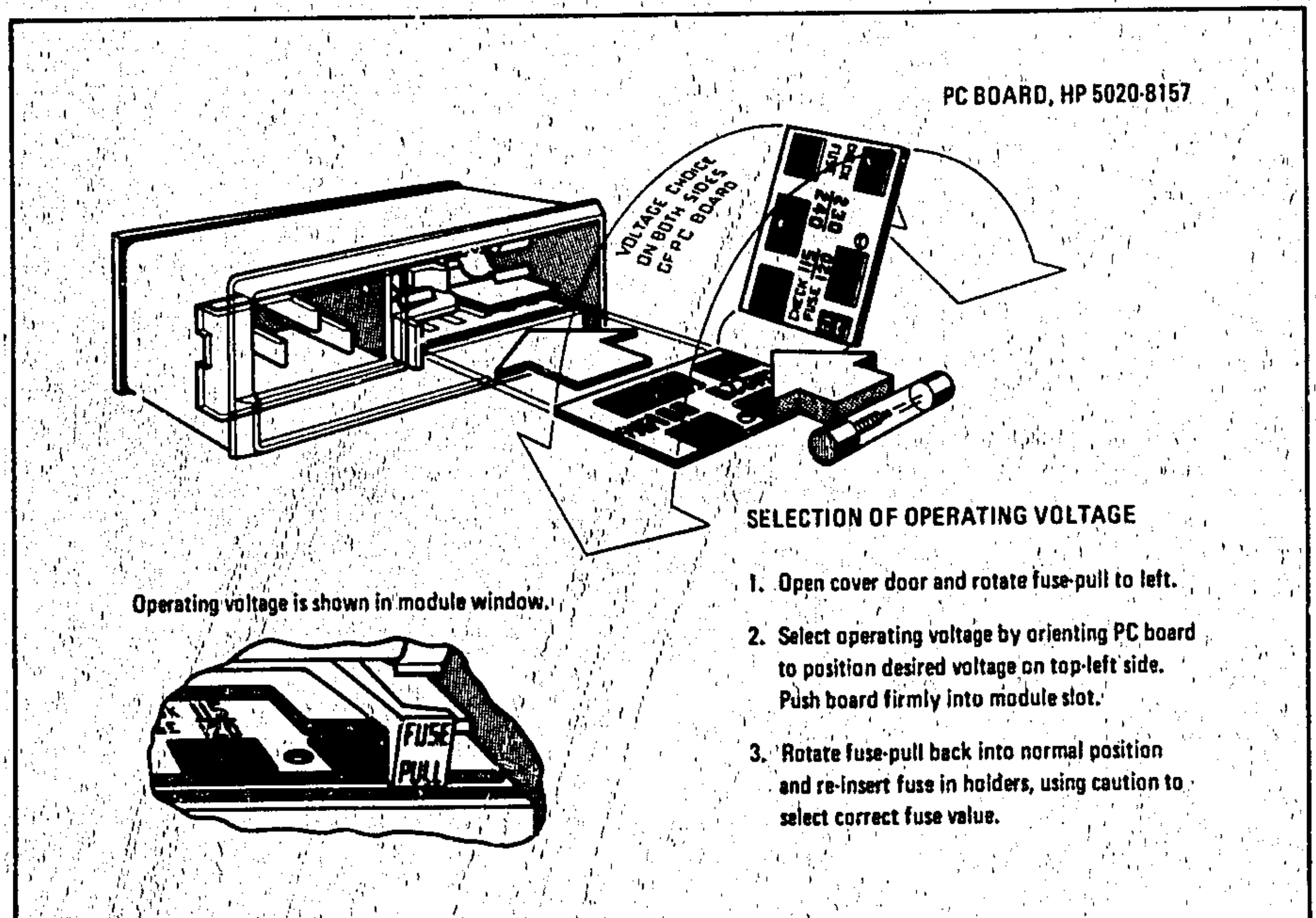
2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1, and procedures for checking electrical performance are given in Section IV. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance test, notify the nearest Hewlett-Packard office. If 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 carrier's inspection. The HP office will arrange for repair or replacement of the instrument without waiting for claim settlement.

2-5. PREPARATION FOR USE

2-6. Power Requirements

2-7. The Model 8640A requires a power source of 100, 120, 220, or 240 Vac +5, −10%, 48 to 440 Hz, single phase. Power consumption is 175 VA maximum (190 VA maximum for Option 002).



re 2-1. Line Selector

2-8. Line Voltage Selection

CAUTION

To prevent damage to the instrument, make the line voltage selection BEFORE connecting the line power. Also ensure the line power cord is connected to a line power socket that is provided with a protective earth contact.

2-9. A rear panel, line power module permits operation from 100, 120, 220, or 240 Vac. The number visible in the window (located on the module) indicates the nominal line voltage to which the instrument must be connected.

2-10. To prepare the instrument for operation, slide the fuse compartment cover to the left (the line power cable must be disconnected). Pull the handle marked FUSE PULL and remove the fuse; rotate the handle to the left. Gently pull the printed circuit voltage selector card from its slot and orient it so that the desired operating voltage appears on the top-left side (see Figure 2-1). Firmly push the voltage selector card back into its slot. Rotate the FUSE PULL handle to the right, install a fuse of the correct rating, and slide the fuse compartment cover to the right. A complete set of fuses is supplied with the instrument — see ACCESSORIES SUPPLIED in Section I.

NOTE

The correct fuse rating for the line voltage selected is listed on the line power module. More information about fuses is given in the table of replaceable parts in Section VI (reference designation is F1).

2-11. Power Cable

2-12. In accordance with international safety standards, this instrument is equipped with a three-wire power cable. When connected to an appropriate power line outlet, this cable grounds the instrument cabinet. The type of power cable plug shipped with each instrument depends on the country of destination. Refer to Figure 2-2 for the part numbers of the power cable plugs available.

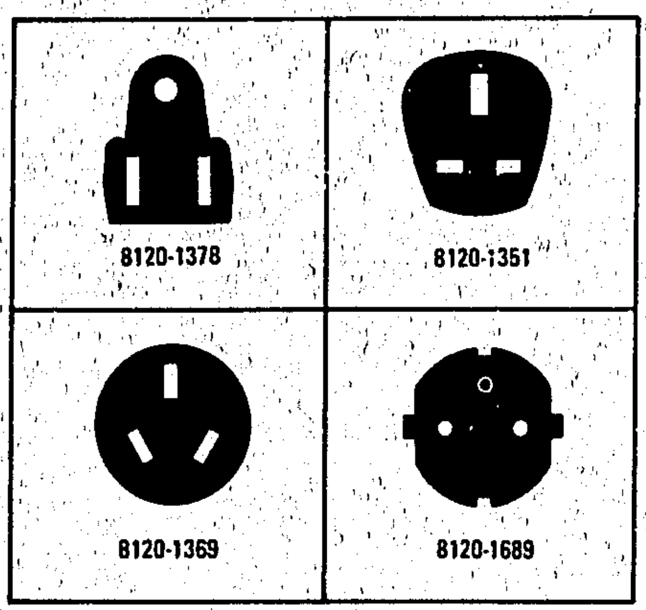


Figure 2-2. Power Cables Available

Power Cable (Cont'd)

WARNING

To avoid the possibility of injury or shock, the following precautions must be followed before the instrument is switched on:

a. If this instrument is to be energized via an autotransformer for voltage reduction, make sure that the common terminal is connected to the earth grounded pole of the power source.

b. The power cable plug shall only be inserted into a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor (grounding).

c. Before switching on the instrument, the protective earth terminal of the instrument must be connected to a protective conductor of the power cord: this is accomplished by ensuring that the instrument's internal earth terminal is correctly connected to the instrument's chassis and that the power cord is wired correctly (see Service Sheet 22).

2-13. Mating Connectors

2-14. Mating connectors used with the Model 8640A should be either 50 ohm-type BNC male or Type N male connectors that are compatible with US MIL-C-39012.

2-15. Operating Environment

2-16. The operating environment should be within the following limitations:

Temperature . . . . 0°C to +55°C
Humidity . . . . < 95% relative
Altitude . . . . < 15,000 feet

2-17. A forced-air cooling system is used to maintain the operating temperature required within the instrument. The air intake and filter are located on the rear panel, and warm air is exhausted through perforations in the right-hand side panel. When operating the instrument, choose a location that provides at least three inches of clearance at the rear and two inches clearance at the right side. The clearances provided by the plastic feet in bench stacking and the filler strips in rack mounting are adequate for the top and bottom cabinet surfaces.

2-18. Bench Operation

2-19. The instrument cabinet has plastic feet and a foldaway tilt stand for convenience in bench operation. The tilt stand raises the front of the instrument for easier viewing of the control panel, and the plastic feet are shaped to make full-width modular instruments self-aligning when stacked.

2-20. Rack Mounting

2-21. A rack mounting kit is available (HP 5060-8740). This kit contains all the necessary hardware and installation instructions for mounting the instrument on a rack with 19-inch spacing (see Figure 2-3).

2-22. STORAGE AND SHIPMENT

2-23. Environment

2-24. The instrument should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment:

Temperature . . . . —40°C to +75°C
Humidity . . . . < 95% relative
Altitude . . . . < 25,000 feet

2-25. Packaging

2-26. **Original Packaging.** Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also, mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-27. **Other Packaging.** The following general instructions should be used for re-packaging with commercially available materials:

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

Packaging (Cont'd)

b. Use a strong shipping container. A double-wall carton made of 350-pound test material is adquate.

c. Use enough shock-absorbing material (3- to 4-inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely.

e. Mark the shipping container FRAGILE to assure careful handling.

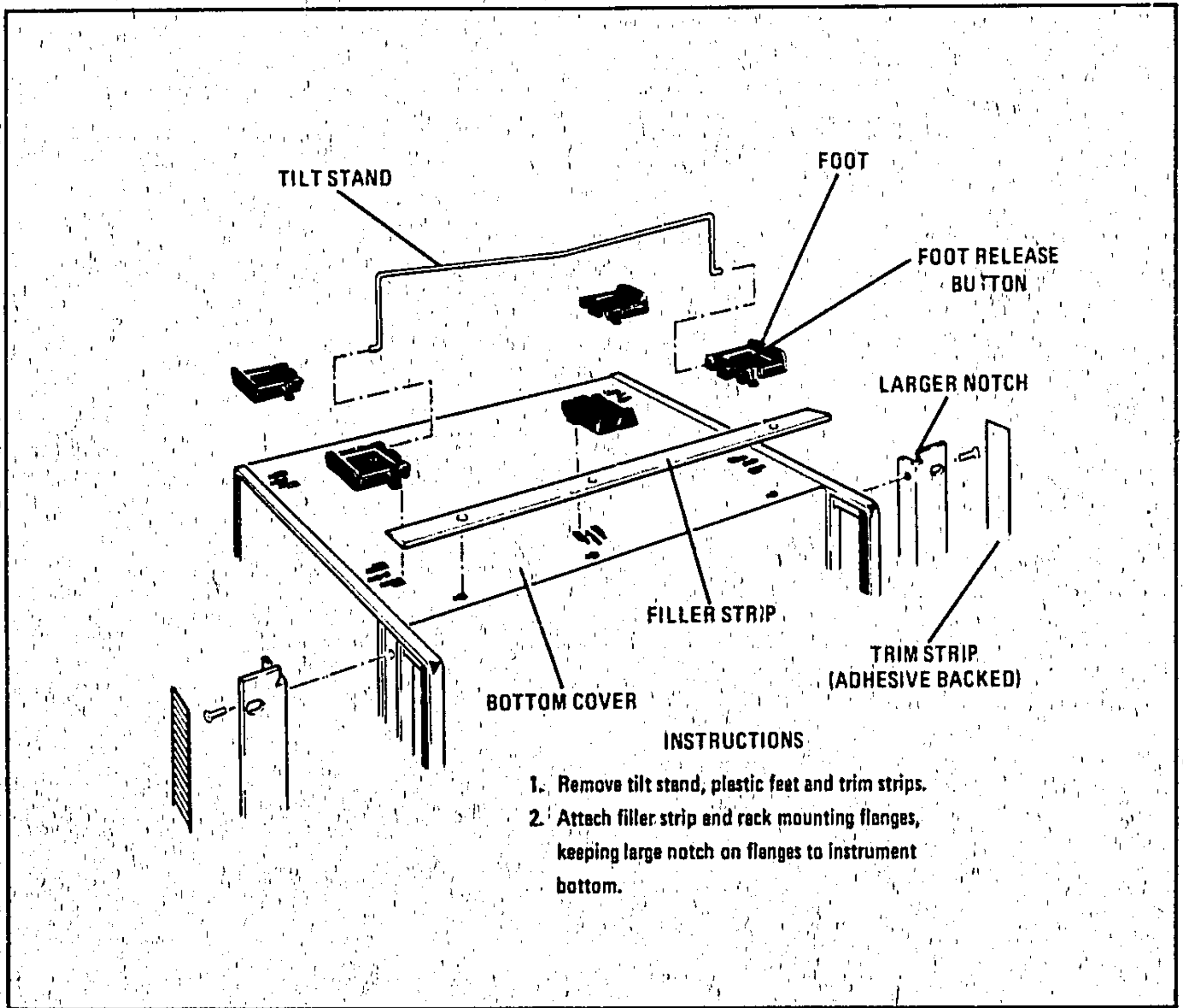


Figure 2-3. Preparation for Rack Mounting

OPERATION

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This section describes the functions of the controls and indicators of the Model 8640A Signal Generator. It explains how to set the frequency, ampltitude, and modulation controls, and covers such operator maintenance as fuse and indicator lamp replacement and fan filter cleaning.

3-3. PANEL FEATURES

3-4. Front panel controls, indicators, and connectors are shown and described in Figure 3-2. Rear panel controls and connectors are shown and described in Figure 3-3.

3-5. OPERATOR'S CHECKS

3-6. Use the operator's checks in Figure 3-4 to verify proper operation of the Signal Generator's main functions.

3-7. OPERATING INSTRUCTIONS

3-8. Figures 3-5 and 3-6 explain how to set the frequency, amplitude, and modulation controls.

3-9. OPERATOR'S MAINTENANCE

3-10. **Fuse.** The main ac line fuse is located on the rear panel next to the line power cable jack. To remove the fuse, first remove the line power cable from its jack. Slide the fuse compartment cover to the left, then pull the handle marked FUSE PULL and remove the fuse.

CAUTION

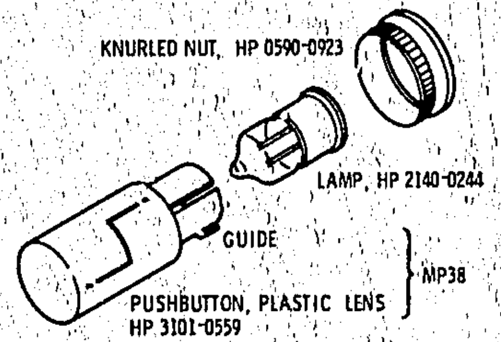
Be sure to select the correct fuse rating for the selected line voltage (see LINE VOLTAGE SELECTION in Section II); fuse ratings are listed on the fuse compartment.

3-11. **Fan.** The cooling fan's filter is located on the rear panel. To service the filter, use a No. 2 Pozidriv screwdriver (HP 8710-0900) to remove the four screws that hold the filter to the rear panel. Then clean it, using a solution of warm water and soap, or replace it, using the part number listed in the table of replaceable parts in Section VI.

3-12. The fan motor has factory lubricated, sealed bearings and requires no periodic maintenance.

3-13. **Lamp Replacement.** Figure 3-1 explains how to replace the lamp located in the line power switch.

3-14. **Meter Zeroing.** To mechanically zero the front panel meter, set LINE switch to OFF and place instrument in its normal operating position. Turn adjustment screw cw until indicator indicates zero, then turn adjustment slightly ccw to free mechanism from adjusting peg.

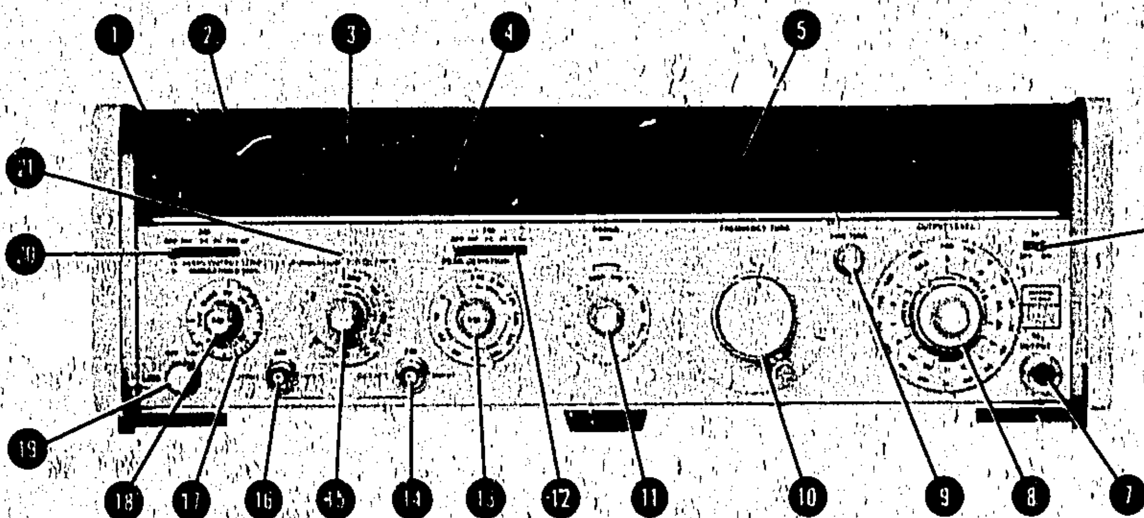


POWER LAMP REPLACEMENT

1. Remove lens by pulling straight out.
2. Replace lamp.
3. To replace lens, align guide with notch in receptacle. Push straight in.

Figure 3-1. Lamp Replacement

FRONT PANEL FEATURES



1 Meter Function: interlocked buttons select one of three functions.

AM: meter indicates percent of amplitude modulation.

FM: meter indicates peak frequency deviation.

LEVEL: meter indicates RF output level in Vrms or dBm 50Ω.

2 SCALE: annunciator lights to indicate applicable meter scale. Meter scale is automatically selected.

3 Meter: ranges to one of three linear scales, read according to meter function.

AM X10%: 0—10 scale is read 0—100%.

FM k/MHz: 0—3, 0—5, and 0—10 scales are read in kHz or MHz, depending upon setting of PEAK DEVIATION switch (e.g., with PEAK DEVIATION set to 80 kHz, a meter reading of 7.2 indicates that deviation is 72 kHz).

LEVEL VOLTS: 0—3 and 0—10 scales are read in microvolts, millivolts, or volts depending upon setting of OUTPUT LEVEL controls (e.g., with OUTPUT LEVEL switch set to .03 VOLTS, a meter reading of 2.4 indicates that actual level is 24 mVrms). The −10 to +3 dB scale is read relative to the OUTPUT LEVEL switch dBm scale.

4 Output Problem Annunciators: lamps light to indicate that modulation or OUTPUT LEVEL settings are causing generator to be uncalibrated.

REDUCE PEAK POWER: indicates a combination of OUTPUT LEVEL and amplitude modulation that exceeds specified limits. This allows 100% AM on all OUTPUT LEVEL ranges except the +20 dBm range. In instruments with the Internal Doubler (Option 002), on the 512—1024 MHz range, the peak envelope power of the carrier may not exceed the maximum level of any OUTPUT LEVEL range.

REDUCE FM VERNIER: indicates that an external FM input level or vernier setting is causing FM deviation to exceed limits.

Figure 3-2. Front Panel Controls, Indicators, and Connectors (1 of 3)

FRONT PANEL FEATURES

REDUCE PEAK DEVIATION: indicates PEAK DEVIATION setting is too high for the selected frequency range.

5 **FREQUENCY MHz:** dial indicates RF frequency in MHz.

6 **RF ON/OFF:** enables or disables the RF output.

NOTE

The RF ON/OFF switch is wired to turn off only the amplitude modulator. This allows the RF Oscillator to remain warmed up and the Auxiliary RF Output to remain on. If it is desirable to switch both the modulator and the RF Oscillator off, the RF ON/OFF function can be easily modified (see Service Sheet 6 in Section VIII).

7 **RF OUTPUT:** RF output through Type N female connector. (Connector meets US MIL-C-39012).

CAUTION

If not protected by Option 003 (Reverse Power Protection), application of >40 Vdc or +13 dBm of RF power into the output jack of the Signal Generator is likely to cause damage to the output circuits of the instrument.

8 **OUTPUT LEVEL:** the switch controls a 10 dB step attenuator that sets the output level range. Concentric vernier sets output level, within an 18 dB range (the meter indicates actual output).

NOTE

For optimum operation, use the vernier in the top 10 dB of its range.

9 **FINE TUNE:** fine frequency control.

10 **FREQUENCY TUNE:** coarse frequency control.

11 **RANGE:** Selects one of ten octave frequency ranges. The eleventh position, 512–1024 MHz/EXT DOUBLER, gives 256–512 MHz at RF OUTPUT, but the frequency dial readings and FM meter indications are corrected for use with an RF doubler connected to RF OUTPUT. In the Option 002 Instrument, the 512–1024 MHz range displays actual RF OUTPUT frequency.

12 **FM:** selects frequency modulation and source.

OFF: no FM.

INT: FM by internal oscillator.

AC: FM by external source through FM INPUT jack (>20 Hz, ac + dc <5 Vpk).

DC: FM by external source through FM INPUT jack (ac + dc <5 Vpk).

CAL: used to calibrate external modulation input.

13 **PEAK DEVIATION:** switch and concentric vernier vary FM frequency deviation (as indicated on the meter). Vernier range is from zero to the peak deviation selected by the switch.

14 **FM INPUT/OUTPUT:** 600 ohm input for external FM; nominally 1 Vpk (0.707 Vrms) required for full peak deviation selected by PEAK DEVIATION switch (never more than 5 Vpk). Output for internal oscillator whenever FM selector is set to INT (600 ohm source impedance); level controlled by AUDIO OUTPUT LEVEL.

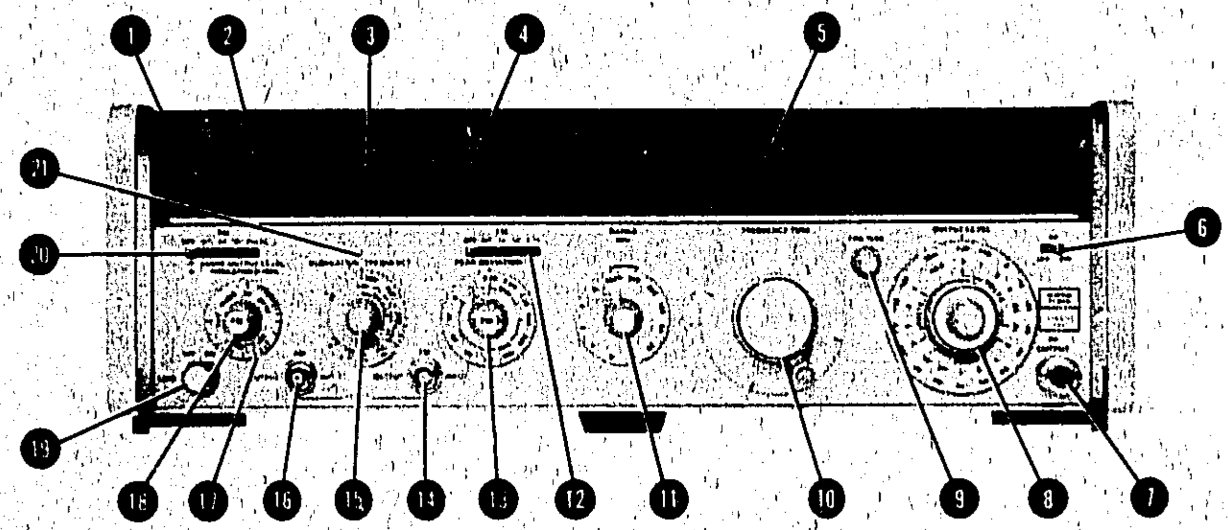
15 **MODULATION FREQUENCY:** switch selects 400 Hz or 1000 Hz. With Option 001 Variable Modulation Oscillator (shown), switch also selects multiplier. Vernier, with multiplier, sets frequency from 20 Hz to 600 kHz.

NOTE

With the Option 001 Variable Modulation Oscillator, AM OUTPUT and FM OUTPUT are in parallel. Parallel load should be ≥600 ohms.

Figure 3-2. Front Panel Controls, Indicators, and Connectors (2 of 3)

FRONT PANEL FEATURES



16 AM INPUT/OUTPUT: 600 ohm input for external AM; 1 Vpk (0.707 Vrms) required for 100% modulation (never more than 5 Vpk). Input for pulse modulation (50 ohm): >0.5 Vpk positive pulse required to turn on RF. Output for internal oscillator whenever AM selector is set to INT (600 ohm source impedance): level controlled by AUDIO OUTPUT LEVEL.

17 AUDIO OUTPUT LEVEL: control varies level of signal from AM and/or FM OUTPUT jacks (calibration gives voltage into 600Ω).

18 MODULATION: vernier varies amplitude modulation from 0 to 100% (as indicated on the meter).

19 LINE: switch applies or removes ac power. The button is lighted when ON.

20 AM: selects amplitude modulation and source.

OFF: no AM.

INT: AM by internal oscillator.

AC: AM by external source through AM INPUT jack (>20 Hz, ac + dc <5 Vpk).

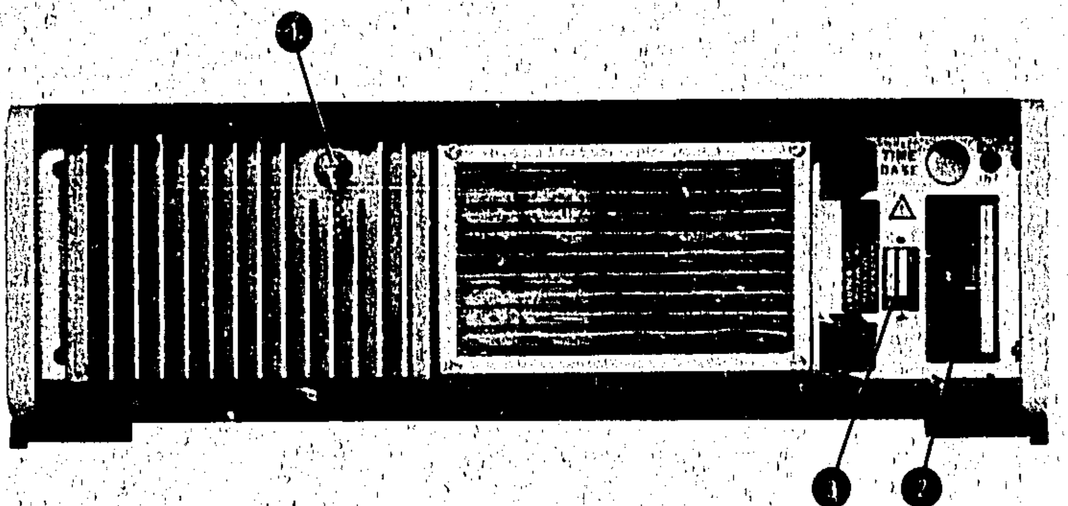
DC: AM by external source through AM INPUT jack (ac + dc <5 Vpk).

PULSE: when selected with no modulation, it disables the RF output; a positive pulse at AM INPUT pulses on the RF.

21 Mechanical Meter Zero: sets meter suspension so that meter indicates zero when power is removed and instrument is in normal operating position.

Figure 3-2. Front Panel Controls, Indicators, and Connectors (3 of 3)

REAR PANEL FEATURES



1 **AUX RF OUTPUT:** nominal −5 dBm auxiliary RF output; 500 ohm source impedance. Signal does not contain amplitude or pulse modulation (however, it does contain FM). In all instruments, on the 512–1024 MHz range the auxiliary RF output is one-half the frequency of the indicated RF frequency.

2 **Line Power Module:** permits operation from 100, 120, 220 or 240 Vac. The number visible in window indicates nominal line voltage to which instrument must be connected (see Figure 2-1). Center conductor is safety earth ground.

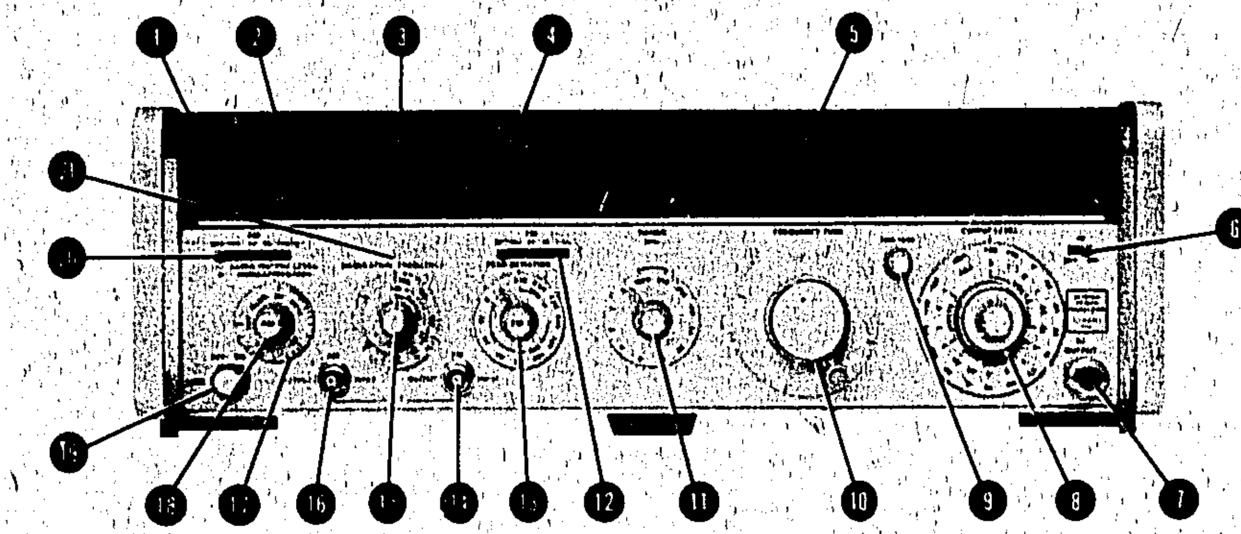
WARNING

Any interruption of the protective (grounding) conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited. (See Section II).

3 **Serial Number Plate:** first four digits and letter of serial number constitute the prefix which defines the instrument configuration; last five digits form sequential suffix that is unique to each instrument. The plate also indicates any options supplied with instrument.

Figure 3-3. Rear Panel Controls and Connectors

OPERATOR'S CHECKS



INITIAL CONTROL SETTINGS

a. Push LINE switch 19 to ON.

b. Set controls as follows:

1	Meter Function	LEVEL
20	AM	OFF
17	AUDIO OUTPUT LEVEL	ccw
18	MODULATION	ccw
15	MODULATION FREQUENCY	400 Hz
12	FM	OFF
13	PEAK DEVIATION	5 kHz
13	PEAK DEVIATION Vernier	ccw
11	RANGE	0.5–1 MHz
10	FREQUENCY TUNE	Centered (four turns from stop)
9	FINE TUNE	Centered (2.5 turns from stop)
8	OUTPUT LEVEL Switch	0.1 VOLTS (−10 dBm)
6	OUTPUT LEVEL Vernier	Meter reads 10 (+3 dB)
8	RF ON/OFF	ON

Figure 3-4. Operator's Checks (1 of 3)

OPERATOR'S CHECKS

RF OUTPUT

c. Use a Type N to BNC adapter and a BNC to BNC cable to connect RF OUTPUT 7 to a frequency counter.

d. Adjust FREQUENCY TUNE 10 and FINE TUNE 9 until the frequency counter reads 0.75000 MHz.

e. With RANGE 11 set as follows, the frequency counter should read approximately as shown:

RANGE (MHz)	Frequency (MHz)
0.5–1	0.75000
1–2	01.5000
2–4	03.0000
4–8	06.0000
8–16	12.0000
16–32	024.000
32–64	048.000
64–128	096.000
128–256	0192.00
256–512	0384.00
512–1024	0384.00

NOTE

In instruments without the internal doubler (Option 002) when range is set to 512–1024 MHz, the frequency counter will read approximately 0384.00 MHz (the actual frequency at RF OUTPUT). With Option 002, and RANGE set to 512–1024 MHz, when FREQUENCY TUNE is set above 550 MHz, the counter may not display the correct frequency of the output signal.

METER

f. Set OUTPUT LEVEL switch 8 to 1 VOLT (+10 dBm) and OUTPUT LEVEL vernier 8 until the meter 3 indicates 5 on the 0–10 SCALE; the 0–10 SCALE annunciator 2 should light.

g. Set OUTPUT LEVEL switch to .3 VOLTS (0 dBm); the 0–3 SCALE annunciator 2 should light.

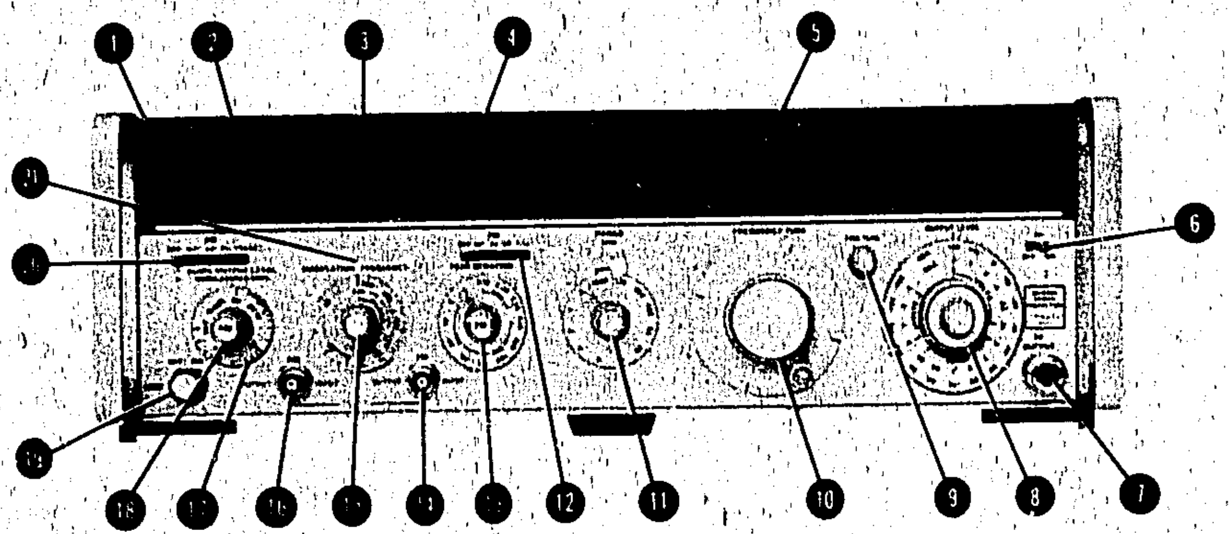
AMPLITUDE MODULATION

h. Set RANGE switch to 256–512 MHz. Set Meter Function 1 to AM and AM 20 to INT. Slowly turn MODULATION 18 clockwise. When the meter indicates 10 (i.e., 100% modulation) set OUTPUT LEVEL switch 8 to the 3 VOLTS (+20 dBm) range; the REDUCE PEAK POWER annunciator 4 should light.

i. For Option 002 only, set OUTPUT LEVEL switch 8 to 1 VOLTS (+10 dBm); the annunciator should go out. Set RANGE 11 to 512–1024 MHz. Set Meter Function 1 to LEVEL and OUTPUT LEVEL

Figure 3-4. Operator's Checks (2 of 3)

OPERATOR'S CHECKS



AMPLITUDE MODULATION (Cont'd)

vernier 8 to a reading of 0 on the dB scale of the meter; the REDUCE PEAK POWER annunciator should light.

FREQUENCY MODULATION

j. Set AM 20 to OFF (the annunciator should go out) and FM 12 to INT. Set Meter Function 1 to FM and check that PEAK DEVIATION 13 is set to 5 kHz and the vernier is fully counterclockwise; the meter 3 should indicate 0.

k. Turn the PEAK DEVIATION vernier 13 fully clockwise; the meter 3 should indicate greater than 5 kHz and the REDUCE FM VERNIER annunciator 4 should light.

l. Reduce FM vernier 13 until meter reads 5 kHz (the annunciator should go out). Set RANGE 11 to 0.5–1 MHz, and set PEAK DEVIATION 13 to 10 kHz; the REDUCE PEAK DEVIATION annunciator 4 should light and the meter should indicate 0.

m. Set RANGE 11 to 1–2 MHz (the annunciator should go out) and turn the PEAK DEVIATION vernier 13 fully counterclockwise; the meter 3 should indicate 0 on the 0–10 SCALE.

MODULATION OSCILLATOR

n. Using the BNC to BNC cable, connect FM OUTPUT 14 to a frequency counter. Set AUDIO OUTPUT LEVEL 17 to 1V and MODULATION FREQUENCY 15, in turn, to 400 Hz and 1 kHz; the frequency counter should display approximately 400 and 1000 Hz.

Figure 3-4. Operator's Checks (3 of 3)

SETTING FREQUENCY AND AMPLITUDE

FREQUENCY

a. Set RANGE ⓫ to span the desired frequency.

b. Use FREQUENCY TUNE ⓾ and FINE TUNE ❾ to set the Signal Generator to the desired frequency.

NOTE

To get additional frequency accuracy, connect a frequency counter to the AUX RF OUTPUT jack on the rear panel. To prevent spurious signals from the counter from causing spurious signals on the generator's RF output, use an amplifier between the AUX RF OUTPUT jack and the counter (amplifier reverse isolation should be >30 dB).

To minimize the effects of backlash, always approach the frequency setting from the bottom end of the range.

c. For instruments without an internal doubler, to use an external frequency doubler, connect to RF OUTPUT ❼ and set RANGE ⓫ to 512–1024 MHz/EXT DOUBLER. The frequency dial ❺ will indicate the frequency out of doubler (i.e., the frequency dial indicates twice the frequency at RF OUTPUT).

AMPLITUDE

a. Use the OUTPUT LEVEL switch and vernier ❽ to set the desired signal level (there are two types of scales, rms volts and dBm). For optimum operation, use the vernier in the top 10 dB of its range. To enable the RF OUTPUT signal, set the RF ON/OFF switch ❻ to ON.

CAUTION

For instruments with Option 003 (reverse power protection) avoid control settings which cause the REDUCE PEAK POWER annunciator to light. The Signal Generator's own output can trip the level sensor. This may occur with high peak envelope power AM signals or during low RF frequency, open-circuit operation. This condition can cause relay contact chatter and reduce contact life.

NOTE

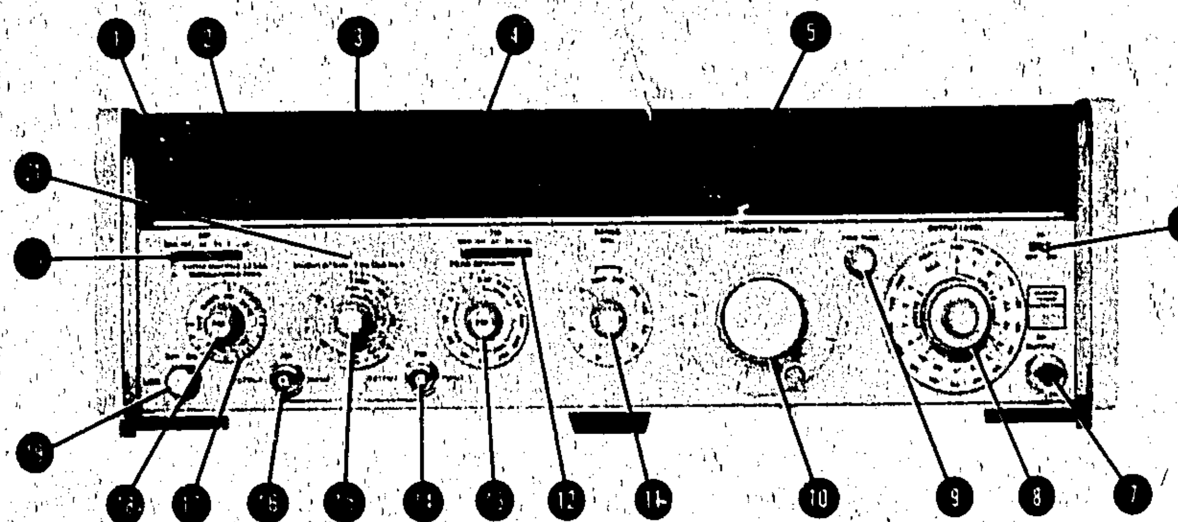
The RF ON/OFF switch may be wired to turn off the amplitude modulator or both the amplitude modulator and the RF Oscillator (see Service Sheet 5 in Section VIII).

b. To read the output level, set Meter Function ❶ to LEVEL. The meter ❸ is read in conjunction with the OUTPUT LEVEL control ❽ (e.g., with OUTPUT LEVEL switch set to .03 VOLTS, a meter reading of 2.1 indicates that the actual level is 21 mVrms).

c. If a 50 ohm to 75 ohm adapter (consisting of a 25 ohm series resistor) is connected to RF OUTPUT ❼, the OUTPUT LEVEL ❽ voltage scale will be correct if the instrument is used with 75 ohm terminations. However, 1.76 dB must be subtracted from the dB scale for correct readings.

Figure 3-5. Setting the Frequency and Amplitude Controls

SETTING MODULATION



AMPLITUDE MODULATION

a. Set Meter Function 1 to AM.

CAUTION

For instruments with Option 003 (reverse power protection) avoid control settings which cause the REDUCE PEAK POWER annunciator to light. The Signal Generator's own output can trip the level sensor. This may occur with high peak envelope power AM signals or during low RF frequency, open-circuit operation. This condition can cause relay contact chatter and reduce contact life.

b. To use the internal modulation oscillator, set AM 20 to INT. Set MODULATION FREQUENCY 15 to the desired frequency, and set percent of modulation with the MODULATION vernier 18; modulation is indicated by the meter 3 (e.g., a meter reading of 5.4 indicates 54% AM).

NOTE

The REDUCE PEAK POWER annunciator 4 lights whenever the Signal Generator's output amplifier is being overdriven. When it lights, reduce MODULATION vernier 18 or OUTPUT LEVEL vernier 8.

c. With AM 8 set to INT, the internal modulation oscillator signal is present at the AM OUTPUT jack 16 (600 ohm source impedance). Its level is set by AUDIO OUTPUT LEVEL 17.

d. To use an external modulation signal, set AM 20 to AC (or DC if modulation signal is less than 20 Hz). Apply the signal to the AM INPUT jack 16 (600 ohm load impedance). The Signal

Figure 3-6. Setting the Modulation Controls (1 of 3)

SETTING MODULATION

AMPLITUDE MODULATION (Cont'd)

Generator requires 1 Vpk (0.707 Vrms) for 100% modulation. Set percent of modulation with the MODULATION vernier (18) ; percent AM is indicated by the meter (3).

NOTE

The meter reading is accurate when AM is set to DC only if no dc offset is applied to the AM INPUT jack. The meter responds to the positive peak of the ac component of the modulating signal.

PULSE MODULATION

a. Set Meter Function (1) to LEVEL.

b. Set AM (20) to PULSE (this disables the RF output). Apply the modulation pulse (>0.5 Vpk) to the AM INPUT jack (16) (50 ohm load impedance). The Signal Generator requires a positive level to produce an RF output.

c. Set the desired pulse-on level using the OUTPUT LEVEL controls (6).

FREQUENCY MODULATION

a. Set Meter Function (1) to FM.

b. To use the internal modulation oscillator, set FM (12) to INT. Set MODULATION FREQUENCY (15) to the desired frequency, and set the peak deviation with the PEAK DEVIATION switch and vernier (13).

NOTE

The REDUCE PEAK DEVIATION annunciator (4) lights whenever the PEAK DEVIATION switch setting is too high for the selected frequency range. When it lights, reduce PEAK DEVIATION.

c. Peak frequency deviation is indicated by the meter (3) , and the meter is read in conjunction with the PEAK DEVIATION switch (13) (e.g., with PEAK DEVIATION set to 320 kHz, a meter reading of 2.8 indicates that peak frequency deviation is 280 kHz).

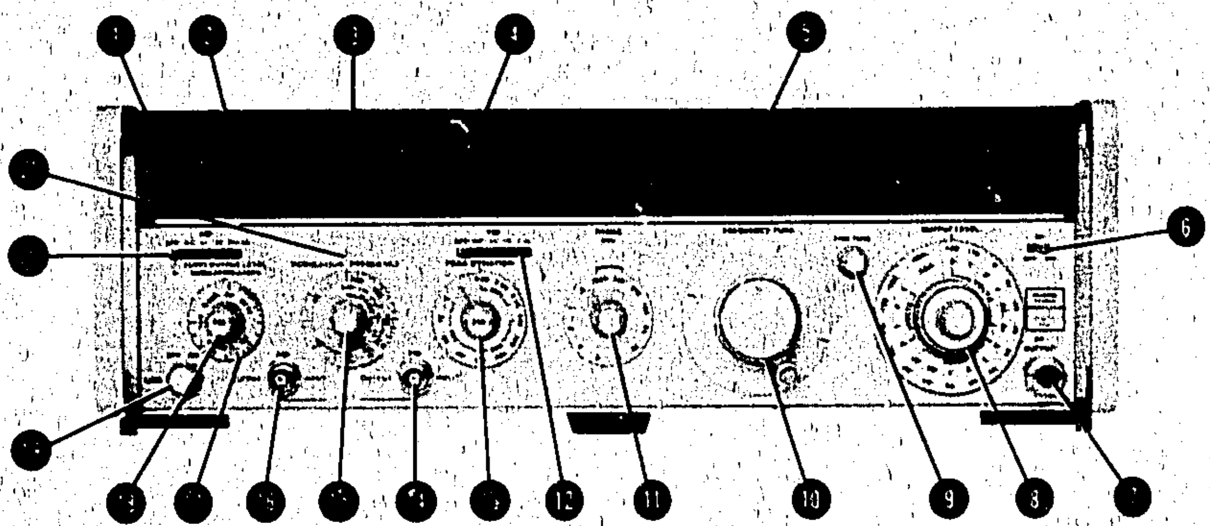
d. With FM (12) set to INT, the internal modulation oscillator signal is present at the FM OUTPUT jack (600 ohm source impedance). Its level is set by AUDIO OUTPUT LEVEL (17).

e. To use an external modulation signal, set FM (12) to AC (or DC if modulation signal is less than 20 Hz). Apply the signal to the FM INPUT jack (14) (600 ohm load impedance). The Signal Generator requires 1 Vpk (0.707 Vrms) for full peak deviation. The PEAK DEVIATION controls (13) and the meter are used the same way as when using the internal modulation oscillator signal.

f. To calibrate the external input, set the FM switch (12) to DC (with no signal applied to FM input) and read the frequency of the RF OUTPUT. Set FM to CAL and, using the PEAK DEVIATION switch and vernier (13), offset the frequency at RF OUTPUT an amount equal to the desired peak deviation. Set FM (12) to DC or AC; a 1 Vpk (0.707 Vrms) signal applied to FM INPUT (14) will now produce the desired peak deviation.

Figure 3-6. Setting the Modulation Controls (2 of 3)

SETTING MODULATION



FREQUENCY MODULATION (Cont'd)

NOTE

The REDUCE FM VERNIER annunciator (4) lights when an FM input causes peak deviation to exceed its limits. When it lights, reduce either the PEAK DEVIATION vernier or the external signal level.

SIMULTANEOUS AM AND FM

a. Simultaneous AM and FM, or pulse modulation and FM, can be accomplished using the procedures described above. The internal modulation oscillator can be used for either one or both, AM and FM.

NOTE

On Signal Generators with the Option 001 Variable Modulation Oscillator, do not load both AM OUTPUT (16) and FM OUTPUT (14) when the oscillator is providing both modulating signals. The outputs are in parallel and the parallel load should be greater than 600 ohms.

Figure 3-6. Setting the Modulation Controls (3 of 3)

OPTION 002 AM CALIBRATION PROCEDURE (512–1024 MHz Range Only)

REFERENCE: Service Sheet 14.

DESCRIPTION: On the 512–1024 MHz range, % AM varies both with FREQUENCY and OUTPUT LEVEL vernier setting. Each instrument can be calibrated at a given frequency and output level by this procedure. % AM is calibrated while comparing the actual amount of amplitude modulation to the level of the input modulating signal. The AM is demodulated by a spectrum analyzer in the zero span mode. A DVM is used to measure the ac and dc voltages at the analyzer's vertical output. The dc voltage corresponding to the carrier level is set to 282.8 mVdc. The rms value of the modulation is then a very accurate measure of AM percent (% AM is 1/2 the ac voltage in mVrms).

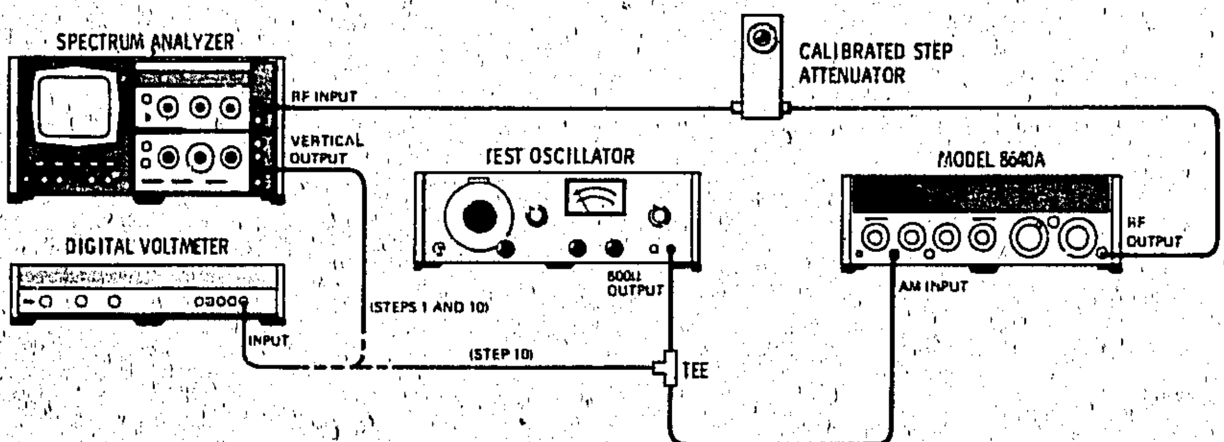


Figure 3-7. Option 002 AM Calibration Test Setup (512–1024 MHz Range Only)

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Digital Voltmeter	HP 3490A
Test Oscillator	HP 651B
10 dB Step Attenuator.	HP 355D

PROCEDURE:

1. Connect equipment as shown in Figure 3-7 after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
MODULATION	Fully ccw
FM	OFF
RANGE	2–3 MHz
FREQUENCY TUNE	3 MHz
OUTPUT LEVEL Switch	–30 dBm
OUTPUT LEVEL Vernier	Meter reads +3 dB
RF ON/OFF	ON

2. Set step attenuator to 0 dB.

OPTION 002 AM CALIBRATION PROCEDURE (512–1024 MHz Range Only) (Cont'd)

3. Set spectrum analyzer's resolution bandwidth to 300 kHz, input attenuation to 20 dB, frequency span per division (scan width) to 20 kHz (tuning stabilizer on), scale to linear, and adjust center frequency and scale reference level controls to center the 3 MHz signal on the display. Set frequency span per division to 0 Hz and display smoothing (video filter) to 10 kHz. Peak the signal on the display with center frequency controls.

4. Adjust analyzer's reference level controls for −500 mVdc indicated on DVM ($V_{DET\ 1}$).

5. Set step attenuator to 20 dB. Note DVM reading ($V_{DET\ 2}$).

6. Calculate V_{off}, where

$$V_{off} = \frac{V_{DET\ 2} - \alpha V_{DET\ 1}}{1 - \alpha}$$

and $\alpha = V_{RF\ 2}/V_{RF\ 1}$ (i.e., α = attenuation; for 20 dB it is 0.1),

therefore

$$V_{off} = \frac{V_{DET\ 2} + 50\ \text{mVdc}}{0.9} = \underline{\hspace{3cm}}\ \text{mVdc.}$$

7. Set step attenuator to 0 dB.

8. Set generator's controls as follows:

Meter Function	AM
AM	AC
RANGE	512–1024 MHz
FREQUENCY TUNE	As desired

9. Set analyzer's center frequency controls to peak the signal on the display.

10. Set generator's MODULATION control fully cw. Connect the DVM to spectrum analyzer's vertical output.

11. Use analyzer's reference level controls to set −282.8 mVdc + V_{off} at vertical output (as measured on the DVM). For example, if V_{off} is +50.0 mVdc, then set −282.8 mVdc + (+50.0 mVdc) or −232.8 mVdc at vertical output. (Check that signal is peaked on analyzer display.)

12. To measure % AM, set the DVM to measure mVrms (ac only). Adjust the test oscillator to give the desired % AM which is equal to 1/2 the voltage reading (e.g., 100 mVrms equals 50% AM).

OPTION 002 AM CALIBRATION PROCEDURE (512–1024 MHz Range Only) (Cont'd)

NOTE

Should the AM peak power exceed −27 dBm, the REDUCE PEAK POWER annunciator will light. In such a case reduce the OUTPUT LEVEL vernier until the light goes out, then readjust the analyzer's dc output level as in step 5, and contunue.

13. Note the AM panel meter reading and the test oscillator output level (as measured with DVM).

NOTE

This calibrates the actual AM against the input modulation sensitivity and meter indication. The meter indication now applies for both external and internal AM.

14. Repeat steps 12 and 13 for other desired levels of % AM.
15. Repeat steps 11 through 14 for other desired OUTPUT LEVEL vernier settings.

NOTE

For a given OUTPUT LEVEL vernier setting, the AM calibration applies for the same setting on other OUTPUT LEVEL ranges.

16. Repeat steps 2 through 15 for other desired RF frequencies on the 512–1024 MHz range.

PERFORMANCE CHECK

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

4-2. The procedures in this section test the critical electrical performance of the Signal Generator using the specifications of Table 1-1 as the performance standards. The first test (Basic Functional Checks) presents steps for checking the overall basic functions of the generator. The performance tests that follow provide the most comprehensive check of the specifications. A simpler operational test is included in Section III under Operator's Checks.

4-3. The Basic Functional Checks should be useful for incoming inspections, routine maintenance and general post-repair checks, but is not intended to be a complete check of specifications. The test requires only commonly available equipment and is written so that a wide variety of models with equivalent specifications may be used.

4-4. EQUIPMENT REQUIRED

4-5. Table 4-1 lists the test equipment recommended for the Basic Functional Checks only. Equipment required for the other performance tests is listed in the Recommended Test Equipment table in Section I. Any equipment that satisfies the critical specifications given in the tables may be substituted for the recommended model(s).

4-6. TEST RECORD

4-7. A separate check-off list is provided as a test record at the end of the Basic Functional Checks. Results of the other 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.

4-8. TEST PROCEDURES

4-9. It is assumed that the person performing the following tests understands how to operate the specified test equipment. Equipment settings, other than those for the Model 8640A are stated in general terms. For example, a test might require that a spectrum analyzer's resolution bandwidth be set to 100 Hz; however, the time per division setting would not be specified and the operator would set that control so that the analyzer operates correctly.

4-10. It is also assumed that the person performing the tests will supply whatever cables, connectors, and adapters are necessary. The Test Accessories table in Section I lists the requirements for some of these items.

4-11. Unless otherwise specified, set the following controls as shown:

AUDIO OUTPUT LEVEL . . . . Fully ccw
RF ON/OFF . . . . ON
LINE . . . . ON

Use FINE TUNE in conjunction with FREQUENCY TUNE to set whatever frequency is required.

CAUTION

To avoid the possibility of damage to test equipment, read completely through each test before starting it. Make any preliminary control settings necessary for correct test equipment operation.

PERFORMANCE TESTS

4-12. BASIC FUNCTIONAL CHECKS

DESCRIPTION: A minimum of test equipment is used to check the overall basic functions of the signal generator.

EQUIPMENT:

Table 4-1. Recommended Test Equipment (Basic Functional Checks)

Instrument Type	Critical Specifications	Suggested Models
AC Voltmeter	Accuracy: ±1% at 0.7 Vrms	HP 400E, or HP 34740A/34702A, or HP 3490A
Frequency Counter	Range: 550 MHz Accuracy: <100 ppm	HP 5327C or HP 5383A
Power Meter	Frequency Range: 10 MHz to 1.5 GHz Max Input Level: 10 dBm Accuracy: ±1%	HP 435A/8482A, or HP 432A/478A
Pulse Generator	Output: 1 V into 50Ω Range: >2 kHz (waveform not critical)	HP 3311A, or HP 8011A
Spectrum Analyzer	Range: >100 MHz Resolution Bandwidth: >100 kHz to <3 kHz Log and linear display	HP 8558B/182C, or HP 8553B/8552A/141T, or HP 8554B/8552A/141T

PROCEDURE:

1. Set the Signal Generator's controls as follows. Return the controls to these initial settings before starting any section within the check.

Meter Function	FM
AM	OFF
AUDIO OUTPUT LEVEL	1V
MODULATION	Fully ccw
MODULATION FREQUENCY	1 kHz
FM	OFF
PEAK DEVIATION	5 kHz
PEAK DEVIATION Vernier	Fully ccw
RANGE	0.5–1 MHz
FREQUENCY TUNE	Approximately centered
FINE TUNE	Approximately centered
OUTPUT LEVEL Switch	+10 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON
LINE	ON

4-12. BASIC FUNCTIONAL CHECKS (Cont'd)

2. **Preliminary Checks (refer to step 1 for initial control settings):**

   a. Set LINE switch to OFF. The panel meter should read exactly 0 when viewed directly from the front.

   b. The air filter on the rear panel should be clean.

   c. Set LINE switch to ON. The lamp in the switch pushbutton should light.

   d. The fan should be operating.

   e. Set PEAK DEVIATION as indicated below. The correct SCALE annunciator should light as shown.

PEAK DEVIATION	SCALE
5 kHz	0–5
10 kHz	0–10
20 kHz	0–3

   f. Set PEAK DEVIATION to 10 kHz, and FM to INT. The REDUCE PEAK DEVIATION annunciator should light.

   g. Set PEAK DEVIATION to 5 kHz and PEAK DEVIATION vernier fully cw. The REDUCE FM VERNIER annunciator should light. Return FM to OFF, and PEAK DEVIATION vernier to fully ccw.

   h. Set OUTPUT LEVEL switch and vernier fully cw. The REDUCE PEAK POWER annunciator should light. Return OUTPUT LEVEL switch to +10 dBm.

3. **Mechanical Dial and Frequency Checks (refer to step 1 for initial control settings):**

   a. Connect a counter to the RF OUTPUT. Set FREQUENCY TUNE to full ccw stop. Counter should read 0.450 MHz or less.

   b. Rotate FREQUENCY TUNE to fully cw position. Counter should read 1.07 MHz or greater.

   c. Set FREQUENCY TUNE for exact dial settings indicated below approaching the setting in a cw direction. The counter should read within the limits shown.

Frequency Setting (MHz)	Frequency Limits (MHz)
1.000	0.990–1.010
0.750	0.743–0.757
0.500	0.495–0.505

PERFORMANCE TESTS

4-12. BASIC FUNCTIONAL CHECKS (Cont'd)

d. With the FREQUENCY TUNE at the last setting above, vary the RANGE settings as tabulated below. The corresponding counter reading is indicated.

RANGE (MHz)	Frequency (MHz)
1–2	1.00
2–4	2.00
4–8	4.00
8–16	8.00
16–32	16.0
32–64	32.0
64–128	64.0
128–256	128
256–512	256
512–1024	256 (except for Opt.002) 512 (Opt. 002 only)

e. Set FREQUENCY RANGE to 256–512 MHz. Tune frequency to approximately 345 MHz. Slowly rotate FREQUENCY TUNE in a cw direction. A faint but audible click should be heard when tuning through the range 355–357 MHz. This is relay switching of the high band filters.

4. Meter and Modulation Oscillator Checks (refer to step 1 for initial control settings):

a. Set FM to INT, AM to AC, MODULATION fully cw, and Meter Function to AM. Connect FM OUTPUT to AM INPUT through a BNC tee. Connect an ac voltmeter to the tee. Set AUDIO OUTPUT LEVEL to 0.707 Vrms as read on the voltmeter. The generator's front panel meter should read between 9.6 and 10.4. Return AM to OFF.

b. Connect FM OUTPUT to a frequency counter. The counter should read between 970 and 1030 Hz. Record this frequency for future reference.

970 ________ 1030 Hz

c. For Option 001 only, set MODULATION FREQUENCY to X1, and MODULATION FREQUENCY vernier to 100. Change MODULATION FREQUENCY range as shown in the following table. The counter should read within the frequency limits indicated.

MODULATION FREQUENCY Range	Frequency Limits (Hz)
X1	85–115
X10	850–1150
X100	8 500–11 500
X1k	85 000–115 000
X3k	255 000–345 000

PERFORMANCE TESTS

4-12. BASIC FUNCTIONAL CHECKS (Cont'd)

5. **Output Level Checks** (refer to step 1 for initial control settings):

   a. Set RANGE to 32–64 MHz, FREQUENCY TUNE to 50 MHz, and Meter Function to LEVEL. Connect a power meter to RF OUTPUT and set OUTPUT LEVEL vernier for a front panel meter indication of −1 dB. The power meter should read between +8.5 and +9.5 dBm.

   b. Reduce OUTPUT LEVEL to −7 dB as read on the panel meter. The power meter should read between +2.5 and +3.5 dBm.

   c. Return OUTPUT LEVEL to +9 dBm *as read on the power meter.* Tune across all frequency ranges for which the power sensor is specified and note maximum and minimum level variations. The level should be between the limits indicated below.

Option Combination (Opt. 001 inconsequential)	Output Level Limits (dBm) vs. RANGE (MHz)		
	0.5–64	64–512	512–1024
Standard	8.50–9.50	8.50–9.50	—
Opt. 002	8.50–9.50	8.00–10.00	7.50–10.50
Opt. 003	7.75–9.75	7.75–9.75	—
Opt. 002 with 003	7.00–10.00	7.00–10.00	7.00–11.00

6. **AM and Pulse Checks** (refer to step 1 for initial control settings):

   a. Set RANGE to 64–128 MHz, FREQUENCY TUNE to 100 MHz, and OUTPUT LEVEL switch to −40 dBm (with vernier fully cw). Connect RF OUTPUT to the input of a spectrum analyzer.

   b. Set analyzer controls to display the 100 MHz signal with 100 kHz or greater resolution bandwidth, linear vertical scale, 5 to 20 kHz of display smoothing, and zero frequency span width. Check that the signal is peaked on the display and adjust the vertical sensitivity for 4 divisions of deflection. (Also ensure that the base line with no signal is at the bottom line of the display.)

   c. Set AM to INT, MODULATION FREQUENCY to 1 kHz and Meter Function to AM. Adjust MODULATION for a panel meter reading of 50%. Set the analyzer scan trigger to video. The peak-to-peak amplitude on the display should be between 3.6 and 4.4 divisions centered about the fourth division. The waveform should appear undistorted.

   d. Connect a pulse generator to AM INPUT and set it for an output of +1V into 50Ω, 1 kHz rate, and 0.5 ms width. Set analyzer resolution bandwidth to 100 kHz or greater and no display smoothing.

   e. Set AM to OFF. Check that signal is peaked and at fourth division. Set AM to PULSE. The level of the flat part of the pulse should be between 3.5 and 4.5 divisions.

   f. Set AM to OFF. Adjust analyzer to view the 100 MHz signal in smallest resolution bandwidth and frequency span that is reasonable, and set vertical scale to 10 dB log per division. Step OUTPUT LEVEL switch down in 10 dB steps and check that the output signal decreases in 10 dB steps to the lowest observable level on the analyzer.

PERFORMANCE TESTS

4-12. BASIC FUNCTIONAL CHECKS (Cont'd)

7. **FM Check** (refer to step 1 for initial control settings):

   a. Set FREQUENCY TUNE to 1 MHz, and OUTPUT LEVEL switch to —40 dBm. Locate signal on spectrum analyzer. Adjust analyzer for full-scale deflection of signal with 10 dB log per vertical division, 100 Hz resolution bandwidth, and 500 Hz to 2 kHz frequency span per division. (If 100 Hz resolution bandwidth is not available, see steps c and d.)

   b. Set FM to INT and increase PEAK DEVIATION vernier for a panel meter reading of 2.4 kHz (note that the carrier decreases as peak deviation increases). The carrier signal should be down greater than 18 dB from its original level (which corresponds to a peak deviation accuracy of ±10%).

   NOTE

   To obtain a more accurate measurement, adjust PEAK DEVIATION vernier for a carrier null. The panel meter should read 2.405 times the modulation rate measured in step 4b (±10%). The above steps may also be repeated for other carrier frequencies.

   c. If a spectrum analyzer with 100 Hz resolution bandwidth is not available, set RANGE to 4—8 MHz, FREQUENCY TUNE to 8 MHz, and OUTPUT LEVEL switch to —40 dBm. Locate signal on spectrum analyzer. Adjust analyzer for full-scale deflection of signal in 10 dB log per vertical division with 3 kHz resolution bandwidth and 20 kHz frequency span per division.

   d. Set an external audio oscillator to 1 Vrms at 10 kHz, connect to FM INPUT, and set FM to AC; or for Option 001, set MODULATION FREQUENCY to 10 kHz and set FM to INT. In either case, set the 10 kHz frequency with a counter. Set PEAK DEVIATION switch to 40 kHz and increase PEAK DEVIATION vernier for a panel meter reading of 24 kHz (note that the carrier decreases as peak deviation increases). The carrier signal should be down greater than 18 dB from its original level (which corresponds to a peak deviation accuracy of ± 10%).

Table 4-2. Record of Basic Functional Checks (1 of 2)

Step	Description	√
2.	Preliminary Checks	______
	a. Meter mechanical zero	______
	b. Clean air filter	______
	c. LINE ON/OFF lamp	______
	d. Fan	______
	e. SCALE annunciators	______
	f. REDUCE PEAK DEVIATION annunciator	______
	g. REDUCE FM VERNIER annunciator	______
	h. REDUCE PEAK POWER annunciator	______

(Continued on next page)

PERFORMANCE TESTS

4-12. BASIC FUNCTIONAL CHECKS (Cont'd)

Table 4-2. Record of Basic Functional Checks (2 of 2)

Step	Description	√
3.	**Mechanical Dial and Frequency Checks**	____
	a. Low frequency range	____
	b. High frequnncy range	____
	c. Dial Accuracy	____
	d. Range check	____
	e. High band/low band switching	____
4.	**Meter and Modulation Oscillator Checks**	
	a. Panel meter accuracy	____
	b. Modulation oscillator frequency accuracy — 1 kHz	____
	c. Modulation oscillator frequency accuracy — other ranges (Option 001)	____
5.	**Output Level Checks**	
	a. Output level accuracy	____
	b. Output level accuracy	____
	c. Output level flatness	____
6.	**AM and Pulse Checks**	
	c. AM accuracy and distortion	____
	e. Pulse level accuracy	____
	f. Output attenuator	____
7.	**FM Check**	
	b. or d. FM accuracy	____

PERFORMANCE TESTS

4-13. FREQUENCY RANGE AND DIAL ACCURACY TEST

SPECIFICATION: **Standard:** 500 kHz to 512 MHz in 10 octave ranges.
Option 002: 500 kHz to 1024 MHz in 11 octave ranges.
Range and Range Overlap: Ranges extend approximately 10% below and 7% above the nominal frequency ranges shown below.

Frequency Range (MHz)	Frequency Range (MHz) (with overlap)
0.5–1	0.45–1.07
1–2	0.90–2.14
2–4	1.80–4.29
4–8	3.60–8.59
8–16	7.19–17.1
16–32	14.4–34.3
32–64	28.8–68.7
64–128	57.5–137
128–256	115–275
256–512	230–550
512–1024	460–1100*

*Without Opt. 002 the actual output is 230–550 MHz. With Opt. 002 or with an external doubler the output is as shown.

Dial Accuracy: better than ±1%.

DESCRIPTION: The frequency range and dial accuracy are verified by using an external counter to indicate the frequency at the high and low end of each range.

EQUIPMENT: Frequency Counter . . . . HP 5327C

PROCEDURE:

1. Connect generator's AUX RF OUTPUT (rear panel) to frequency counter's 50Ω input after setting signal generator's controls as follows:

   FM . . . . OFF
   RANGE . . . . 0.5–1 MHz
   FREQUENCY TUNE . . . . Fully ccw
   FINE TUNE . . . . Approximately centered

2. Note displayed frequency for each RANGE. Set FREQUENCY TUNE fully cw and repeat. For each RANGE setting, the frequency should be within the limits shown below.

RANGE (MHz)	Low End (MHz)	High End (MHz)
0.5–1	________ 0.45	1.07 ________
1–2	________ 0.90	2.14 ________
2–4	________ 1.80	4.29 ________
4–8	________ 3.60	8.59 ________
8–16	________ 7.19	17.1 ________

(continued on next page)

PERFORMANCE TESTS

4-13. FREQUENCY RANGE AND DIAL ACCURACY TEST

RANGE (MHz)	Low End (MHz)	High End (MHz)
16–32	________ 14.4	34.3 ________
32–64	________ 28.8	68.7 ________
64–128	________ 57.5	137 ________
128–256	________ 115	275 ________
256–512	________ 230	550 ________
512–1024	________ 460*	1100* ________
*Actual frequency output is 230 MHz (low end) and 550 MHz (high end) for all but Option 002.		

3. Set RANGE to 0.5–1 MHz. Set FREQUENCY TUNE for exact dial settings indicated below approaching the setting in a cw direction. The counter should read within the limits shown.

Frequency Setting (MHz)	Frequency Limits (MHz)
1.000	0.990 ________ 1.010
0.750	0.743 ________ 0.757
0.500	0.495 ________ 0.505

4. To check frequency dial accuracy at other frequencies, set RANGE and FREQUENCY TUNE control (FINE TUNE centered) to desired frequency and compare counter reading with indicated frequency on dial. Approach all frequencies from a cw direction. The counter should read within ±1% of the dial indication.

________ ±1%

4-14. HARMONIC DISTORTION TEST

SPECIFICATION: Harmonics (at 1 volt, +10 dBm output range and below):
>30 dB below fundamental, 0.5 to 512 MHz.
>12 dB below fundamental, 512 to 1024 MHz (Option 002).

DESCRIPTION: Harmonics are measured with a spectrum analyzer as the Signal Generator frequency is tuned from 0.5 to 512 MHz (and to 1024 MHz for Option 002).

EQUIPMENT: Spectrum Analyzer . . . . HP 8554B/8552B/141T

PROCEDURE:

1. Connect Signal Generator RF OUTPUT to spectrum analyzer input after setting generator controls as follows:

   Meter Function . . . . LEVEL
   AM . . . . OFF
   FM . . . . OFF
   RANGE . . . . 0.5 — 1 MHz
   FREQUENCY TUNE . . . . 0.5 MHz
   OUTPUT LEVEL Switch . . . . . +10 dBm
   OUTPUT LEVEL Vernier . . . . . Meter reads + 3 dB

2. Set spectrum analyzer input attenuation to 40 dB (use an external attenuator if necessary). Set analyzer resolution bandwidth, frequency span per division, and

4-14. HARMONIC DISTORTION TEST (Cont'd)

center frequency controls and Signal Generator RANGE control as listed in the table below. For each RANGE setting, tune FREQUENCY TUNE across range beginning at high frequency end and note level of harmonics with respect to the fundamental. Harmonics should be within the limits shown.

Spectrum Analyzer			Sig. Gen.	Harmonics (dB down from fundamental)
Frequency Span per Division (MHz)	Center Frequency (MHz)	Resolution Bandwidth (kHz)	RANGE (MHz)	
1	0	100	0.5–1	30_______
2	0	100	1–2	30_______
5	0	300	2–4	30_______
10	0	300	4–8	30_______
10	50	≥ 300	8–16	30_______
20	100	≥ 300	16–32	30_______
50	250	≥ 300	32–64	30_______
100	500	≥ 300	64–128	30_______
100	600	≥ 300	128–256	30_______
100	700	≥ 300	256–512	30_______
100	900	≥ 300	512–1024 (Opt. 002 only)	12_______

NOTE

For Option 002, an internal low-pass filter suppresses the harmonics above 1200 MHz. A check to 1250 MHz is sufficient.

4-15. SUBHARMONIC TEST (Option 002)

SPECIFICATION: **Subharmonically Related Spurious Output Signals:** >20 dB below carrier (frequency range 512–1024 MHz).

DESCRIPTION: Subharmonics are measured with a spectrum analyzer as the Signal Generator frequency is tuned from 512 to 1024 MHz.

EQUIPMENT: Spectrum Analyzer . . . . . . HP 8554B/8552B/141T

PROCEDURE: 1. Connect Signal Generator RF OUTPUT to spectrum analyzer input after setting generator controls as follows:

Meter Function . . . . LEVEL
AM . . . . OFF
FM . . . . OFF
RANGE . . . . 512–1024 MHz
FREQUENCY TUNE . . . . . . 512 MHz
OUTPUT LEVEL Switch . . . . −40 dBm
OUTPUT LEVEL Vernier . . . . Meter reads +3 dB

4-15. SUBHARMONIC TEST (Option 002) (Cont'd)

2. Set spectrum analyzer input attenuation to 0 dB, resolution bandwidth to 300 kHz (or greater), frequency span 100 MHz per division, and center frequency to 750 MHz. Tune FREQUENCY TUNE across range and note level of subharmonics (i.e., 1/2 and 3/2 of fundamental frequency) with respect to the fundamental. Subharmonics should be down greater than 20 dB.

20 dB ____________

NOTE

An internal low-pass filter suppresses the 3/2 subharmonic above 1200 MHz. A check to 1250 MHz is sufficient.

4-16. SINGLE SIDEBAND PHASE NOISE TEST

SPECIFICATION: SSB phase noise at 20 kHz offset from carrier:
[averaged rms noise level below carrier (dBc) stated in a 1 Hz bandwidth].

512 MHz to 1024 MHz (Opt. 002): >124 dBc from 460 to 900 MHz increasing linearly to >116 dBc at 1100 MHz.

256 MHz to 512 MHz: >130 dBc from 230 to 450 MHz increasing linearly to >122 dBc at 550 MHz.

0.5 MHz to 256 MHz: Decreases approximately 6 dB for each divided frequency range until it reaches SSB Broadband noise floor of >140 dBc.

DESCRIPTION: Phase noise is measured with a spectrum analyzer. A reference signal generator and a mixer are used to down-convert the test Signal Generator's CW signal to 0 Hz (the two signal generators are phase locked together). Then the spectrum analyzer measures SSB phase noise at a 20 kHz offset from the carrier.

NOTE

This test measures the total SSB phase noise of both generators. Therefore, the reference signal generator must have SSB phase noise that is less than or equal to the specification for the test generator.

EQUIPMENT:

Reference Signal Generator	HP 8640A
Mixer	HP 10514A
10 dB Step Attenuator	HP 355D
40 dB Amplifier	HP 08640-60506
Oscilloscope	HP 180C/1801A/1820C
Spectrum Analyzer	HP 8556A/8552B/141T
Noise Phase Lock Circuit	HP 08640-60504

PERFORMANCE TESTS

4-16. SINGLE SIDEBAND PHASE NOISE TEST (Cont'd)

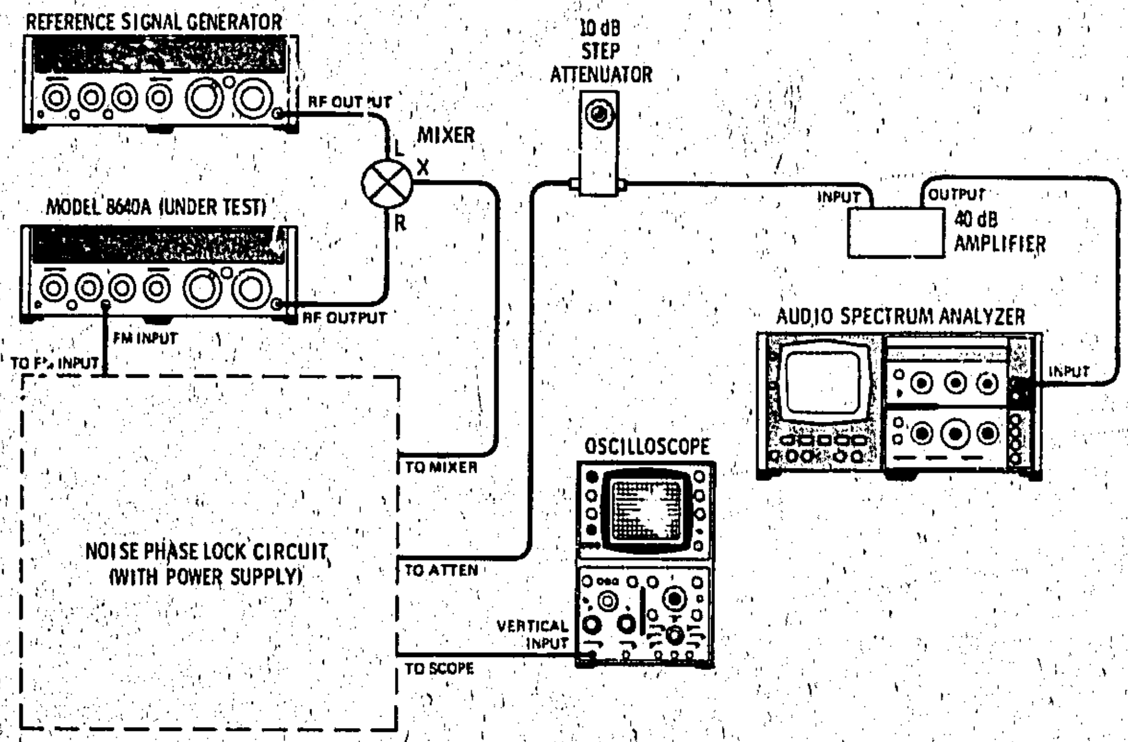


Figure 4-1. Single Sideband Phase Noise Test Setup

PROCEDURE:

1. Connect equipment as shown in Figure 4-1 after setting test Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
PEAK DEVIATION	5 kHz
PEAK DEVIATION Vernier	Fully cw
RANGE	256–512 MHz
FREQUENCY TUNE	550 MHz
OUTPUT LEVEL Switch	−10 dBm
OUTPUT LEVEL Vernier	Fully cw

2. Set analyzer's input level control to −40 dBm, resolution bandwidth to 1 kHz, dBm/dBV control to dBm 50 ohms, span width per division (scan width) to 5 kHz, and center frequency controls to 20 kHz. Set display reference level to −40 dBm (at 10 dB per division). Using analyzer's 20 kHz markers, measure and note 20 kHz on the display.

3. Set oscilloscope's volts/div control to 0.02 and time/div control to 50 μs; set the input to measure dc. Set 10 dB step attenuator to 80 dB. Set 40 dB amplifier's input impedance switch to 50 ohms.

PERFORMANCE TESTS

4-16. SINGLE SIDEBAND PHASE NOISE TEST (Cont'd)

4. Set reference signal generator for a 549.98 MHz, CW signal at +13 dBm (i.e., 20 kHz below test generator's frequency). Fine adjust its frequency for a 20 kHz signal on analyzer's display. Adjust analyzer's display reference level controls so that the 20 kHz signal is 4.3 dB below the top (reference) graticule line.

NOTE

The correction factors for this measurement are as follows:

a. The DSB to SSB transfer is −6 dB because the mixing process translates two **correlated** *1 kHz BW portions of the noise into the 1 kHz BW of the analyzer — giving twice the effective noise voltage.*

b. +2.5 dB because noise is average detected after logging[1].

c. −0.8 dB. Effective noise BW is 1.2 x 3 dB which gives −0.8 dB −10 log (actual 3 dB/nominal 3 dB BW).[1]

Summing of correction factors gives −4.3 dB −10 log (actual 3 dB BW/nominal 3 dB BW) or approximately −4.3 dB ±1 dB.

5. Phase lock the generators by setting test generator's FM switch to DC and by tuning reference signal generator to 550 MHz (i.e., for a difference frequency of 0 Hz). Monitor phase lock on oscilloscope, checking that mixer's output is 0 Vdc (if it is not, fine tune reference generator until it is).

6. Set analyzer's display smoothing (video filter) to 10 Hz. Set step attenuator to 0 dB. The top (reference) graticule line on analyzer's display represents 110 dB/$\sqrt{\text{Hz}}$ below carrier level (the transfer from a 1 kHz BW to a 1 Hz BW is 30 dB). The average noise level on the display should be >12 dB below top graticule line at 20 kHz (i.e., >122 dB below carrier).

12 dB____________

NOTE

Set oscilloscope to check for possible line-related signals in test setup. They should be <10 mVp-p.

7. Set test Signal Generator to 450 MHz and FM switch to OFF. Set reference signal generator to 449.98 MHz (i.e., 20 kHz below the test generator's frequency). Repeat steps 2 through 6. The average noise level on the display should be >20 dB below top graticule line at 20 kHz.

20 dB____________

NOTE

SSB phase noise can be checked at any other frequency from 230 kHz to 550 MHz on lower ranges, and on the 512—1024 MHz range (Option 002) by following the procedures given above. Noise decreases approximately 6 dB per each octave decrease in band change down to 140 dB below carrier (137 dB for 512—1024 MHz range for Option 002).

[1] See Hewlett-Packard Application Note 150-4, Spectrum Analysis — Noise Measurements

PERFORMANCE CHECK CON'T

PERFORMANCE TESTS

4-17. SINGLE SIDEBAND BROADBAND NOISE FLOOR TEST

SPECIFICATION: SSB Broadband Noise Floor at maximum output vernier and greater than 500 kHz offset from carrier: (averaged rms noise level below carrier stated in a 1 Hz bandwidth.)
0.5 to 512 MHz: > 140 dBc.
512 to 1024 MHz (Option 002): >137 dBc.

DESCRIPTION: A spectrum analyzer is used to measure the broadband noise floor (a reference signal generator and a mixer are used to down-convert the test Signal Generator's RF output and noise to within the range of the spectrum analyzer). A reference level is set on the analyzer with a 5 kHz signal, the signal is changed to 500 kHz and removed from the analyzer with a filter, and the broadband noise floor is measured.

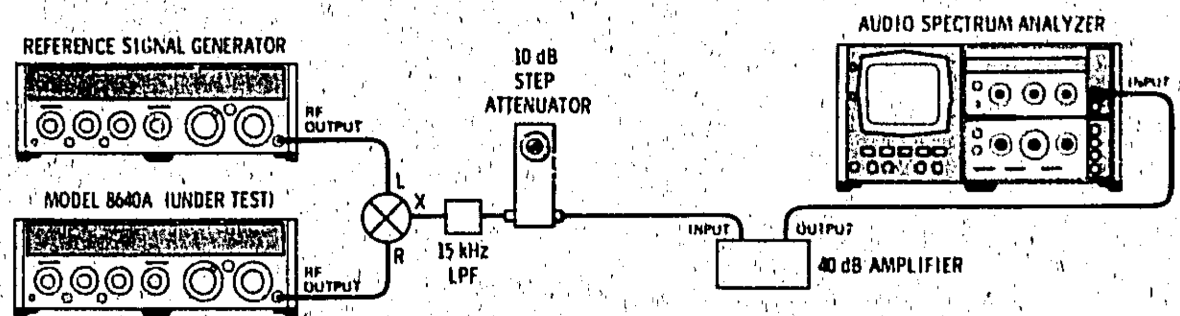


Figure 4-2. Single Sideband Broadband Noise Floor Test Setup

EQUIPMENT:

Reference Signal Generator	HP 8640A
Mixer	HP 10514A
15 kHz Low-Pass Filter	CIR-Q-TEL 7 Pole
10 dB Step Attenuator	HP 355D
40 dB Amplifier	HP 08640-60506
Spectrum Analyzer	HP 8556A/8552B/141T

PROCEDURE:

1. Connect equipment as shown in Figure 4-2 after setting test Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	256–512 MHz
FREQUENCY TUNE	500.000 MHz
OUTPUT LEVEL Switch	−10 dBm
OUTPUT LEVEL Vernier	Fully cw

2. Set 10 dB step attenuator to 80 dB. Set reference signal generator for a 500.005 MHz (i.e., 5 kHz above the test generator's frequency), CW signal at +13 dBm (output vernier maximum cw). Set 40 dB amplifier's input impedance switch to 50 ohms.

3. Set spectrum analyzer's resolution bandwidth to 1 kHz, set input level control to −40 dBm and dBm/dBV to dBm 50 ohms, and adjust frequency controls to set the 5 kHz difference frequency in the center of the display. Set analyzer's display ref-

4-17. SINGLE SIDEBAND BROADBAND NOISE FLOOR TEST (Cont'd)

erence level controls for 10 dB per division with the 5 kHz difference signal 1.3 dB from the top (reference) graticule line on the display.

NOTE

The correction factors for this measurement are as follows:

a. The DSB to SSB transfer is −3 dB because the mixing process translates two **uncorrelated** *1 kHz BW portions of the noise into the 1 kHz BW of the analyzer — giving $\sqrt{2}$ times the effective noise voltage.*

b. +2.5 dB because noise is average detected after logging.[1]

c. −0.8 dB. Effective noise BW is 1.2 x 3 dB BW which gives −0.8 dB −10 log (actual 3 dB BW/nominal 3 dB BW).[1]

Summing the correction factors gives −1.3 dB −10 log (actual 3 dB BW/nominal 3 dB BW) or approximately −1.3 dB ± 1 dB.

4. Change reference signal generator's output frequency to 500.50 MHz. Set 10 dB step attenuator to 0 dB. Set analyzer's display smoothing (video filter) to 10 Hz. The top graticule line on analyzer's display represents −110 dB (the transfer from a 1 kHz BW to a 1 Hz BW is 30 dB). The average noise level on the display should be >30 dB below the top graticule line (i.e., >140 dB below carrier).

30 dB________

NOTE

If the test generator appears to be out of specification, check for excessive noise in the test setup by disconnecting the test generator. The noise level on the analyzer's display should decrease at least 10 dB.

4-18. RESIDUAL AM TEST

SPECIFICATION: **Residual AM** (averaged rms):

Post-Detection Noise Bandwidth	
300 Hz to 3 kHz	**20 Hz to 15 kHz**
>85 dBc	>78 dBc

[1] See Hewlett-Packard Application Note 150-4, Spectrum Analysis — Noise Measurements.

4-18. RESIDUAL AM TEST (Cont'd)

DESCRIPTION: An rms voltmeter is calibrated with a measured amount of amplitude modulation from the Signal Generator. Then the AM is removed and the generator's residual AM is read directly from the voltmeter. Residual AM is measured only for a 20 Hz to 15 kHz post-detection noise bandwidth since any out-of-tolerance condition for it will also be out of tolerance for a 300 Hz to 3 kHz bandwidth.

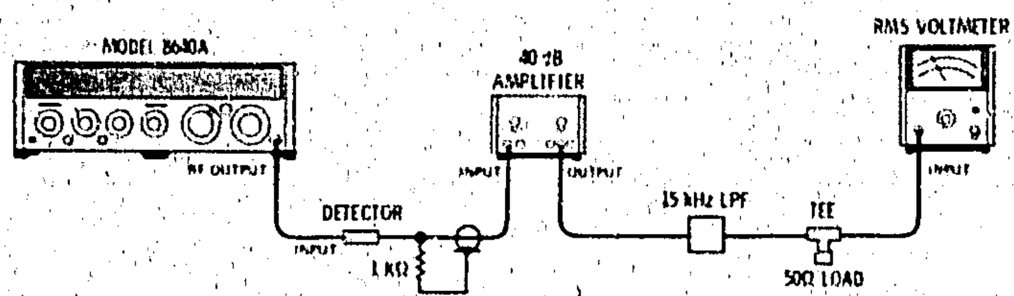


Figure 4-3. Residual AM Test Setup

EQUIPMENT:

RMS Voltmeter	HP 3400A
Crystal Detector	HP 8471A
15 kHz Low-Pass Filter (LPF)	CIR-Q-TEL 7 Pole
40 dB Amplifier	HP 465A
50 Ohm Load	HP 11593A
1 kΩ Resistor	HP 0757-0280

PROCEDURE:

1. Connect equipment as shown in Figure 4-3 (with the generator connected to the rms voltmeter through the detector, amplifier, 15 kHz LPF, and across the 50 ohm load). Set Signal Generator's controls as follows:

Meter Function	AM
AM	INT
MODULATION	Fully ccw
MODULATION FREQUENCY	1 kHz
FM	OFF
RANGE	256–512 MHz
FREQUENCY TUNE	500 MHz
OUTPUT LEVEL Switch	+10 dBm
OUTPUT LEVEL Vernier	Fully cw

2. Slowly turn Signal Generator's MODULATION control clockwise until its panel meter indicates 10% AM. Note voltmeter reading in dB.

3. Set generator's AM switch to OFF. Residual AM should read >58 dB below the reference noted in step 2 (i.e., >78 dB down, since the 10% AM, after detection, is 20 dB below the carrier level).

58 dB ________

4. Set RANGE switch to 512–1024 and repeat steps 2 and 3.

58 dB ________

PERFORMANCE TESTS

4-19. RESIDUAL FM TEST

SPECIFICATION: Residual FM (averaged rms):

Frequency Range (MHz)	Post-Detection Noise Bandwidth: CW and up to 1/8 maximum allowable peak deviation, 300 Hz to 3 kHz	CW and up to 1/8 maximum allowable peak deviation, 20 Hz to 15 kHz	Up to maximum allowable peak deviation, 300 Hz to 3 kHz	Up to maximum allowable peak deviation, 20 Hz to 15 kHz
256 to 512	<5 Hz	<15 Hz	<15 Hz	<30 Hz
512 to 1025 (Option 002)	<10 Hz	<30 Hz	<30 Hz	<60 Hz

Note: Residual FM for ranges below 256—512 MHz decreases by approximately 1/2 for each divided frequency range until limited by the broadband noise floor. This limit for 300 Hz to 3 kHz bandwidth is ≈1 Hz and for 20 Hz to 15 kHz bandwidth is ≈4 Hz.

DESCRIPTION: A frequency meter is used as an FM discriminator to measure FM deviation (a reference signal generator and a mixer are used to down-convert the test Signal Generator's RF output to within the range of the discriminator). The discriminator output is filtered and amplified and then measured with a voltmeter. The voltmeter reading, in mVrms, is proportional to the rms frequency deviation of the residual FM.

NOTE

This test measures the total residual FM of both generators. Therefore, the reference generator must have residual FM that is less than or equal to the specification for the test generator. Residual FM is measured only for a 20 Hz to 15 kHz post-detection noise bandwidth since any out-of-tolerance condition for it will also be out of tolerance for a 300 Hz to 3 kHz bandwidth.

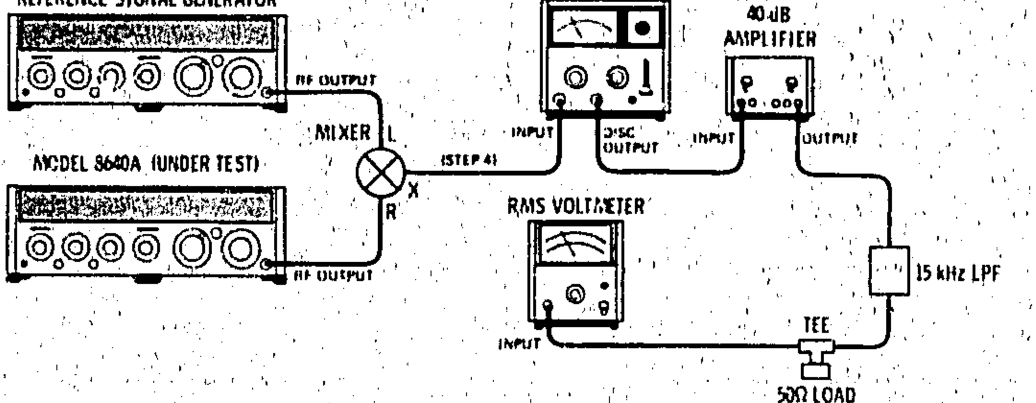


Figure 4-4. Residual FM Test Setup

PERFORMANCE TESTS

4-19. RESIDUAL FM TEST (Cont'd)

EQUIPMENT:

Frequency Meter	HP 5210A
Filter Kit	HP 10531A
RMS Voltmeter	HP 3400A
40 dB Amplifier	HP 465A
Reference Signal Generator	HP 8640A
Mixer	HP 10514A
15 kHz Low-Pass Filter (LPF)	CIR-Q-TEL 7 Pole
50 Ohm Load	HP 11593A

PROCEDURE:

1. Connect equipment as shown in Figure 4-4 after setting test Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	AC
PEAK DEVIATION	320 kHz
PEAK DEVIATION Vernier	Fully cw
RANGE	256–512 MHz
FREQUENCY TUNE	500 MHz
OUTPUT LEVEL Switch	–10 dBm
OUTPUT LEVEL Vernier	Fully cw

2. Install shorting board in frequency meter and calibrate it for 1 Vdc (at the output jack) for a full-scale meter reading. Remove shorting board, prepare a 20 kHz Butterworth low-pass filter (from filter kit), and install filter in frequency meter.

3. Set reference signal generator for a 500.10 MHz, CW signal at +13 dBm.

4. Connect frequency meter to mixer. Set frequency meter's range to 100 kHz and sensitivity to 0.01 Vrms. Fine tune either generator for a full-scale meter reading on frequency meter.

5. Connect amplifier to discriminator output. Connect voltmeter through 15 kHz LPF to amplifier's output. The signal out of the amplifier is 0.5 mVrms per 1 Hz (rms) of residual FM deviation, and the average voltmeter reading should be less than 7.5 mVrms (i.e., <15 Hz (rms) residual FM).

_________7.5 mVrms

NOTE

Test setup calibration can be checked by setting the test generator's FM to INT, PEAK DEVIATION to 5 kHz (as read on panel meter with Meter Function set to FM), and MODULATION FREQUENCY to 1000 Hz. The voltmeter should read 1.77 Vrms.

6. Set test Signal Generator's PEAK DEVIATION switch to 2.56 MHz. The average voltmeter reading should be less than 15 mVrms (i.e., <30 Hz (rms) residual FM).

_________15 mVrms

4-20. OUTPUT LEVEL ACCURACY TEST

SPECIFICATION: **Level Accuracy:** (total accuracy as indicated on level meter).

Frequency Range (MHz)	Output Level Using Top 10 dB of Vernier Range (dBm) *		
	+19 to −7	−7 to −47	−47 to −137
0.5–512	±1.5 dB	±2.0 dB	± 2.5 dB
*When below top 10 dB of vernier range, add ±0.5 dB.			

DESCRIPTION: The RF level accuracy for the upper four OUTPUT LEVEL attenuator ranges is measured with a power meter. For the lower ranges, a reference signal is established on a spectrum analyzer display, the Signal Generator's OUTPUT LEVEL switch and the spectrum analyzer's vertical scale log reference level control are stepped together, and any amplitude variations are measured on the analyzer's display. An RF attenuator and amplifier at the RF OUTPUT are adjusted for analyzer compatibility and best sensitivity.

This procedure uses an IF substitution technique in which the spectrum analyzer's IF is the standard. The IF step accuracy should be within ±0.2 dB overall. The IF step accuracy can be checked using the above technique by comparing a lab calibrated attenuator (such as HP Model 355D Option H36) with the IF step control at the frequency of attenuator calibration (e.g., 3 MHz for the HP 355D Option H36).

NOTE

The output level accuracy of the Signal Generator is affected by Options 002 and 003. For these options, perform the following tests in place of this test:

a. For Option 002, perform paragraph 4-21.

b. For Option 003 perform paragraph 4-22.

c. For Option 002 with Option 003 perform paragraph 4-23.

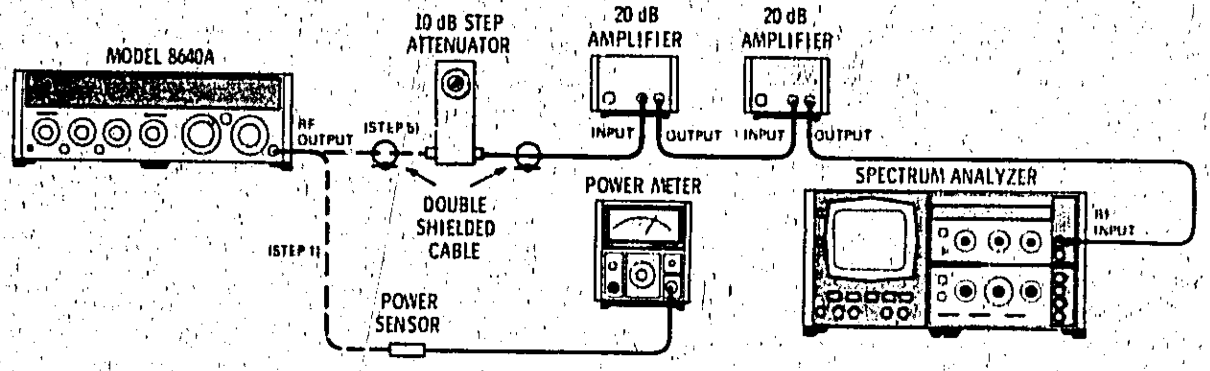


Figure 4-5. Output Level Accuracy Test Setup

4-20. OUTPUT LEVEL ACCURACY TEST (Cont'd)

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Power Meter	HP 435A
Power Sensor	HP 8482A
20 dB Amplifier (2 required)	HP 8447A
10 dB Step Attenuator	HP 355D
Double Shielded Cable (2 required)	HP 08708-6033

PROCEDURE:

1. Connect equipment as shown in Figure 4-5 after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	256–512 MHz
FREQUENCY TUNE	512 MHz
OUTPUT LEVEL Switch	+20 dBm
OUTPUT LEVEL Vernier	Meter reads −1 dB

2. Set power meter's controls so that it can measure +19 dBm. Connect power sensor to Signal Generator's RF OUTPUT.

3. Set Signal Generator's OUTPUT LEVEL controls for levels (using generator's panel meter) shown in the table below; verify that the level on the power meter is within the specified tolerance.

Signal Generator		Power Meter Reading (dBm)
OUTPUT LEVEL Switch (dBm)	Panel Meter Indication (dB)	
+20	−1	+17.5 ________ +20.5
	−7	+11.5 ________ +14.5
	−10	+8.0 ________ +12.0
+10	+3	+11.5 ________ +14.5
	−2	+6.5 ________ + 9.5
	−7	+1.5 ________ + 4.5
	−10	− 2.0 ________ + 2.0
0	+3	+ 1.5 ________ + 4.5
−10	+3	− 9.0 ________ − 6.0

4. Set step attenuator to 70 dB. Set spectrum analyzer center frequency to 512 MHz, resolution bandwidth to 1 kHz, frequency span per division (scan width) to 0.5 kHz, input attenuation to 0 dB, tuning stabilizer on, display smoothing (video filter) to 100 Hz, and vertical log display to 2 dB per division with a −20 dBm reference level.

PERFORMANCE TESTS

4-20. OUTPUT LEVEL ACCURACY TEST (Cont'd)

5. Connect attenuator to generator's RF OUTPUT without disturbing generator's controls. Center signal on analyzer's display. Consider the center horizontal graticule line equivalent to −7 dBm (with a panel meter reading of +3 dB), then with the vertical scale reference vernier control set the signal peak to be equal to the last level measured on the power meter.

NOTE

If, for example, the last power meter reading was −7.4 dBm, the vertical scale resolution is 2 dB/division, therefore, the signal peak should be 0.4 dB or 0.2 division below the center (reference) graticule line.

6. Step Signal Generator's OUTPUT LEVEL switch and analyzer's vertical scale log reference level control switch as shown in the following table. Verify that the amplitude falls within the specified tolerance. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

Signal Generator	Spectrum Analyzer	
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)
−10	−20	Set level
−20	−30	−2.0 ______ +2.0
−30	−40	−2.0 ______ +2.0
−40	−50	−2.0 ______ +2.0

7. Set analyzer's vertical scale log reference level to −10 dBm and reset the 10 dB step attenuator to 30 dB. With the vertical scale log reference vernier, set the signal peak to the same level, with respect to the horizontal center (reference) graticule line, as the last measurement recorded on the preceding table.

NOTE

If generator appears to be out of specification, check accuracy of spectrum analyzer's vertical scale calibration.

8. Step Signal Generator's OUTPUT LEVEL switch and analyzer's vertical scale log reference level control switch as shown in the following table. Verify that the amplitude is within the specified tolerance. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

PERFORMANCE TESTS

4-20. OUTPUT LEVEL ACCURACY TEST (Cont'd)

Signal Generator	Spectrum Analyzer	
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)
−40	−10	Set level
−50	−20	−2.5 ________ +2.5
−60	−30	−2.5 ________ +2.5
−70	−40	−2.5 ________ +2.5
−80	−50	−2.5 ________ +2.5

9. Set step attenuator to 0 dB; set spectrum analyzer's vertical scale log reference level to −20 dBm. Adjust vertical scale log reference vernier to give the same level, with respect to the center (reference) graticule line, as the last recorded entry on the previous table.

10. Set Signal Generator and analyzer controls as shown in the following table. The amplitude levels should be within the specified tolerances. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

Signal Generator	Spectrum Analyzer	
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)
−80	−20	Set level
−90	−30	−2.5 ________ +2.5
−100	−40	−2.5 ________ +2.5
−110	−50	−2.5 ________ +2.5
−120	−60	−2.5 ________ +2.5

11. Set analyzer's display to 10 dB/division log. Adjust log reference level vernier to set signal to −10 dB graticule line (one major division from top of display) plus last recorded entry on previous table.

NOTE

If the following step appears to be out of specification, check the accuracy of the analyzer's display with an external, calibrated attenuator.

12. Set generator's OUTPUT LEVEL switch to −130 dBm (adjust vernier for +3 dB indication on panel meter). The amplitude level indicated on analyzer's display should be within ±2.5 dB of the −20 dB graticule line (second major division from top of display).

−22.5 ________ −17.5 dB

NOTE

The noise level on the analyzer's display should be >10 dB below the signal level. The signal should drop into the noise when the OUTPUT LEVEL vernier is turned fully ccw.

4-21. OUTPUT LEVEL ACCURACY TEST (Option 002)

SPECIFICATION: **Level Accuracy** (total accuracy as indicated on level meter):

Frequency Range (MHz)	Output Level Using Top 10 dB of Vernier Range (dBm)*		
	+18.5 to −7	−7 to −47	−47 to −137
0.5 to 64	±1.5 dB	±2.0 dB	±2.5 dB
64 to 512	±2.0 dB	±2.5 dB	±3.0 dB
512 to 1024	±3.0 dB (+13 to −7 dBm)	±3.5 dB	±4.0 dB (−47 to −127 dBm)

*When below top 10 dB of vernier range, add ±0.5 dB.

DESCRIPTION: The RF level accuracy for the upper four OUTPUT LEVEL attenuator ranges is measured with a power meter. For the lower ranges, a reference signal is established on a spectrum analyzer display, the Signal Generator's OUTPUT LEVEL switch and the spectrum analyzer's vertical scale log reference level control are stepped together, and any amplitude variations are measured on the analyzer's display. An RF attenuator and amplifier at the RF OUTPUT are adjusted for analyzer compatibility and best sensitivity.

This procedure uses an IF substitution technique in which the spectrum analyzer's IF is the standard. The IF step accuracy should be within ±0.2 dB overall. The IF step accuracy can be checked using the above technique by comparing a lab calibrated attenuator (such as HP Model 355D Option H36) with the IF step control at the frequency of attenuator calibration (e.g., 3 MHz for the HP 355D Option H36).

NOTE

If the Signal Generator also contains Option 003, perform paragraph 4-23 in place of this test.

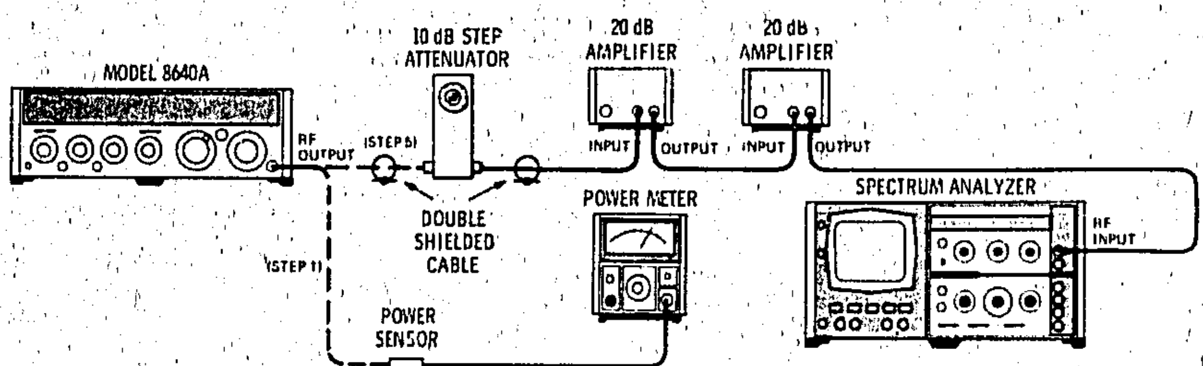


Figure 4-6. Output Level Accuracy Test Setup (Option 002)

PERFORMANCE TESTS

4-21. OUTPUT LEVEL ACCURACY TEST (Option 002) (Cont'd)

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Power Meter	HP 435A
Power Sensor	HP 8482A
20 dB Amplifier (2 required)	HP 8447B
10 dB Step Attenuator	HP 355D
Double Shielded Cable (2 required)	HP 08708-6033

PROCEDURE:

1. Connect equipment as shown in Figure 4-6 after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	32–64 MHz
FREQUENCY TUNE	64 MHz
OUTPUT LEVEL Switches	+20 dBm
OUTPUT LEVEL Vernier	Meter reads −2 dB

2. Set power meter's controls so that it can measure +18 dBm. Connect power sensor to Signal Generator's RF OUTPUT.

3. Set Signal Generator's OUTPUT LEVEL controls for levels (using generator's panel meter) shown in the table below; verify that the level on the power meter is within the specified tolerance.

Signal Generator		Power Meter Reading (dBm)		
OUTPUT LEVEL Switch (dBm)	Panel Meter Indication (dB)	0.5–64 MHz	64–512 MHz	512–1024 MHz
+20	−2	+16.5____+19.5	+16.0____+20.0	Not Specified
	−7	+11.5____+14.5	+11.0____+15.0	+10.0____+16.0
	−10	+8.0____+12.0	+7.5____+12.5	+6.5____+13.5
+10	+3	+11.5____+14.5	+11.0____+15.0	+10.0____+16.0
	−2	+6.5____+9.5	+6.0____+10.0	+5.0____+11.0
	−7	+1.5____+4.5	+1.0____+5.0	0.0____+6.0
	−10	−2.0____+2.0	−2.5____+2.5	−3.5____+3.5
0	+3	+1.5____+4.5	+1.0____+5.0	0.0____+6.0
−10	+3	−9.0____−5.0	−9.5____−4.5	−10.5____−3.5

4-21. OUTPUT LEVEL ACCURACY TEST (Option 002) (Cont'd)

4. Set step attenuator to 70 dB. Set spectrum analzyer center frequency to 64 MHz, resolution bandwidth to 1 kHz, frequency span per division (scan width) to 0.5 kHz, input attenuation to 0 dB, tuning stabilizer on, display smoothing (video filter) to 100 Hz, and vertical log display to 2 dB per division with a −20 dBm reference level.

5. Connect attenuator to generator's RF OUTPUT without disturbing generator's controls. Center signal on analyzer's display. Consider the center horizontal graticule line equivalent to −7 dBm (with a panel meter reading of +3 dB), then with the vertical scale reference vernier control set the signal peak to be equal to the last level measured on the power meter.

NOTE

If, for example, the last power meter reading was −7.4 dBm, the vertical scale resolution is 2 dB/division, therefore, the signal peak should be 0.4 dB or 0.2 division below the center (reference) graticule line.

6. Step Signal Generator's OUTPUT LEVEL switch and analyzer's vertical scale log reference level control switch as shown in the following table. Verify that the amplitude falls within the specified tolerance. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

Signal Generator	Spectrum Analyzer			
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)		
		0.5–64 MHz	64–512 MHz	512–1024 MHz
−10	−20	Set Level	Set Level	Set Level
−20	−30	−2.0 ____ +2.0	−2.5 ____ +2.5	−3.5 ____ +3.5
−30	−40	−2.0 ____ +2.0	−2.5 ____ +2.5	−3.5 ____ +3.5
−40	−50	−2.0 ____ +2.0	−2.5 ____ +2.5	−3.5 ____ +3.5

7. Set analyzer's vertical scale log reference level to −10 dBm and reset the 10 dB step attenuator to 30 dB. With the vertical scale log reference vernier, set the signal peak to the same level, with respect to the horizontal center (reference) graticule line, as the last measurement recorded on the preceding table.

NOTE

If generator appears to be out of specification, check accuracy of spectrum analyzer's vertical scale calibration.

8. Step Signal Generator's OUTPUT LEVEL switch and analyzer's vertical scale log reference level control switch as shown in the following table. Verify that the amplitude is within the specified tolerance. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

PERFORMANCE TESTS

4-21. OUTPUT LEVEL ACCURACY TEST (Option 002) (Cont'd)

Signal Generator	Spectrum Analyzer			
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)		
		0.5–64 MHz	64–512 MHz	512–1024 MHz
−40	−10	Set Level	Set Level	Set Level
−50	−20	−2.5 ____ +2.5	−3.0 ____ +3.0	−4.0 ____ +4.0
−60	−30	−2.5 ____ +2.5	−3.0 ____ +3.0	−4.0 ____ +4.0
−70	−40	−2.5 ____ +2.5	−3.0 ____ +3.0	−4.0 ____ +4.0
−80	−50	−2.5 ____ +2.5	−3.0 ____ +3.0	−4.0 ____ +4.0

9. Set step attenuator to 0 dB; set spectrum analyzer's vertical scale log reference level to −20 dBm. Adjust vertical scale log reference vernier to give the same level, with respect to the center (reference) graticule line, as the last recorded entry on the previous table.

10. Set Signal Generator and analyzer controls as shown in the following table. The amplitude levels should be within the specified tolerances. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

Signal Generator	Spectrum Analyzer			
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)		
		0.5–64 MHz	64–512 MHz	512–1024 MHz
−80	−20	Set Level	Set Level	Set Level
−90	−30	−2.5 ____ +2.5	−3.0 ____ +3.0	−4.0 ____ +4.0
−100	−40	−2.5 ____ +2.5	−3.0 ____ +3.0	−4.0 ____ +4.0
−110	−50	−2.5 ____ +2.5	−3.0 ____ +3.0	−4.0 ____ +4.0
−120	−60	−2.5 ____ +2.5	−3.0 ____ +3.0	−4.0 ____ +4.0

11. Set analyzer's display to 10 dB/division log. Adjust log reference level vernier to set signal to −10 dB graticule line (one major division from top of display) plus last recorded entry on previous table.

NOTE

If the following step appears to be out of specification, check the accuracy of the analyzer's display with an external, calibrated attenuator.

4-21. OUTPUT LEVEL ACCURACY TEST (Option 002) (Cont'd)

12. Set generator's OUTPUT LEVEL switch to −130 dBm (adjust vernier for +3 dB indication on panel meter). The amplitude level indicated on analyzer's display should be within the specified tolerance.

0.5–64 MHz:	−22.5	______	−17.5 dB
64–512 MHz:	−23.0	______	−17.0 dB
512–1024 MHz:	−24.0	______	−16.0 dB

NOTE

The noise level on the analyzer's display should be >10 dB below the signal level. The signal should drop into the noise when the OUTPUT LEVEL vernier is turned fully ccw.

13. Repeat steps 1 through 12 except set the generator's RANGE control to 256–512 MHz and FREQUENCY TUNE to 512 MHz. Set spectrum analyzer center frequency to 512 MHz.

14. Repeat steps 1 through 12 except set the generator's RANGE control to 512–1024 MHz, and FREQUENCY TUNE to 1024 MHz. Set spectrum analyzer center frequency to 1024 MHz.

4-22. OUTPUT LEVEL ACCURACY TEST (Option 003)

SPECIFICATION: Level Accuracy (total accuracy as indicated on level meter):

Frequency Range (MHz)	Output Level Using Top 10 dB of Vernier Range (dBm)*		
	+18.5 to −7	−7 to −47	−47 to −137
0.5–512	+1.75 dB −2.25 dB	+2.25 dB −2.75 dB	+2.75 dB −3.25 dB

*When below top 10 dB of vernier range, add ±0.5 dB.

DESCRIPTION: The RF level accuracy for the upper four OUTPUT LEVEL attenuator ranges is measured with a power meter. For the lower ranges, a reference signal is established on a spectrum analyzer display, the Signal Generator's OUTPUT LEVEL switch and the spectrum analyzer's vertical scale log reference level control are stepped together, and any amplitude variations are measured on the analyzer's display. An RF attenuator and amplifier at the RF OUTPUT are adjusted for analyzer compatibility and best sensitivity.

This procedure uses an IF substitution technique in which the spectrum analyzer's IF is the standard. The IF step accuracy should be within ±0.2 dB overall. The IF step accuracy can be checked using the above technique by comparing a lab calibrated attenuator (such as HP Model 355D Option H36) with the IF step control at the frequency of attenuator calibration (e.g., 3 MHz for the HP 355D Option H36).

4-22. OUTPUT LEVEL ACCURACY TEST (Option 003) (Cont'd)

NOTE

If the Signal Generator also contains Option 002, perform paragraph 4-23 in place of this test.

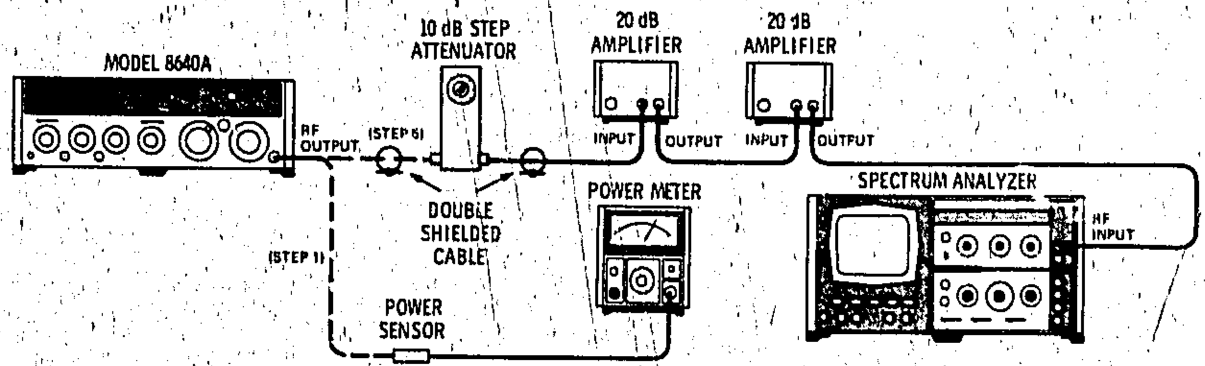


Figure 4-7. Output Level Accuracy Test Setup (Option 003)

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Power Meter	HP 435A
Power Sensor	HP 8482A
20 dB Amplifier (2 required)	HP 8447A
10 dB Step Attenuator	HP 355D
Double Shielded Cable (2 required)	HP 08708-6033

PROCEDURE:

1. Connect equipment as shown in Figure 4-7 after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	256–512 MHz
FREQUENCY TUNE	512 MHz
OUTPUT LEVEL Switch	+20 dBm
OUTPUT LEVEL Vernier	Meter reads −2 dB

2. Set power meter's controls so that it can measure +18 dBm. Connect power sensor to Signal Generator's RF OUTPUT.

3. Set Signal Generator's OUTPUT LEVEL controls for levels (using generator's panel meter) shown in the table on the following page; verify that the level on the power meter is within the specified tolerance.

PERFORMANCE TESTS

4-22. OUTPUT LEVEL ACCURACY TEST (Option 003) (Cont'd)

Signal Generator		Power Meter Reading (dBm)
OUTPUT LEVEL Switch (dBm)	Panel Meter Indication (dB)	
+20	−2	+15.75 ______ +19.75
	−7	+10.75 ______ +14.75
	−10	+7.25 ______ +12.25
+10	+3	+10.75 ______ +14.75
	−2	+5.75 ______ +9.75
	−7	+0.75 ______ +4.75
	−10	−2.75 ______ +2.25
0	+3	+0.75 ______ +4.75
−10	+3	−9.75 ______ −4.75

4. Set step attenuator to 70 dB. Set spectrum analyzer center frequency to 512 MHz, resolution bandwidth to 1 kHz, frequency span per division (scan width) to 0.5 kHz, input attenuation to 0 dB, tuning stabilizer on, display smoothing (video filter) to 100 Hz, and vertical log display to 2 dB per division with a −20 dBm reference level.

5. Connect attenuator to generator's RF OUTPUT without disturbing generator's controls. Center signal on analyzer's display. Consider the center horizontal graticule line equivalent to −7 dBm (with a panel meter reading of +3 dB), then with the vertical scale reference vernier control set the signal peak to be equal to the last level measured on the power meter.

NOTE

If, for example, the last power meter reading was −7.4 dBm, the vertical scale resolution is 2 dB/division, therefore, the signal peak should be 0.4 dB or 0.2 division below the center (reference) graticule line.

6. Step Signal Generator's OUTPUT LEVEL switch and analyzer's vertical scale log reference level control switch as shown in the table on the next page. Verify that the amplitude falls within the specified tolerance. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

4-22. OUTPUT LEVEL ACCURACY TEST (Option 003) (Cont'd)

Signal Generator	Spectrum Analyzer	
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)
−10	−20	Set Level
−20	−30	−2.75 ______ +2.25
−30	−40	−2.75 ______ +2.25
−40	−50	−2.75 ______ +2.25

7. Set analyzer's vertical scale log reference level to −10 dBm and reset the 10 dB step attenuator to 30 dB. With the vertical scale log reference vernier, set the signal peak to the same level, with respect to the horizontal center (reference) graticule line, as the last measurement recorded on the preceding table.

NOTE

If generator appears to be out of specification, check accuracy of spectrum analyzer's vertical scale calibration.

8. Step Signal Generator's OUTPUT LEVEL switch and analyzer's vertical scale log reference level control switch as shown in the following table. Verify that the amplitude is within the specified tolerance. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

Signal Generator	Spectrum Analyzer	
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)
−40	−10	Set Level
−50	−20	−3.25 ______ +2.75
−60	−30	−3.25 ______ +2.75
−70	−40	−3.25 ______ +2.75
−80	−50	−3.25 ______ +2.75

9. Set step attenuator to 0 dB; set spectrum analyzer's vertical scale log reference to −20 dBm. Adjust vertical scale log reference vernier to give the same level, with respect to the center (reference) graticule line, as the last recorded entry on the previous table.

10. Set Signal Generator and analyzer controls as shown in the table on the following page. The amplitude levels should be within the specified tolerances. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +3 dB.

PERFORMANCE TESTS

4-22. OUTPUT LEVEL ACCURACY TEST (Option 003) (Cont'd)

Signal Generator	Spectrum Analyzer	
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)
−80	−20	Set Level
−90	−30	−3.25 ________ +2.75
−100	−40	−3.25 ________ +2.75
−110	−50	−3.25 ________ +2.75
−120	−60	−3.25 ________ +2.75

11. Set analyzer's display to 10 dB/division log. Adjust log reference level vernier to set signal to −10 dB graticule line (one major division from top of display) plus last recorded entry on previous table.

NOTE

If the following step appears to be out of specification, check the accuracy of the analyzer's display with an external, calibrated attenuator.

12. Set generator's OUTPUT LEVEL switch to −130 dBm (adjust vernier for +3 dB indication on panel meter). The amplitude level indicated on analyzer's display should be within +2.75 dB or −3.25 dB of the −20 dB graticule line (second major division from top of display).

−23.25 ________ −17.25 dB

NOTE

The noise level on the analyzer's display should be >10 dB below the signal level. The signal should drop into the noise when the OUTPUT LEVEL vernier is turned fully ccw.

4-23. OUTPUT LEVEL ACCURACY TEST (Option 002 with Option 003)

SPECIFICATION: Level Accuracy (total accuracy as indicated on level meter):

Frequency Range (MHz)	Ouput Level Using Top 10 dB of Vernier Range (dBm) *		
	+18.0 to −7	−7 to −47	−47 to −137
0.5–512	+2.0 dB −3.0 dB	+2.5 dB −3.5 dB	+3.0 dB −4.0 dB
512–1024	±3.5 dB (+12 to −7 dB)	±4.0 dB	±4.5 dB (−47 to −128 dBm)

*When below top 10 dB of vernier range, add ±0.5 dB.

PERFORMANCE TESTS

4-23. OUTPUT LEVEL ACCURACY TEST (Option 002 with Option 003) (Cont'd)

DESCRIPTION: The RF level accuracy for the upper four OUTPUT LEVEL attenuator ranges is measured with a power meter. For the lower ranges, a reference signal is established on a spectrum analyzer display, the Signal Generator's OUTPUT LEVEL switch and the spectrum analyzer's vertical scale log reference level control are stepped together, and any amplitude variations are measured on the analyzer's display. An RF attenuator and amplifier at the RF OUTPUT are adjusted for analyzer compatibility and best sensitivity.

This procedure uses an IF substitution technique in which the spectrum analyzer's IF is the standard. The IF step accuracy should be within ±0.2 dB overall. The IF step accuracy can be checked using the above technique by comparing a lab calibrated attenuator (such as HP Model 355D Option H36) with the IF step control at the frequency of attenuator calibration (e.g., 3 MHz for the HP 355D Option H36).

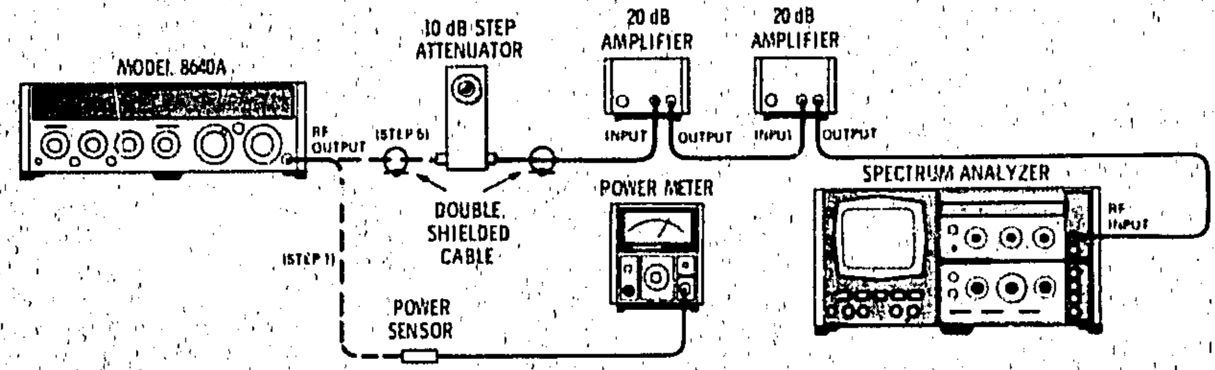


Figure 4-8. Output Level Accuracy Test Setup (Option 002 with Option 003)

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Power Meter	HP 435A
Power Sensor	HP 8482A
20 dB Amplifier (2 required)	HP 8447B
10 dB Step Attenuator	HP 355D
Double Shielded Cable (2 required)	HP 08708-6033

PROCEDURE:

1. Connect equipment as shown in Figure 4-8 after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	256–512 MHz
FREQUENCY TUNE	512 MHz
OUTPUT LEVEL Switch	+20 dBm
OUTPUT LEVEL Vernier	Meter reads −2 dB

2. Set power meter's controls so that it can measure +18 dBm. Connect power sensor to Signal Generator's RF OUTPUT.

PERFORMANCE TESTS

4-23. OUTPUT LEVEL ACCURACY TEST (Option 002 with Option 003) (Cont'd)

3. Set Signal Generator's OUTPUT LEVEL controls for levels (using generator's panel meter) shown in the table below; verify that the level on the power meter is within the specified tolerance.

Signal Generator		Power Meter Reading (dBm)	
OUTPUT LEVEL Switch (dBm)	Panel Meter Indication (dB)	0.5–512 MHz	512–1024 MHz
+20	−2	+15.0 ______ +20.0	Not Specified
	−7	+10.0 ______ +15.0	+9.5 ______ +16.5
	−10	+6.5 ______ +12.5	+6.0 ______ +14.0
+10	+2	+9.0 ______ +14.0	+8.5 ______ +15.5
	−2	+5.0 ______ +10.0	+4.5 ______ +11.5
	−7	0.0 ______ +5.0	−0.5 ______ +6.5
	−10	−3.5 ______ +2.5	−4.0 ______ +4.0
0	+2	−1.0 ______ +4.0	−1.5 ______ +5.5
−10	+2	−11.5 ______ −6.5	−12.0 ______ −4.0

4. Set step attenuator to 70 dB. Set spectrum analyzer center frequency to 512 MHz, resolution bandwidth to 1 kHz, frequency span per division (scan width) to 0.5 kHz, input attenuation to 0 dB, tuning stabilizer on, display smoothing (video filter) to 100 Hz, and vertical log display to 2 dB per division with a −20 dBm reference level.

5. Connect attenuator to generator's RF OUTPUT without disturbing generator's controls. Center signal on analyzer's display. Consider the center horizontal graticule line equivalent to −8 dBm (with a panel meter reading of +2 dB), then with the vertical scale reference vernier control set the signal peak to be equal to the last level measured on the power meter.

NOTE

If, for example, the last power meter reading was −8.4 dBm, the vertical scale resolution is 2 dB/division, therefore, the signal peak should be 0.4 dB or 0.2 division below the center (reference) graticule line.

6. Step Signal Generator's OUTPUT LEVEL switch and analyzer's vertical scale log reference level control switch as shown in the following table. Verify that the amplitude falls within the specified tolerance. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +2 dB.

4-23. OUTPUT LEVEL ACCURACY TEST (Option 002 with Option 003) (Cont'd)

Signal Generator	Spectrum Analyzer		
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)	
		0.5–512 MHz	512–1024 MHz
−10	−20	Set Level	Set Level
−20	−30	−3.5 ______ +2.5	−4.0 ______ +4.0
−30	−40	−3.5 ______ +2.5	−4.0 ______ +4.0
−40	−50	−3.5 ______ +2.5	−4.0 ______ +4.0

7. Set analyzer's vertical scale log reference level to −10 dBm and reset the 10 dB step attenuator to 30 dB. With the vertical scale log reference vernier, set the signal peak to the same level, with respect to the horizontal center (reference) graticule line, as the last measurement recorded on the preceding table.

NOTE

If generator appears to be out of specification, check accuracy of spectrum analyzer's vertical scale calibration.

8. Step Signal Generator's OUTPUT LEVEL switch and analyzer's vertical scale log reference level control switch as shown in the following table. Verify that the amplitude is within the specified tolerance. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +2 dB.

Signal Generator	Spectrum Analyzer		
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)	
		0.5–512 MHz	512–1024 MHz
−40	−10	Set Level	Set Level
−50	−20	−4.0 ______ +3.0	−4.5 ______ +4.5
−60	−30	−4.0 ______ +3.0	−4.5 ______ +4.5
−70	−40	−4.0 ______ +3.0	−4.5 ______ +4.5
−80	−50	−4.0 ______ +3.0	−4.5 ______ +4.5

9. Set step attenuator to 0 dB; set spectrum analyzer's vertical scale log reference level to −20 dBm. Adjust vertical scale log reference vernier to give the same level, with respect to the center (reference) graticule line, as the last recorded entry on the previous table.

PERFORMANCE TESTS

4-23. OUTPUT LEVEL ACCURACY TEST (Option 002 with Option 003) (Cont'd)

10. Set Signal Generator and analyzer controls as shown in the following table. The amplitude levels should be within the specified tolerances. If necessary, use generator's OUTPUT LEVEL vernier to reset panel meter to +2 dB.

Signal Generator	Spectrum Analyzer		
OUTPUT LEVEL Switch (dBm)	Log Reference Level Control (dBm)	Display Amplitude (dB)	
		0.5–512 MHz	512–1024 MHz
−80	−20	Set Level	Set Level
−90	−30	−4.0 ______ +3.0	−4.5 ______ +4.5
−100	−40	−4.0 ______ +3.0	−4.5 ______ +4.5
−110	−50	−4.0 ______ +3.0	−4.5 ______ +4.5
−120	−60	−4.0 ______ +3.0	−4.5 ______ +4.5

11. Set analyzer's display to 10 dB/division log. Adjust log reference level vernier to set signal to −10 dB graticule line (one major division from top of display) plus last recorded entry on previous table.

NOTE

If the following step appears to be out of specification, check the accuracy of the analyzer's display with an external, calibrated attenuator.

12. Set generator's OUTPUT LEVEL switch to −130 dBm (adjust vernier for +2 dB indication on panel meter). The amplitude level indicated on analyzer's display should be within the specifi d tolerance.

0.5–512 MHz: −24.0 ______ −17.0 dB
512–1024 MHz: −24.5 ______ −15.5 dB

NOTE

The noise level on the analyzer's display should be >10 dB below the signal level. The signal should drop into the noise when the OUTPUT LEVEL vernier is turned fully ccw.

13. Repeat steps 1 through 12 except set the generator's RANGE control to 512–1024 MHz and FREQUENCY TUNE to 512 MHz. Set spectrum analyzer center frequency to 1024 MHz.

PERFORMANCE TESTS

4-24. OUTPUT LEVEL FLATNESS TEST

SPECIFICATION: **Level Flatness** (referred to output at 50 MHz and applies to 1V range and for top 10 dB of vernier range):

Frequency Range (MHz)	Option Combination			
	Standard	002	003	002/003
0.5 to 64	±0.5 dB	±0.5 dB	+0.75 dB −1.25 dB	+1.0 dB −2.0 dB
64 to 512		±1.0 dB		
512 to 1024 (Option 002)	—	±1.5 dB	—	±2.0 dB

DESCRIPTION: Output flatness across each frequency range is measured with a power meter.

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

NOTE

The power sensor's SWR should be <1.2:1.

PROCEDURE:

1. Connect power sensor to generator's RF OUTPUT after setting Signal Generator's controls as follows:

   Meter Function . . . . LEVEL
   AM . . . . OFF
   FM . . . . OFF
   RANGE . . . . 32–64 MHz
   FREQUENCY TUNE . . . . 50 MHz
   OUTPUT LEVEL Switch . . . . +10 dBm
   OUTPUT LEVEL Vernier . . . . Meter reads −1 dB

2. Adjust OUTPUT LEVEL vernier for a power meter reading of +9 dBm at 50 MHz. Using RANGE and FREQUENCY TUNE controls, slowly tune Signal Generator from 512 MHz to 0.5 MHz (and 1024 MHz to 512 MHz for Option 002). On each range, note maximum and minimum power meter readings in dBm. The overall maximum reading and the overall minimum reading should both be within the specified tolerances.

Option Combination (Opt. 001 Inconsequential)	Output Level Limits (dBm) vs. RANGE (MHz)		
	0.5–64	64–512	512–1024
Standard	8.50 ______ 9.50	8.50 ______ 9.50	Not Specified
Option 002	8.50 ______ 9.50	8.00 ______ 10.00	7.50 ______ 10.50
Option 003	7.75 ______ 9.75	7.75 ______ 9.75	Not Specified
Opt.002 with Opt.003	7.00 ______ 10.0	7.00 ______ 10.00	7.00 ______ 11.00

PERFORMANCE TESTS

4-25. OUTPUT LEAKAGE TEST

SPECIFICATION: Leakage (with all unused outputs terminated properly):
Leakage limits are below those specified in MIL-I-6181D. Furthermore, less than 3 μV is induced in a 2-turn, 1-inch diameter loop 1 inch away from any surface and measured into a 50Ω receiver.

DESCRIPTION: A loop antenna is held one inch from all surfaces of the Signal Generator and any leakage monitored with a spectrum analyzer. The loop antenna is suspended in a molding so that when the molding is in contact with a surface, the loop antenna is one inch from the surface.

NOTES

The use of a screen room may be necessary to reduce external radiated interference.

To avoid disturbing antenna's field and causing measurement error, grasp antenna at the end that has the BNC connector.

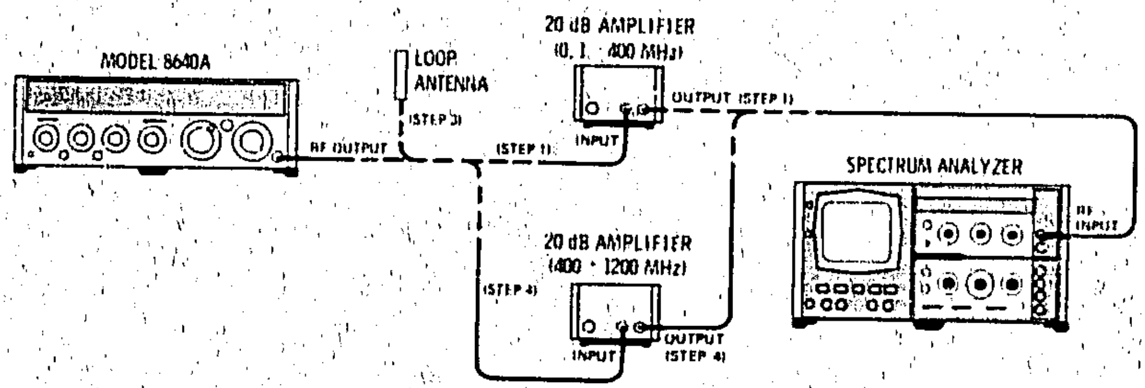


Figure 4-9. Output Leakage Test Setup

EQUIPMENT:

One-Inch Loop Antenna	HP 08640-60501
20 dB Amplifier (0.5–400 MHz)	HP 8447A
20 dB Amplifier (400–1200 MHz)	HP 8447B
Spectrum Analyzer	HP 8554B/8552B/141T

PROCEDURE:

1. Connect equipment as shown in Figure 4-9 (with Signal Generator connected to spectrum analyzer through 0.5–400 MHz amplifier) after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	64–128 MHz
FREQUENCY TUNE	100 MHz
OUTPUT LEVEL Switch	–100 dBm
OUTPUT LEVEL Vernier	Meter reads +3 dB

2. Set spectrum analyzer's resolution bandwidth to 30 kHz, input attenuation to 0 dB, frequency span per division (scan width) to 50 kHz, scale to log (10 dB per division), scale reference level controls to –50 dBm, and scale center frequency

4-25. OUTPUT LEAKAGE TEST (Cont'd)

controls to 100 MHz. Calibrate the analyzer by using the scale reference level controls to set the −97 dBm (3 μV) signal from the generator to the −40 dB graticule line on the display. Disconnect generator from analyzer. Install caps on COUNTER INPUT and AUX RF OUTPUT (rear panel).

3. Connect one-inch loop antenna to analyzer through 0.5—400 MHz amplifier. Set analyzer frequency span to 20 MHz per division. Hold end of loop antenna cylinder in contact with all surfaces of Signal Generator. Repeat the test for a 300 MHz center frequency. All signals and noise should be below the −40 dB graticule line on analyzer's display (below 3 μV) from 0.5 to 400 MHz.

_______________ −40 dB

4. Replace 0.5—400 MHz amplifier with 400—1200 MHz amplifier. Set analyzer's center frequency controls to 500 MHz; set generator's RANGE control to 256—512 MHz and FREQUENCY TUNE control to 500 MHz, and connect generator to analyzer and calibrate analyzer as specified in step 2. Then reconnect loop antenna to analzyer and hold end of loop antenna cylinder in contact with all surfaces of generator. Repeat the test for center frequencies of 700, 800, and 1100 MHz. All signals and noise should be below the −40 dB graticule line on analyzer's display from 400 to 1200 MHz.

_______________ −40 dB

5. For Option 002, set analyzer's center frequency controls to 1000 MHz; set generator's RANGE control to 512—1024 MHz. Hold end of loop antenna cylinder in contact with all surfaces of the generator. All signals and noise should be below the −40 dB graticule line on analyzer's display from 900 to 1100 MHz.

_______________ −40 dB

4-26. MODULATION OSCILLATOR FREQUENCY ACCURACY TEST

SPECIFICATION: **Standard:** Frequency: Fixed 400 Hz and 1 kHz, ±3%.
Option 001: Variable 20 Hz to 600 kHz, ±15% in 5 decade continuous ranges plus fixed 400 Hz and 1 kHz, ±3%.

DESCRIPTION: The frequency of the modulation oscillator is measured with the internal counter.

EQUIPMENT: Frequency Counter . . . . HP 5327C

PROCEDURE: 1. Set Signal Generator controls as follows:

AM . . . . INT
AUDIO OUTPUT LEVEL . . . . 1 to 3V
MODULATION FREQUENCY . . . . 400 Hz (Fixed)

2. Connect AM OUTPUT to external counter's high impedance input. Display should read 400 ± 12 Hz.

388 __________ 412 Hz

3. Set MODULATION FREQUENCY to 1 kHz (fixed). Display should read 1000 ±30 Hz.

970 __________ 1030 Hz

PERFORMANCE TESTS

4-26. MODULATION OSCILLATOR FREQUENCY ACCURACY TEST (Cont'd)

4. For Option 001, set MODULATION FREQUENCY vernier to 100. Set MODULATION FREQUENCY range as shown in the following table. Display should read within the frequency limits indicated.

MODULATION FREQUENCY Range	Frequency Limits (Hz)
X1	85 ______ 115
X10	850 ______ 1150
X100	8 500 ______ 11 500
X1k	85 000 ______ 115 000
X3k	255 000 ______ 345 000

4-27. INTERNAL MODULATION OSCILLATOR DISTORTION TEST (Option 001)

SPECIFICATION: **Total Harmonic Distortion:**
- <0.5% 400 Hz and 1 kHz fixed tones.
- <0.5% 20 Hz to 2 kHz.
- <1.0% 2 kHz to 200 kHz.
- <2.0% 200 kHz to 600 kHz.

DESCRIPTION: A distortion analyzer is used to measure distortion on the output of the modulation oscillator.

EQUIPMENT:

Distortion Analyzer . . . . HP 331A
600 Ohm Feedthrough . . . . HP 11095A

PROCEDURE:

1. Connect generator's AM OUTPUT to distortion analyzer input (through 600Ω feedthrough) after setting Signal Generator's controls as follows:

   AM . . . . INT
   AUDIO OUTPUT LEVEL 3V
   MODULATION FREQUENCY . . . . As specified
   FM . . . . OFF

2. Set the MODULATION FREQUENCY controls to various frequencies within the variable ranges shown below. At each frequency tested, calibrate the distortion analyzer and measure the distortion. It should be as shown.

Frequency Range	Distortion
20 Hz to 2 kHz	______ 0.5%
2 kHz to 200 kHz	______ 1.0%
200 kHz to 600 kHz	______ 2.0%

3. Set MODULATION FREQUENCY controls to 400 Hz and 1 kHz fixed frequencies. Distortion at both frequencies should be below 0.5%.

   400 Hz: ______ 0.5%
   1 kHz: ______ 0.5%

PERFORMANCE TESTS

4-28. AM BANDWIDTH TEST

SPECIFICATION: **AM 3-dB Bandwidth:**

Frequency Ranges (MHz)	0 to 50% AM	50 to 90% AM
0.5–2	20 kHz	12.5 kHz
2–8	40 kHz	25 kHz
8–512	60 kHz	50 kHz
512–1024 (Opt.002)	60 kHz	50 kHz

DESCRIPTION: The Signal Generator is externally amplitude modulated by a test oscillator. The AM is demodulated with a spectrum analyzer in a zero span mode. The demodulated AM, available at the analyzer's vertical output, is measured with a distortion analyzer which is used as an adjustable voltmeter. As the test oscillator frequency is increased, the decrease in AM depth is noted.

EQUIPMENT:

Spectrum Analyzer . . . . HP 8554B/8552B/141T
Distortion Analyzer . . . . HP 331A
Test Oscillator . . . . HP 651B

PROCEDURE: 1. Connect equipment as shown in Figure 4-10 after setting Signal Generator as follows:

Meter Function . . . . AM
AM . . . . AC
MODULATION . . . . Fully ccw
FM . . . . OFF
RANGE . . . . 1–2 MHz
FREQUENCY TUNE . . . . 2 MHz
OUTPUT LEVEL Switch . . . . . −40 dBm
OUTPUT LEVEL Vernier . . . . . Fully cw

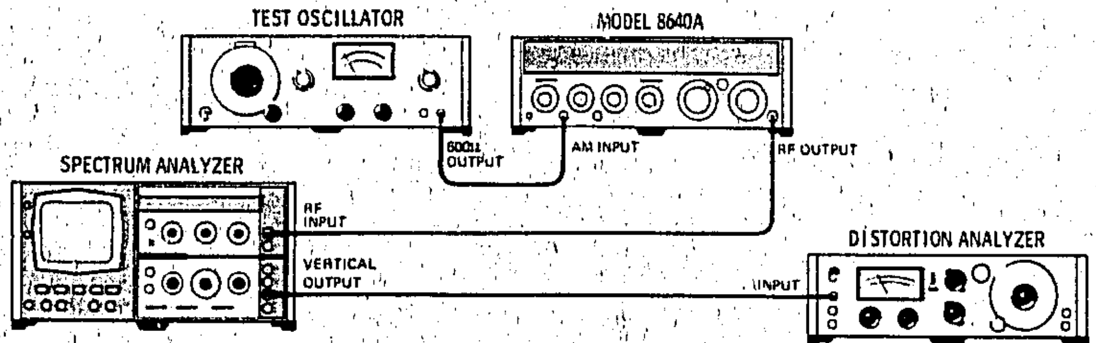


Figure 4-10. AM Bandwidth Test Setup

PERFORMANCE TESTS

4-28. AM BANDWIDTH TEST (Cont'd)

2. Set spectrum analyzer resolution bandwidth to 300 kHz or greater, input attenuation to 0 dB, vertical scale to linear, display smoothing (video filter) to minimum (off), and adjust center frequency controls to center 2 MHz signal on display. Set frequency span to 0; fine adjust frequency controls to peak signal on display. Adjust vertical reference level controls to bring signal level to approximately fourth graticule line from bottom of display.

3. Set test oscillator to 1 kHz and 1 Vrms into 600Ω.

4. Increase MODULATION level until panel meter indicates 50% AM. Set distortion analyzer to set level position and adjust set level control for an indication of 0 dB. Increase test oscillator frequency to 20 kHz. Distortion analyzer should indicate a level of within 3 dB.

   ________ 3 dB

5. Set test oscillator back to 1 kHz. Increase MODULATION level for 90% AM. Readjust distortion analyzer's set level for 0 dB. Increase test oscillator frequency to 12.5 kHz. Distortion analyzer should indicate a level of within 3 dB.

   ________ 3 dB

6. Repeat steps 2 through 5 with the Signal Generator set to the frequencies given below. The distortion analyzer should indicate a level of within 3 dB for the test oscillator frequencies indicated.

Signal Generator		Test Oscillator Frequency	
RANGE (MHz)	FREQUENCY TUNE (MHz)	for 50% AM (kHz)	for 90% AM (kHz)
4–8	8	40	25
8–16	16	60	50
512–1024 (Opt.002)	512	60	50

4-29. AM DISTORTION TEST

SPECIFICATION: AM Distortion (at 400 Hz and 1 kHz rates):

Frequency Ranges (MHz)	0 to 50% AM	50 to 90% AM
0.5 to 512	< 1%	< 3%
Frequency Range (MHz)	**0 to 30% AM**	**30 to 90% AM**
512 to 1024 (Option 002)	< 10%	< 20%

4-29. AM DISTORTION TEST (Cont'd)

DESCRIPTION: The Signal Generator is amplitude modulated by the internal modulation oscillator. The AM is demodulated by a spectrum analyzer in a zero span mode and percent of AM is set; a distortion analyzer is connected to the analyzer's vertical output and used to measure AM distortion.

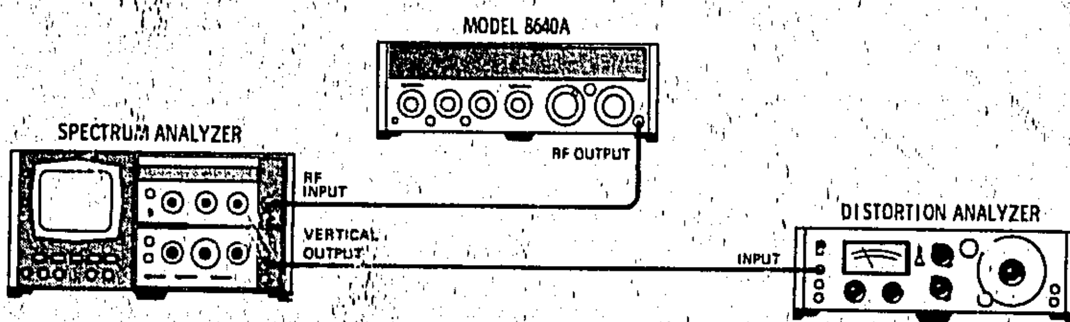


Figure 4-11. AM Distortion Test Setup

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Distortion Analyzer	HP 331A

PROCEDURE:

1. Connect equipment as shown in Figure 4-11 after setting Signal Generator's controls as follows:

Meter Function	AM
AM	OFF
MODULATION	Fully ccw
MODULATION FREQUENCY	1 kHz
FM	OFF
RANGE	256–512 MHz
FREQUENCY TUNE	512 MHz
OUTPUT LEVEL Switch	–40 dBm
OUTPUT LEVEL Vernier	Fully cw

2. Set spectrum analyzer's resolution bandwidth to 300 kHz or greater, input attenuation to 0 dB, vertical scale to linear, display smoothing (video filter) to 10 kHz, and adjust center frequency controls to center 512 MHz signal on display. Set frequency span to 0; fine adjust frequency controls to peak signal on display. Adjust vertical reference level controls to bring signal level to approximately fourth graticule line from bottom of display.

3. Set generator's AM switch to INT and adjust MODULATION control for 50% AM as read on panel meter.

4. Calibrate distortion analyzer and measure distortion. Distortion should be less than 1%.

__________1%

PERFORMANCE TESTS

4-29. AM DISTORTION TEST (Cont'd)

5. Increase AM to 90%. Calibrate distortion analyzer and measure distortion. Distortion should be less than 3%.
   ________ 3%

6. Increase OUTPUT LEVEL switch to −30 dBm and reduce OUTPUT LEVEL vernier to 10 dB (panel meter should read −7 dB in LEVEL). Repeat steps 2 thru 5.
   50% AM: ________ 1%
   90% AM: ________ 3%

7. For Option 002, set generator's RANGE to 512—1024 MHz. Repeat steps 2 through 6 except measure distortion at 30% AM instead of 50%. Begin step 2 with OUTPUT LEVEL switch at −40 dBm and vernier fully cw. Distortion should be less than 10% for 30% AM and less than 20% for 90% AM.

   Vernier fully cw 30% AM: ________ 10%
   Vernier fully cw 90% AM: ________ 20%
   Vernier −10 dB 30% AM: ________ 10%
   Vernier −10 dB 90% AM: ________ 20%

4-30. AM SENSITIVITY AND ACCURACY TEST

SPECIFICATION: **External AM Sensitivity** (400 Hz and 1 kHz rates):
0.5 to 512 MHz: (0.1 ± 0.005)% AM per mV pk into 600Ω with AM vernier at fully cw position.

Indicated AM Accuracy (400 Hz and 1 kHz rates using internal meter):
0.5 to 512 MHz: ±(5.5% of reading +1.5% of full scale).

DESCRIPTION: AM sensitivity accuracy and meter accuracy are measured by comparing the actual amount of amplitude modulation to the level of the input modulating signal. The AM is demodulated by a spectrum analyzer in a zero span mode. A DVM is used to measure the ac and dc voltages at the analyzer's vertical output, and the dc value (corresponding to the carrier) is set to 282.8 mVdc; the rms value of the modulation is then a very accurate measure of AM percent (% AM is 1/2 the ac voltage in mVrms).

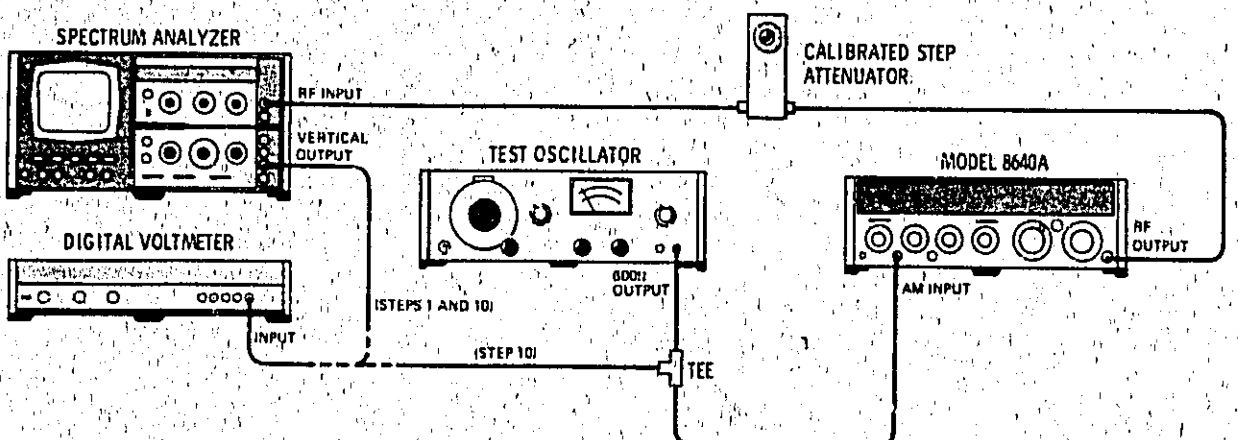


Figure 4-12. AM Sensitivity and Accuracy Test Setup

PERFORMANCE TESTS

4-30. AM SENSITIVITY AND ACCURACY TEST (Cont'd)

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Digital Voltmeter	HP 3490A
Test Oscillator	HP 651B
10 dB Step Attenuator	HP 355D

PROCEDURE:

1. Connect equipment as shown in Figure 4-12 after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
MODULATION	Fully ccw
FM	OFF
RANGE	2–4 MHz
FREQUENCY TUNE	3 MHz
OUTPUT LEVEL Switch	−30 dBm
OUTPUT LEVEL Vernier	Meter reads +3 dB

2. Set step attenuator to 0 dB.

3. Set spectrum analyzer's resolution bandwidth to 300 kHz, input attenuation to 20 dB, frequency span per division (scan width) to 20 kHz (tuning stabilizer on) scale to linear, and adjust center frequency and scale reference level controls to center the 3 MHz signal on the display. Set frequency span per division to 0 Hz and display smoothing (video filter) to 10 kHz. Peak the signal on the display with the center frequency controls.

4. Adjust analyzer's reference level controls for −500 mVdc indicated on DVM ($V_{DET\,1}$).

5. Set step attenuator to 20 dB. Note DVM reading ($V_{DET\,2}$).

6. Calculate V_{off} where

$$V_{off} = \frac{V_{DET\,2} - \alpha V_{DET\,1}}{1 - \alpha}$$

and $\alpha = V_{RF\,2}/V_{RF\,1}$ (i.e., α = attenuation; for 20 dB it is 0.1)

therefore

$$V_{off} = \frac{V_{DET\,2} + 50\text{ mVdc}}{0.9} = \_\_\_\_\_\_\text{ mVdc}$$

7. Set step attenuator to 0 dB.

8. Set generator's controls as follows:

Meter Function	AM
AM	AC
RANGE	256–512 MHz
FREQUENCY TUNE	512 MHz

PERFORMANCE TESTS

4-30. AM SENSITIVITY AND ACCURACY TEST (Cont'd)

9. Set analyzer's center frequency controls to 512 MHz and peak the signal on the display.
10. Set generator's MODULATION control fully cw. Connect DVM to tee on test oscillator output. Set test oscillator for a 1 kHz, 636.39 mVrms signal as read on DVM (90% AM). Disconnect DVM from test oscillator (leave oscillator connected to generator). Connect DVM to spectrum analyzer's vertical output.
11. Use the analyzer's reference level controls to set −282.8 mV +V_{off} at vertical output (as measured on the DVM). For example, if V_{off} is +50.0 mV, then set −282.8 mV + (+50.0 mV) or −232.8 mVdc at vertical output. (Check that signal is peaked on analyzer display.).
12. To measure modulation percent, set DVM to measure mVrms (ac only). The DVM should read 180 mVrms ±5%. (Check that signal is peaked on analyzer display.)

    171.0 ________ 189.0 mVrms
13. To check indicated accuracy, set test oscillator's amplitude controls for a reading of 9 (90% AM) on the 0—10 scale of generator's panel meter. The DVM should read 180 mVrms ± 6.45%. (Check that signal is peaked on analyzer display.)

    167.1 ________ 192.9 mVrms
14. Set the test oscillator's amplitude controls for the % AM panel meter readings shown below. The DVM should read as specified. (Before each reading, check that signal is peaked on analyzer display.)

% AM	Digital Voltmeter Reading
70	129.3 ________ 150.7 mVrms
50	91.5 ________ 108.5 mVrms
30	53.7 ________ 66.3 mVrms
20	34.8 ________ 45.2 mVrms
10	15.9 ________ 24.1 mVrms

4-31. PULSE MODULATION TEST

SPECIFICATION: Pulse Modulation (specifications apply for top 10 dB of output vernier range):

Frequency Ranges (MHz)	0.5 to 1	1 to 2	2 to 8	8 to 32	32 to 512	512 to 1024 (Opt. 002)
Rise and Fall Times	<9 μs	<4 μs	<2 μs	<1 μs		<1 μs typical
Pulse Repetition Rate	50 Hz to 50 kHz		50 Hz to 100 kHz	50 Hz to 250 kHz	50 Hz to 500 kHz	
Pulse Width Minimum for Level Accuracy Within 1 dB of CW (>0.1% duty cycle)	10 μs		5 μs	2 μs		

PERFORMANCE TESTS

4-31. PULSE MODULATION TEST (Cont'd)

DESCRIPTION: The Signal Generator is pulse modulated with a pulse generator. For low frequencies the RF pulses are observed directly on an oscilloscope. For high frequencies, the RF is detected and the detected envelope is observed on the oscilloscope.

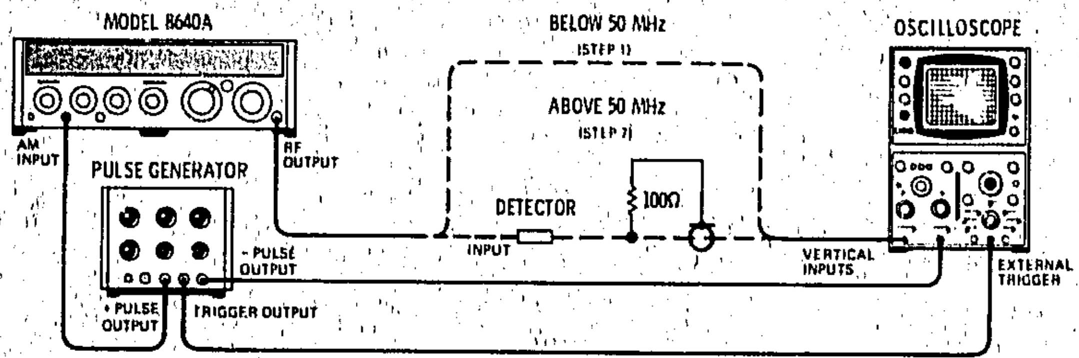


Figure 4-13. Pulse Modulation Test Setup

EQUIPMENT:

Pulse Generator	HP 8003A
Oscilloscope	HP 180C/1801A/1820C
Crystal Detector	HP 8471A
100Ω Resistor	HP 0757-0401

PROCEDURE:

1. Connect equipment as shown in Figure 4-13, with oscilloscope connected directly to test generator's RF OUTPUT, after setting test Signal Generator's controls as follows:

Meter Function	LEVEL
AM	PULSE
FM	OFF
RANGE	0.5–1 MHz
FREQUENCY TUNE	1 MHz
OUTPUT LEVEL Switch	–20 dBm
OUTPUT LEVEL Vernier	Meter reads +3 dB

2. Set pulse generator for a repetition rate of 100 Hz, a pulse width of 10 μs, and an amplitude of 1V.

3. Adjust oscilloscope to display the RF pulse envelope. Readjust the pulse width for 10 μs (measured at 50% amplitude points) and measure the rise and fall times (see Figure 4-14). Both should be less than 9 μs (measured between 10% and 90% of the full pulse amplitude).

Rise Time: ______________ 9 μs
Fall Time: ______________ 9 μs

4-31. PULSE MODULATION TEST (Cont'd)

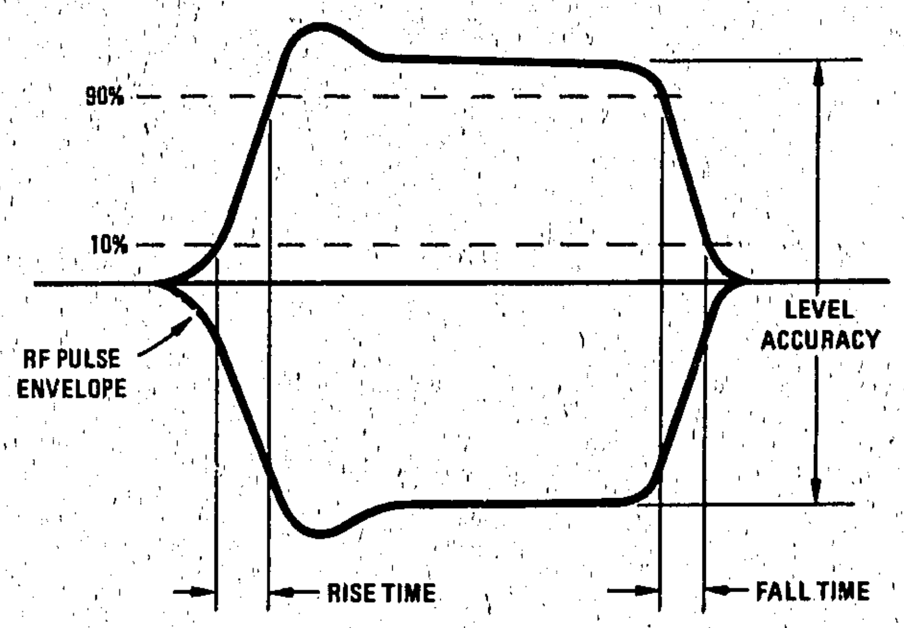


Figure 4-14. Pulse Measurements

4. Set test Signal Generator's AM switch to OFF and adjust oscilloscope's vertical controls for 6 divisions of deflection on the display (peak to peak).

5. Set test Signal Generator's AM switch to PULSE. Pulse amplitude (peak to peak) on oscilloscope's display should be 5.4 to 6.7 divisions.

5.4 _______ 6.7 div

6. Repeat steps 1 through 5 for the frequency ranges shown below. The rise and fall times and level accuracy should be as specified.

Signal Generator RANGE (MHz)	Pulse Generator		Rise Time (μs)	Fall Time (μs)	Level Accuracy (Divisions)
	Pulse Rate (Hz)	Pulse Width (μs)			
1–2	100	10	_______ 4	_______ 4	5.4 _______ 6.7
2–4	200	5	_______ 2	_______ 2	5.4 _______ 6.7
4–8	200	5	_______ 2	_______ 2	5.4 _______ 6.7
8–16	500	2	_______ 1	_______ 1	5.4 _______ 6.7
16–32	500	2	_______ 1	_______ 1	5.4 _______ 6.7

PERFORMANCE TESTS

4-31. PULSE MODULATION TEST (Cont'd)

7. Connect detector and 100Ω detector load to RF OUTPUT as shown in Figure 4-13. Set OUTPUT LEVEL switch to +10 dBm.

8. Repeat steps 1 through 5 (using the detector to monitor the pulse envelope) for the frequency ranges shown below. For the level accuracy portion of the measurement the oscilloscope's vertical controls should be adjusted for 6 divisions of deflection with respect to ground (dc coupled). The rise and fall times and level accuracy should be as specified.

Signal Generator RANGE (MHz)	Pulse Generator		Rise Time (μs)	Fall Time (μs)	Level Accuracy (Divisions)
	Pulse Rate (Hz)	Pulse Width (μs)			
32–64	500	2	______ 1	______ 1	5.4 ______ 6.7
64–128	500	2	______ 1	______ 1	5.4 ______ 6.7
128–256	500	2	______ 1	______ 1	5.4 ______ 6.7
256–512	500	2	______ 1	______ 1	5.4 ______ 6.7
512–1024 (Opt.002)	500	2	______ 1	______ 1	5.4 ______ 6.7

4-32. PULSE ON/OFF RATIO TEST

SPECIFICATION: Pulse ON/OFF ratio at maximum vernier: >40 dB (0.5–512 MHz), >60 dB (512–1024 MHz, Option 002).

DESCRIPTION: The on/off ratio of the pulse modulation circuits is measured with a spectrum analyzer.

EQUIPMENT: Spectrum Analyzer . . . . HP 8554B/8552B/141T

PROCEDURE:

1. Connect generator's RF OUTPUT to analyzer's input after setting Signal Generator's controls as follows:
   Meter Function . . . . LEVEL
   AM . . . . OFF
   FM . . . . OFF
   RANGE . . . . 256–512 MHz
   FREQUENCY TUNE . . . . 256 MHz
   OUTPUT LEVEL Switch . . . . –10 dBm
   OUTPUT LEVEL Vernier . . . . Fully cw

2. Set spectrum analyzer's input attenuation to 20 dB. Adjust center frequency controls to center the 256 MHz signal on the display. Adjust scale reference level controls to set the signal to the top (0 dB) graticule line with the scale controls set to display 10 dB per division.

4-32. PULSE ON/OFF RATIO TEST (Cont'd)

3. Set generator's AM switch to PULSE and tune across range. The signal on the analyzer's display should decrease and remain more than 40 dB below reference.

40 dB________________

4. For Option 002, repeat steps 1 through 3 with the RANGE switch set to 512—1024 MHz. The signal on the analyzer's display should decrease and remain more than 60 dB below reference.

60 dB________________

4-33. FM BANDWIDTH TEST

SPECIFICATION: **FM 3-dB Bandwidth:**
Internal and external ac; 20 Hz to 250 kHz.
External dc; dc to 250 kHz.

DESCRIPTION: An audio spectrum analyzer is used to measure the 3-dB bandwidth. The analyzer is set to sweep over the specified audio frequency range and its tracking generator output is used to frequency modulate the Signal Generator. The generator's RF output is demodulated with a frequency meter. The demodulated signal is fed to the analyzer's input and any amplitude variation is measured on the analyzer's display. Bandwidth is checked at maximum deviation on the 8—16 MHz range.

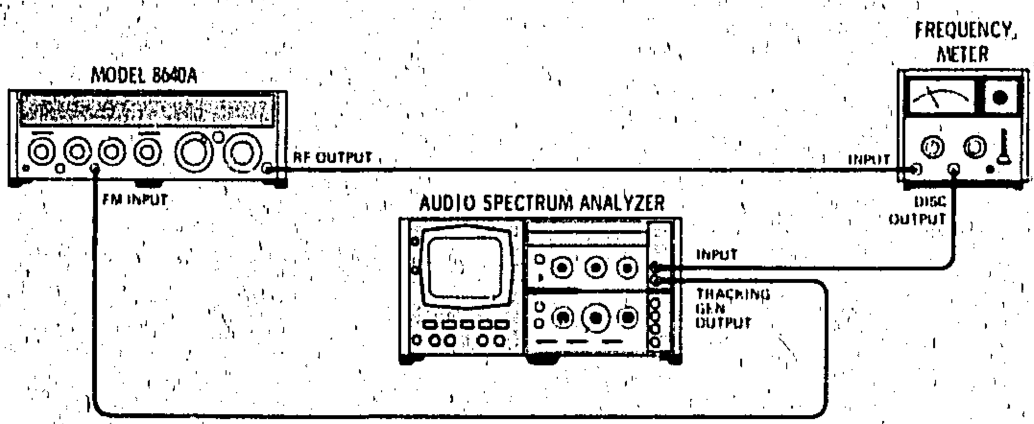


Figure 4-15. FM Bandwidth Test Setup

EQUIPMENT:

Audio Spectrum Analyzer . . . . HP 8556A/8552B/141T
Frequency Meter . . . . HP 5210A
Filter Kit (for Frequency Meter) . . . . HP 10531A

PROCEDURE:

1 Connect equipment as shown in Figure 4-15 after setting Signal Generator's controls as follows:

Meter Function . . . . FM
AM . . . . OFF

4-33. FM BANDWIDTH TEST (Cont'd)

FM	OFF
PEAK DEVIATION	80 kHz
PEAK DEVIATION Vernier .	Fully cw
RANGE	8–16 MHz
FREQUENCY TUNE	8 MHz
OUTPUT LEVEL Switch . . .	+10 dBm
OUTPUT LEVEL Vernier . .	Fully cw

2. Prepare a 1 MHz Butterworth low-pass filter and install it in the frequency meter. Set frequency meter's range to 10 MHz and input sensitivity to 1V.

3. Set Signal Generator's FM switch to AC. Set spectrum analyzer's resolution bandwidth to 3 kHz and its center frequency controls to 1 kHz (with no sweep). Set analyzer's tracking generator output level for 80 kHz peak deviation as read on generator's panel meter. Set the analyzer's frequency controls for a 0 to 250 kHz sweep. Set the analyzer's display for 2 dB per division; adjust the display reference level controls to display the demodulated sweep.

4. Measure the sweep on the analyzer's display. Total amplitude variation from 20Hz to 250 kHz should be < 3 dB.

_______________ 3 dB

NOTE

If the frequency meter's incidental AM rejection is insufficient, the generator could appear to be out of specification. To check the frequency meter, note analyzer's reading (in dBm), set generator's AM switch to AC and connect analyzer's tracking generator output to AM INPUT. Set MODULATION for 10% as read on panel meter. The analyzer should read >30 dB below the reading noted above. If it does not, adjust frequency meter sensitivity and trigger level (or generator's OUTPUT LEVEL vernier) until it does. Then repeat steps 2 through 4.

4-34. FM DISTORTION TEST

SPECIFICATION: **FM Distortion** (at 400 and 1 kHz rates):
<1% for deviations up to 1/8 maximum allowable.
<3% for deviations up to maximum allowable.

DESCRIPTION: The Signal Generator is modulated with a 1 kHz signal. The generator's RF output is then demodulated with a frequency meter and the distortion on the frequency meter output is measured with a spectrum analyzer.

4-34. FM DISTORTION TEST (Cont'd)

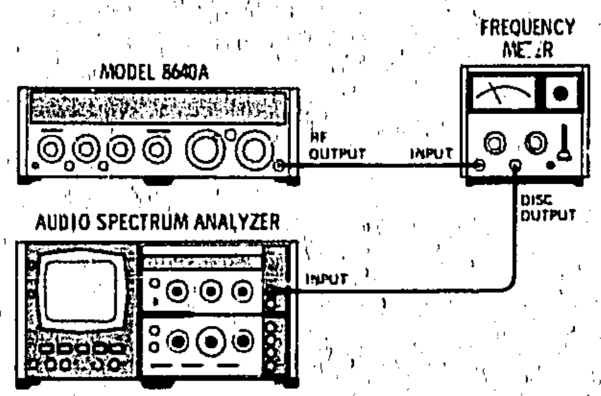


Figure 4-16. FM Distortion Test Setup

EQUIPMENT:

Frequency Meter	HP 5210A
Filter Kit (for Frequency Meter)	HP 10531A
Audio Spectrum Analyzer	HP 8556A/8552B/141T

PROCEDURE:

1. Connect equipment as shown in Figure 4-16 after setting Signal Generator's controls as follows:

Meter Function	FM
AM	OFF
MODULATION FREQUENCY	1 kHz (Fixed)
FM	INT
PEAK DEVIATION	80 kHz
PEAK DEVIATION Vernier	Fully cw
RANGE	8–16 MHz
FREQUENCY TUNE	8 MHz
OUTPUT LEVEL Switch	+10 dBm
OUTPUT LEVEL Vernier	Fully cw

2. Using the filter kit, prepare a 1 MHz Butterworth low-pass filter and install it in the frequency meter.

3. Set frequency meter's range to 10 MHz and sensitivity to 1V.

4. Set spectrum analyzer's resolution bandwidth to 100 Hz and its center frequency controls for a 0 to 5 kHz span. Set the display for 10 dB per division.

5. Use generator's PEAK DEVIATION vernier to set 80 kHz of peak deviation (as read on panel meter). Use analyzer's display reference level controls to set the demodulated 1 kHz signal to the top (reference) graticule line on the display.

6. Note the level of the 1 kHz signal's harmonics (2 kHz, 3 kHz, etc.). For less than 3% distortion, they should be more than 30.5 dB below the reference graticule line.

30.5 dB ________

4-34. FM DISTORTION TEST (Cont'd)

7. Set generator's PEAK DEVIATION switch to 10 kHz. If necessary, use generator's PEAK DEVIATION vernier to set 10 kHz of peak deviation; use analyzer's display reference level controls to set the demodulated 1 kHz signal to the reference graticule line.

8. For less than 1% distortion, the 1 kHz signal's harmonics should be more than 40 dB below the reference graticule line.

40 dB ________

4-35. FM SENSITIVITY AND ACCURACY TEST

SPECIFICATION: **External FM Sensitivity:** 1 volt peak yields maximum deviation indicated on PEAK DEVIATION switch with FM vernier at fully cw position.

External FM Sensitivity Accuracy (400 Hz and 1 kHz rates from 15° to 35°C):
Excluding maximum peak deviation position: ±6%.

Indicated FM Accuracy (400 Hz and 1 kHz rates using internal meter):
Excluding maximum peak deviation position: ±(7% of reading +1.5% of full scale).

DESCRIPTION: The Signal Generator's FM sensitivity is checked using the carrier (Bessel) null technique. An externally applied 2.079 kHz signal is used to FM the generator. The modulation signal's amplitude is adjusted for the first order null of the carrier and the modulation amplitude is measured to find the sensitivity error. (For the first order null of the carrier, peak deviation equals 2.405 times the 2.079 MHz modulation rate or 5 kHz deviation.) The panel meter accuracy is found by comparing its reading to the 5 kHz peak deviation. The reference generator and mixer convert the signal into the range of the spectrum analyzer.

4-35. FM SENSITIVITY AND ACCURACY TEST (Cont'd)

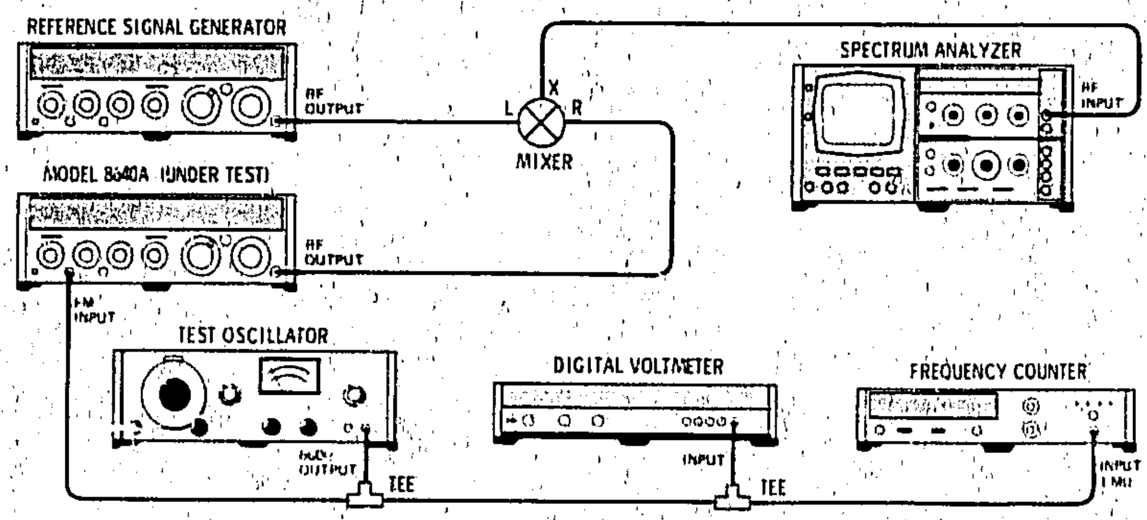


Figure 4-17. FM Sensitivity and Accuracy Test Setup

NOTES

The ambient temperature must be within 15° to 35° for this test.

The reference signal generator should have frequency drift and residual FM specifications equivalent to the Model 8640A.

EQUIPMENT:

Test Oscillator	HP 651B
Digital Voltmeter	HP 3490A
Frequency Counter	HP 5327C
Spectrum Analyzer	HP 8554B/8552B/141T
Reference Signal Generator	HP 8640A
Mixer	HP 10514A

PROCEDURE:

1. Connect equipment as shown in Figure 4-17 (with test Signal Generator connected to mixer, and mixer connected to analyzer) after setting test generator's controls as follows:

Meter Function	FM
AM	OFF
FM	OFF
PEAK DEVIATION	5 kHz
PEAK DEVIATION Vernier	Fully cw
RANGE	256–512 MHz
FREQUENCY TUNE	512 MHz
OUTPUT LEVEL Switch	–10 dBm
OUTPUT LEVEL Vernier	Fully cw

2. Set reference signal generator for a 513 MHz, CW signal at +13 dBm.

PERFORMANCE TESTS

4-35. FM SENSITIVITY AND ACCURACY TEST (Cont'd)

3. Set spectrum analyzer's center frequency controls to 1 MHz, input attenuation to 20 dB, resolution bandwidth to 0.1 kHz, span width per division (scan width) to 1 kHz, and set display to 10 dB per division. Set reference level controls to put peak of the signal at top (log reference) graticule line on the display.

4. To check external sensitivity, set test oscillator for approximately 0.7 Vrms signal (read on DVM) at 2.079 kHz. Set test generator's FM switch to AC and fine adjust test oscillator's amplitude for the first carrier null on analyzer's display (at least 50 dB below the top graticule line). With the DVM, measure amplitude of modulating signal. It should be 707 mVrms ±6% and the panel meter should read 5 kHz ±8.5%.

DVM: 665 ________ 750 mVrms
Panel Meter: 4.6 ________ 5.4 kHz

5. Use the procedures given above to check the remaining ranges by setting the test Signal Generator's RANGE switch as shown below. As outlined in steps 1 through 4, on each range set FM to OFF and tune the generators for a 1 MHz difference. Set the reference on the analyzer, set FM to AC (with a 2.079 kHz modulating signal at approximately 707 mVrms) and adjust the modulating signal's amplitude for the first carrier null. The signal's amplitude should be 707 mVrms ±6% and the panel meter should read 5 kHz ±8.5%.

RANGE (MHz)	FREQUENCY TUNE (MHz)	Reference Generator Frequency (MHz)	Mod. Signal Amplitude (mVrms)	Panel Meter Reading (kHz)
128–256	256	257	665 ______ 750	4.6 ______ 5.4
64–128	128	129	665 ______ 750	4.6 ______ 5.4
32–64	64	65	665 ______ 750	4.6 ______ 5.4
16–32	32	33	665 ______ 750	4.6 ______ 5.4
8–16	16	17	665 ______ 750	4.6 ______ 5.4
4–8	8	9	665 ______ 750	4.6 ______ 5.4
2–4	4	5	665 ______ 750	4.6 ______ 5.4
1–2	2	3	665 ______ 750	4.6 ______ 5.4

Table 4-3. Performance Test Record (1 of 9)

Hewlett-Packard Company
Model 8640A
Signal Generator
Serial No. ______________

Tested By ______________

Date ______________

Para. No.	Test Description		Results Min	Actual	Max
4-13	**Frequency Range and Dial Accuracy Test**				
	High End of Range:	512–1024 MHz	1100 MHz	______	
		256–512 MHz	550 MHz	______	
		128–256 MHz	275 MHz	______	
		64–128 MHz	137 MHz	______	
		32–64 MHz	68.7 MHz	______	
		16–32 MHz	34.3 MHz	______	
		8–16 MHz	17.1 MHz	______	
		4–8 MHz	8.59 MHz	______	
		2–4 MHz	4.29 MHz	______	
		1–2 MHz	2.14 MHz	______	
		0.5–1 MHz	1.07 MHz	______	
	Low End of Range:	512–1024 MHz		______	460 MHz
		256–512 MHz		______	230 MHz
		128–256 MHz		______	115 MHz
		64–128 MHz		______	57.5 MHz
		32–64 MHz		______	28.8 MHz
		16–32 MHz		______	14.4 MHz
		8–16 MHz		______	7.19 MHz
		4–8 MHz		______	3.60 MHz
		2–4 MHz		______	1.80 MHz
		1–2 MHz		______	0.90 MHz
		0.5–1 MHz		______	0.45 MHz
	Dial Accuracy:	1.000 MHz	0.990 MHz	______	1.010 MHz
		0.750 MHz	0.743 MHz	______	0.757 MHz
		0.500 MHz	0.495 MHz	______	0.505 MHz
		Other Ranges	−1%	______	+1%
4-14	**Harmonics Test**				
	Frequency Range:	0.5–1 MHz	30 dB	______	
		1–2 MHz	30 dB	______	
		2–4 MHz	30 dB	______	
		4–8 MHz	30 dB	______	
		8–16 MHz	30 dB	______	
		16–32 MHz	30 dB	______	
		32–64 MHz	30 dB	______	
		64–128 MHz	30 dB	______	
		128–256 MHz	30 dB	______	
		256–512 MHz	30 dB	______	
	(Option 002)	512–1024 MHz	12 dB	______	
4-15	**Subharmonic Test (Option 002)**				
	Below carrier		20 dB	______	

Table 4-3. Performance Test Record (2 of 9)

Para. No.	Test Description		Results		
			Min	Actual	Max
4-16	Single Sideband Phase Noise Test				
	At 550 MHz > 122 dBc		12 dB	________	
	At 450 MHz > 130 dBc		20 dB	________	
4-17	Single Sideband Broadband Noise Floor Test				
	>140 dBc		30 dB	________	
4-18	Residual AM Test				
	>78 dBc		58 dB	________	
	>78 dBc (Option 002)		58 dB	________	
4-19	Residual FM Test				
	<15 Hz		7.5 mVrms	________	
	<30 Hz		15 mVrms	________	
4-20	Output Level Accuracy Test				
	Output Level	Meter Reading			
	Fully cw	+19 dBm	+17.5 dBm	________	+20.5 dBm
	Fully cw	+13 dBm	+11.5 dBm	________	+14.5 dBm
	Fully cw	+10 dBm	+ 8.0 dBm	________	+12.0 dBm
	1 step ccw	+13 dBm	+11.5 dBm	________	+14.5 dBm
	1 step ccw	+8 dBm	+ 6.5 dBm	________	+ 9.5 dBm
	1 step ccw	+3 dBm	+ 1.5 dBm	________	+ 4.5 dBm
	1 step ccw	0 dBm	− 2.0 dBm	________	+ 2.0 dBm
	2 steps ccw	+3 dBm	+ 1.5 dBm	________	+ 4.5 dBm
	3 steps ccw	−7 dBm	− 9.0 dB	________	− 5.0 dB
	4 steps ccw	−17 dBm	− 2.0 dB	________	+ 2.0 dB
	5 steps ccw	−27 dBm	− 2.0 dB	________	+ 2.0 dB
	6 steps ccw	−37 dBm	− 2.0 dB	________	+ 2.0 dB
	7 steps ccw	−47 dBm	− 2.5 dB	________	+ 2.5 dB
	8 steps ccw	−57 dBm	− 2.5 dB	________	+ 2.5 dB
	9 steps ccw	−67 dBm	− 2.5 dB	________	+ 2.5 dB
	10 steps ccw	−77 dBm	− 2.5 dB	________	+ 2.5 dB
	11 steps ccw	−87 dBm	− 2.5 dB	________	+ 2.5 dB
	12 steps ccw	−97 dBm	− 2.5 dB	________	+ 2.5 dB
	13 steps ccw	−107 dBm	− 2.5 dB	________	+ 2.5 dB
	14 steps ccw	−117 dBm	− 2.5 dB	________	+ 2.5 dB
		−127 dBm	−22.5 dB	________	−17.5 dB

Table 4-3. Performance Test Record (3 of 9)

Para No.	Test Description		Results Min	Actual	Max
4-21	**Output Level Accuracy Test (Option 002)**				
	0.5—64 MHz				
	Output Level	Meter Reading			
	Fully cw	+18 dBm	+16.5 dBm	______	+19.5 dBm
	Fully cw	+13 dBm	+11.5 dBm	______	+14.5 dBm
	Fully cw	+10 dBm	+ 8.0 dBm	______	+12.0 dBm
	1 step ccw	+13 dBm	+11.5 dBm	______	+14.5 dBm
	1 step ccw	+8 dBm	+ 6.5 dBm	______	+ 9.5 dBm
	1 step ccw	+3 dBm	+ 1.5 dBm	______	+ 4.5 dBm
	1 step ccw	0 dBm	− 2.0 dBm	______	+ 2.0 dBm
	2 steps ccw	+3 dBm	+ 1.5 dBm	______	+ 4.5 dBm
	3 steps ccw	−7 dBm	− 9.0 dBm	______	− 5.0 dBm
	4 steps ccw	−17 dBm	− 2.0 dB	______	+ 2.0 dB
	5 steps ccw	−27 dBm	− 2.0 dB	______	+ 2.0 dB
	6 steps ccw	−37 dBm	− 2.0 dB	______	+ 2.0 dB
	7 steps ccw	−47 dBm	− 2.5 dB	______	+ 2.5 dB
	8 steps ccw	−57 dBm	− 2.5 dB	______	+ 2.5 dB
	9 steps ccw	−67 dBm	− 2.5 dB	______	+ 2.5 dB
	10 steps ccw	−77 dBm	− 2.5 dB	______	+ 2.5 dB
	11 steps ccw	−87 dBm	− 2.5 dB	______	+ 2.5 dB
	12 steps ccw	−97 dBm	− 2.5 dB	______	+ 2.5 dB
	13 steps ccw	−107 dBm	− 2.5 dB	______	+ 2.5 dB
	14 steps ccw	−117 dBm	− 2.5 dB	______	+ 2.5 dB
		−127 dBm	−22.5 dB	______	−17.5 dB
	64—512 MHz				
	Output Level	Meter Reading			
	Fully cw	+18 dBm	+16.0 dBm	______	+20.0 dBm
	Fully cw	+13 dBm	+11.0 dBm	______	+15.0 dBm
	Fully cw	+10 dBm	+ 7.5 dBm	______	+12.5 dBm
	1 step ccw	+13 dBm	+11.0 dBm	______	+15.0 dBm
	1 step ccw	+8 dBm	+ 6.0 dBm	______	+10.0 dBm
	1 step ccw	+3 dBm	+ 1.0 dBm	______	+ 5.0 dBm
	1 step ccw	0 dBm	− 2.5 dBm	______	+ 2.5 dBm
	2 steps ccw	+3 dBm	+ 1.0 dBm	______	+ 5.0 dBm
	3 steps ccw	−7 dBm	− 9.5 dBm	______	− 4.5 dBm
	4 steps ccw	−17 dBm	− 2.5 dB	______	+ 2.5 dB
	5 steps ccw	−27 dBm	− 2.5 dB	______	+ 2.5 dB
	6 steps ccw	−37 dBm	− 2.5 dB	______	+ 2.5 dB
	7 steps ccw	−47 dBm	− 3.0 dB	______	+ 3.0 dB
	8 steps ccw	−57 dBm	− 3.0 dB	______	+ 3.0 dB
	9 steps ccw	−67 dBm	− 3.0 dB	______	+ 3.0 dB
	10 steps ccw	−77 dBm	− 3.0 dB	______	+ 3.0 dB

Table 4-3. Performance Test Record (4 of 9)

Para No.	Test Description		Results Min	Actual	Max
4-21	**Output Level Accuracy Test (Option 002) (continued)**				
	64–512 MHz (cont'd)				
	Output Level	Meter Reading			
	11 steps ccw	−87 dBm	− 3.0 dB	________	+ 3.0 dB
	12 steps ccw	−97 dBm	− 3.0 dB	________	+ 3.0 dB
	13 steps ccw	−107 dBm	− 3.0 dB	________	+ 3.0 dB
	14 steps ccw	−117 dBm	− 3.0 dB	________	+ 3.0 dB
		−127 dBm	−23.0 dB	________	−17.0 dB
	512–1024 MHz				
	Output Level	Meter Reading			
	Fully cw	+13 dBm	+10.0 dBm	________	+16.0 dBm
	Fully cw	+10 dBm	+ 6.5 dBm	________	+13.5 dBm
	1 step ccw	+13 dBm	+10.0 dBm	________	+16.0 dBm
	1 step ccw	+8 dBm	+ 5.0 dBm	________	+10.0 dBm
	1 step ccw	+3 dBm	+ 0.0 dBm	________	+ 6.0 dBm
	1 step ccw	0 dBm	− 3.5 dBm	________	+ 3.5 dBm
	2 steps ccw	+3 dBm	− 0.0 dBm	________	+ 6.0 dBm
	3 steps ccw	−7 dBm	−10.5 dBm	________	− 3.5 dBm
	4 steps ccw	−17 dBm	− 3.5 dB	________	+ 3.5 dB
	5 steps ccw	−27 dBm	− 3.5 dB	________	+ 3.5 dB
	6 steps ccw	−37 dBm	− 3.5 dB	________	+ 3.5 dB
	7 steps ccw	−47 dBm	− 4.0 dB	________	+ 4.0 dB
	8 steps ccw	−57 dBm	− 4.0 dB	________	+ 4.0 dB
	9 steps ccw	−67 dBm	− 4.0 dB	________	+ 4.0 dB
	10 steps ccw	−77 dBm	− 4.0 dB	________	+ 4.0 dB
	11 steps ccw	−87 dBm	− 4.0 dB	________	+ 4.0 dB
	12 steps ccw	−97 dBm	− 4.0 dB	________	+ 4.0 dB
	13 steps ccw	−107 dBm	− 4.0 dB	________	+ 4.0 dB
	14 steps ccw	−117 dBm	− 4.0 dB	________	+ 4.0 dB
		−127 dBm	−24.0 dB	________	−16.0 dB
4-22	**Output Level Accuracy Test (Option 003)**				
	Output Level	Meter Reading			
	Fully cw	+18 dBm	+15.75 dBm	________	+19.75 dBm
	Fully cw	+13 dBm	+10.75 dBm	________	+14.75 dBm
	Fully cw	+10 dBm	+ 7.25 dBm	________	+12.25 dBm
	1 step ccw	+13 dBm	+10.75 dBm	________	+14.75 dBm
	1 step ccw	+8 dBm	+ 5.75 dBm	________	+ 9.75 dBm
	1 step ccw	+3 dBm	+ 0.75 dBm	________	+ 4.75 dBm
	1 step ccw	0 dBm	− 2.75 dBm	________	+ 2.25 dBm
	2 steps ccw	+3 dBm	+ 0.75 dBm	________	+ 4.75 dBm
	3 steps ccw	−7 dBm	− 9.75 dBm	________	− 4.75 dBm

Table 4-3. Performance Test Record (5 of 9)

Para No.	Test Description		Results Min	Results Actual	Results Max
4-22	**Output Level Accuracy Test (Option 003) (continued)**				
	Output Level	Meter Reading			
	4 steps ccw	−17 dBm	−2.75 dB	________	+ 2.25 dB
	5 steps ccw	−27 dBm	−2.75 dB	________	+ 2.25 dB
	6 steps cw	−37 dBm	−2.75 dB	________	+ 2.25 dB
	7 steps ccw	−47 dBm	−3.25 dB	________	+ 2.75 dB
	8 steps ccw	−57 dBm	−3.25 dB	________	+ 2.75 dB
	9 steps ccw	−67 dBm	−3.25 dB	________	+ 2.75 dB
	10 steps ccw	−77 dBm	−3.25 dB	________	+ 2.75 dB
	11 steps ccw	−87 dBm	−3.25 dB	________	+ 2.75 dB
	12 steps ccw	−97 dBm	−3.25 dB	________	+ 2.75 dB
	13 steps ccw	−107 dBm	−3.25 dB	________	+ 2.75 dB
	14 steps ccw	−117 dBm	−3.25 dB	________	+ 2.75 dB
		−127 dBm	−23.25 dB	________	−17.25 dB
4-23	**Output Level Accuracy Test (Option 002 with Option 003)** 512–1024 MHz				
	Output Level	Meter Reading			
	Fully cw	+18 dBm	+15.0 dBm	________	+20.0 dBm
	Fully cw	+13 dBm	+10.0 dBm	________	+15.0 dBm
	Fully cw	+10 dBm	+ 6.5 dBm	________	+12.5 dBm
	1 step ccw	+12 dBm	+ 9.0 dBm	________	+14.0 dBm
	1 step ccw	+ 8 dBm	+ 5.0 dBm	________	+10.0 dBm
	1 step ccw	+3 dBm	0 dBm	________	+ 5.0 dBm
	1 step ccw	0 dBm	− 3.5 dBm	________	+ 2.5 dBm
	2 steps ccw	+2 dBm	− 1.0 dBm	________	+ 4.0 dBm
	3 steps ccw	−8 dBm	−11.5 dBm	________	− 5.5 dBm
	4 steps ccw	−18 dBm	− 3.5 dB	________	+ 2.5 dB
	5 steps ccw	−28 dBm	− 3.5 dB	________	+ 2.5 dB
	6 steps ccw	−38 dBm	− 3.5 dB	________	+ 2.5 dB
	7 steps ccw	−48 dBm	− 4.0 dB	________	+ 3.0 dB
	8 steps ccw	−58 dBm	− 4.0 dB	________	+ 3.0 dB
	9 steps ccw	−68 dBm	− 4.0 dB	________	+ 3.0 dB
	10 steps ccw	−78 dBm	− 4.0 dB	________	+ 3.0 dB
	11 steps ccw	−88 dBm	− 4.0 dB	________	+ 3.0 dB
	12 steps ccw	−98 dBm	− 4.0 dB	________	+ 3.0 dB
	13 steps ccw	−108 dBm	− 4.0 dB	________	+ 3.0 dB
	14 steps ccw	−118 dBm	− 4.0 dB	________	+ 3.0 dB
		−128 dBm	−24.0 dB	________	−17.0 dB

Table 4-3. Performance Test Record (6 of 9)

Para No.	Test Description	Results		
		Min	Actual	Max
4-23	**Output Level Accuracy Test (Option 002 with Option 003) (continued)**			
	512–1024 MHz			
	Output Level — Meter Reading			
	Fully cw — +13 dBm	+ 9.5 dBm	______	+16.5 dBm
	Fully cw — +10 dBm	+ 6.0 dBm	______	+14.0 dBm
	1 step ccw — +12 dBm	+ 8.5 dBm	______	+15.5 dBm
	1 step ccw — +8 dBm	+ 4.5 dBm	______	+11.5 dBm
	1 step ccw — +3 dBm	− 0.5 dBm	______	+ 6.5 dBm
	1 step ccw — 0 dBm	− 4.0 dBm	______	+ 4.0 dBm
	2 steps ccw — +2 dBm	− 1.5 dBm	______	+ 5.5 dBm
	3 steps ccw — −8 dBm	−12.0 dBm	______	− 4.0 dBm
	4 steps ccw — −18 dBm	− 4.0 dB	______	+ 4.0 dB
	5 steps ccw — −28 dBm	− 4.0 dB	______	+ 4.0 dB
	6 steps ccw — −38 dBm	− 4.0 dB	______	+ 4.0 dB
	7 steps ccw — −48 dBm	− 4.5 dB	______	+ 4.5 dB
	8 steps ccw — −58 dBm	− 4.5 dB	______	+ 4.5 dB
	9 steps ccw — −68 dBm	− 4.5 dB	______	+ 4.5 dB
	10 steps ccw — −78 dBm	− 4.5 dB	______	+ 4.5 dB
	11 steps ccw — −88 dBm	− 4.5 dB	______	+ 4.5 dB
	12 steps ccw — −98 dBm	− 4.5 dB	______	+ 4.5 dB
	13 steps ccw — −108 dBm	− 4.5 dB	______	+ 4.5 dB
	14 steps ccw — −118 dBm	− 4.5 dB	______	+ 4.5 dB
	−128 dBm	−24.5 dB	______	−15.5 dB
4-24	**Output Level Flatness**			
	Standard:	8.50 dBm	______	9.50 dBm
	Option 002: 0.5–64 MHz	8.50 dBm	______	9.50 dBm
	64–512 MHz	8.50 dBm	______	10.00 dBm
	512–1024 MHz	7.50 dBm	______	10.50 dBm
	Option 003:	7.75 dBm	______	9.75 dBm
	Option 003 with Option 002:			
	0.5–512 MHz	7.00 dBm	______	10.0 dBm
	512–1024 MHz	7.00 dBm	______	11.0 dBm
4-25	**Output Leakage Test**			
	0.5–400 MHz		______	−40 dB
	400–600 MHz		______	−40 dB
	600–1200 MHz		______	−40 dB
4-26	**Modulation Oscillator Frequency Accuracy Test**			
	400 Hz Fixed	388 Hz	______	412 Hz
	1 kHz Fixed	970 Hz	______	1030 Hz

Table 4-3. Performance Test Record (7 of 9)

Para No.	Test Description	Results Min	Actual	Max
4-26	**Modulation Oscillator Frequency Accuracy Test (continued)**			
	Variable Frequency (Option 001)			
	X1	85 Hz	________	115 Hz
	X10	850 Hz	________	1150 Hz
	X100	8500 Hz	________	11 500 Hz
	X1k	85 000 Hz	________	115 000 Hz
	X3k	255 000 Hz	________	345 000 Hz
4-27	**Internal Modulation Oscillator Distortion Test (Option 001)**			
	Variable: 20 Hz to 2 kHz		________	0.5%
	2 kHz to 200 kHz		________	1.0%
	200 kHz to 600 kHz		________	2.0%
	Fixed: 400 Hz		________	0.5%
	1 kHz		________	0.5%
4-28	**AM Bandwidth Test**			
	Range / % AM / Bandwidth			
	1–2 MHz 50% 0–20 kHz		________	3 dB
	90% 0–12.5 kHz		________	3 dB
	4–8 MHz 50% 0–40 kHz		________	3 dB
	90% 0–25 kHz		________	3 dB
	8–16 MHz 50% 0–60 kHz		________	3 dB
	90% 0–50 kHz		________	3 dB
	512–1024 MHz 50% 0–60 kHz		________	3 dB
	(Option 002) 90% 0–50 kHz		________	3 dB
4-29	**AM Distortion Test**			
	Range / Vernier Setting / % AM			
	.5–512 MHz cw 50%		________	1%
	90%		________	3%
	−10 dB 50%		________	1%
	90%		________	3%
	512–1024 MHz cw 30%		________	10%
	(Option 002) 90%		________	20%
	−10 dB 30%		________	10%
	90%		________	20%
4-30	**AM Sensitivity and Accuracy Test**			
	External Sensitivity Accuracy:	171.0 mVrms	________	189.0 mVrms
	Indicated Accuracy: 90%	167.1 mVrms	________	192.9 mVrms
	70%	129.3 mVrms	________	150.7 mVrms
	50%	91.5 mVrms	________	108.5 mVrms

Table 4-3. Performance Test Record (8 of 9)

Para No.	Test Description			Results		
				Min	Actual	Max
4-30	**AM Sensitivity and Accuracy Test (cont'd)**					
	Indicated Accuracy:		30%	53.7 mVrms	________	66.3 mVrms
			20%	34.8 mVrms	________	45.2 mVrms
			10%	15.9 mVrms	________	24.1 mVrms
4-31	**Pulse Modulation Test**					
		0.5–1 MHz	Rise Time		________	9 μs
			Fall Time		________	9 μs
			Level Accuracy	5.4 div	________	6.7 div
		1–2 MHz	Rise Time		________	4 μs
			Fall Time		________	4 μs
			Level Accuracy	5.4 div	________	6.7 div
		2–4 MHz	Rise Time		________	2 μs
			Fall Time		________	2 μs
			Level Accuracy	5.4 div	________	6.7 div
		4–8 MHz	Rise Time		________	2 μs
			Fall Time		________	2 μs
			Level Accuracy	5.4 div	________	6.7 div
		8–16 MHz	Rise Time		________	1 μs
			Fall Time		________	1 μs
			Level Accuracy	5.4 div	________	6.7 div
		16–32 MHz	Rise Time		________	1 μs
			Fall Time		________	1 μs
			Level Accuracy	5.4 div	________	6.7 div
		32–64 MHz	Rise Time		________	1 μs
			Fall Time		________	1 μs
			Level Accuracy	5.4 div	________	6.7 div
		64–128 MHz	Rise Time		________	1 μs
			Fall Time		________	1 μs
			Level Accuracy	5.4 div	________	6.7 div
		128–256 MHz	Rise Time		________	1 μs
			Fall Time		________	1 μs
			Level Accuracy	5.4 div	________	6.7 div
		256–512 MHz	Rise Time		________	1 μs
			Fall Time		________	1 μs
			Level Accuracy	5.4 div	________	6.7 div
		512–1024 MHz	Rise Time		________	1 μs
		(Option 002)	Fall Time		________	1 μs
			Level Accuracy	5.4 div	________	6.7 div
4-32	**Pulse ON/OFF Ratio Test**					
		Frequency Range:				
		256–512 MHz		40 dB	________	
		512–1024 MHz		60 dB	________	
		(Option 002)				

Table 4-3. Performance Test Record (9 of 9)

Para No.	Test Description	Results		
		Min	Actual	Max
4-33	**FM Bandwidth Test**		_______	3 dB
4-34	**FM Distortion Test**			
	Maximum Deviation	30.5 dB	_______	
	1/8 Maximum Deviation	40 dB	_______	
4-35	**FM Sensitivity and Accuracy Test**			
	Sensitivity: Frequency Range		_______	
	256–512 MHz	665 mVrms	_______	750 mVrms
	128–256 MHz	665 mVrms	_______	750 mVrms
	64–128 MHz	665 mVrms	_______	750 mVrms
	32–64 MHz	665 mVrms	_______	750 mVrms
	16–32 MHz	665 mVrms	_______	750 mVrms
	8–16 MHz	665 mVrms	_______	750 mVrms
	4–8 MHz	665 mVrms	_______	750 mVrms
	2–4 MHz	665 mVrms	_______	750 mVrms
	1–2 MHz	665 mVrms	_______	750 mVrms
	0.5–1 MHz	665 mVrms	_______	750 mVrms
	Accuracy: Frequency Range			
	256–512 MHz	4.6 kHz	_______	5.4 kHz
	128–256 MHz	4.6 kHz	_______	5.4 kHz
	64–128 MHz	4.6 kHz	_______	5.4 kHz
	32–64 MHz	4.6 kHz	_______	5.4 kHz
	16–32 MHz	4.6 kHz	_______	5.4 kHz
	8–16 MHz	4.6 kHz	_______	5.4 kHz
	4–8 MHz	4.6 kHz	_______	5.4 kHz
	2–4 MHz	4.6 kHz	_______	5.4 kHz
	1–2 MHz	4.6 kHz	_______	5.4 kHz
	0.5–1 MHz	4.6 kHz	_______	5.4 kHz

ADJUSTMENTS

SECTION V
ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section describes adjustments required to return the Signal Generator to peak operating condition when repairs are required. Included in this section are test setups and check and adjustment procedures. Removal and replacement procedures are given on the alphabetic service sheets (after the schematics in Section VIII). Adjustment location photographs are given on the last foldout in Section VIII.

5-3. SAFETY CONSIDERATIONS

5-4. Although this instrument has been designed in accordance with international safety standards, this manual contains information and warnings which must be followed to ensure safe operation and to retain the instrument in a safe condition (see Cautions/Warnings page in the front of the manual). Service and adjustments should be performed only by qualified service personnel.

WARNING

An interruption of the protective (grounding) conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the apparatus dangerous. Intentional interruption is prohibited.

5-5. Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, should be carried out only by a skilled person who is aware of the hazard involved. The opening of covers or removal of parts, except those to which access can be gained by hand, may expose live parts, and also accessible terminals may be live.

5-6. Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

5-7. Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.

5-8. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

5-9. TEST EQUIPMENT REQUIRED

5-10. Tables 1-2 and 1-3 contain a list of test equipment and test accessories required in the adjustment procedures. In addition, the tables contain the required minimum specifications and a suggested manufacturer's model number.

5-11. Pozidriv Screwdrivers

5-12. Many screws in the instrument appear to be Phillips, but are not. To avoid damage to the screw slots, Pozidriv screwdrivers should be used.

5-13. Blade Tuning Tools

5-14. For adjustments requiring a non-metallic metal-blade tuning tool, use the J.F.D. Model No. 5284 (HP 8710-1010). In situations not requiring non-metallic tuning tools, an ordinary small screwdriver or other suitable tool is sufficient. No matter what tool is used, never try to force any adjustment control in the generator. This is especially critical when tuning variable slug-tuned inductors, and variable capacitors.

5-15. Service Aids

5-16. **Miscellaneous Hardware Kit.** The HP 08640-60095 Miscellaneous Hardware Kit contains mechanical spare parts for the generator — such things as nuts, bolts, screws and washers.

5-17. **Extender Board.** An extender board (HP 08640-60036) is available which can be used to extend all circuit plug-in boards (except the A10A2 RF Divider Assembly and the A12 Rectifier Assembly). The RF Divider Assembly is self-extending; just remove the riser board and insert the Divider Assembly into the riser's socket.

5-18. **Wrench.** A wrench is supplied with the generator. One end fits 7/32 inch connectors while the other fits the 1/4 inch size. Both these sizes of SMC RF connectors are used in the generator.

5-19. FACTORY SELECTED COMPONENTS

5-20. Table 5-1 contains a list of factory selected components by reference designation, basis of selection, and schematic diagram location. Factory selected components are designated by an asterisk (*) on the schematic diagrams in Section VIII.

5-21. The following information supplements Table 5-1.

a. A5R42 Selection: If the A3 RF Oscillator Assembly has been changed, perform the FM Sensitivity Adjustment. If insufficient adjustment range exists on the Low-end Sensitivity Adjustment pot, A3A4R2, to achieve a carrier null (of at least 50 dB), a resistor, A5R42 should be added between pins 11 and 12 of the A5 FM Amplifier Assembly. The addition of this resistor increases the overall gain of the FM Amplifier. Select the value as follows:

1. Set up the FM Sensitivity Adjustment at 16 MHz and adjust A3A4R2 for maximum sensitivity (e.g., fully cw until no further effect is noticed).
2. Adjust the frequency of the test oscillator downward until a carrier null (at least 50 dB) is achieved. Note this frequency.
3. Compute the value of A5R42 using the following formula:

$$A5R42 = \frac{36}{40 - (2.405)f_{null}}$$

   where: A5R42 is in kiloohms and f_{null} is the frequency in kHz where the null (at least 50 dB) occurred.

4. Choose the next lowest standard resistance value and solder it between pins 11 and 12 of the A5 FM Amplifier circuit board.
5. Perform the FM Sensitivity Adjustment.

b. A9C8 Selection. If A9 has been changed, perform FM BANDWIDTH TEST (paragraph 4-33) to determine if the FM Amplifier is peaking above specification in the 5 kHz PEAK DEVIATION range. If the FM Amplifier is peaking excessively, increase the value of A9C8 until flatness of the amplifier is within specification.

c. A10A2R3 Selection. If A10A2U11 or U12 is replaced and RF Output irregularities are observed, it may be necessary to change the value of A10A2R3. Select the proper value as follows:

1. Set RANGE to 64—128 MHz.
2. Observe RF OUTPUT signal with spectrum analyzer.
3. Tune FREQUENCY TUNE across range.
4. If signal irregularities (e.g., erratic frequency, sub-harmonics, or increased level of the noise floor) are observed, increase the value of A10A2R3 within the range of values shown in Table 5-1.

d. A10A2R6-8, R12-14, and R18-20 Selection. If A26U2 (Service Sheet 12, 12A) has been replaced, check second harmonic level at RF OUTPUT jack on the following ranges: 128—256 MHz, 64-128 MHz, and 32—64 MHz. If second harmonic level is out of specification, increase affected range's divider output attenuation until second harmonic level is within specification. The following table indicates correct values of resistance for 3 to 6 dB of attenuation (change attenuation in 1 dB steps).

e. To change attenuation, change all three resistors associated with the range that's out of specification. For example, if 64—128 MHz range's second harmonic is too high, then R12, R13, and R14 will have to be changed. Change attenuation in 1 dB steps (e.g., to change their attenuation to 5 dB, change R12 to 31.6Ω, R13 to 178Ω, and R14 to 178Ω.)

RANGE (MHz)	Resistors (A10A2)		
128—256	R6	R7	R8
64—128	R12	R13	R14
32—64	R18	R19	R20
Attenuation	**Resistance**		
3 dB	17.8Ω	287Ω	287Ω
4 dB	23.7Ω	237Ω	237Ω
5 dB	31.6Ω	178Ω	178Ω
6 dB	38.3Ω	147Ω	147Ω

FACTORY SELECTED COMPONENTS (Cont'd)

NOTE

Attenuation should be no higher than necessary to bring a range's second harmonic within specification. Excessive attenuation may reduce maximum RF output level below +19 dBm.

f. A26A3C3, C4, C5, and C6 Selection. If the modulator has been repaired, check RF output for harmonics. If the harmonics are too high, they can be lowered by proper selection of A26A3C3, C4, C5, and C6. Capacitors may or not be used; their values are always 0.22 pF. Select as follows:

1. Set AM switch to PULSE, RANGE to 256—512 MHz, and RF ON/OFF to ON.
2. Connect a spectrum analyzer to RF OUTPUT jack, A26A3J1.
3. Check from 256 to 512 MHz (tune FREQUENCY TUNE across range). Signals should always be below −58 dBm.
4. Add or remove capacitors across diodes as necessary to keep signals below - 58 dBm.

g. A26A1K2A Jumper Selection. For Option 002 only, if the RF output level rises out of specification at 500 kHz, 0.1 dB improvement may be obtained by installation of a jumper between the armature of A26A1K2A and the ungrounded contact. This lowers the relay insertion loss at the 50 MHz reference setting, but also increases the level of the subharmonic output on the doubled range. Output level calibration, level flatness, and subharmonic output should be checked after installation of the jumper.

5-22. POST-REPAIR TESTS AND ADJUSTMENTS

5-23. Table 5-2 lists the performance tests and adjustments needed to calibrate or verify calibration of a repaired assembly. The tests and adjustments are classified by assembly repaired. All tests on which a given faulty assembly could have an effect are listed with that assembly. This makes the list useful for troubleshooting conditions which are out of specification (rather than catastrophic failures) because it serves as a cross reference between performance tests and the possible source of failure. For many repairs not all the tests listed need be performed. The notes under each assembly indicate which of the tests and adjustments listed should be performed for many common repairs.

5-24. For all repairs the Basic Functional Checks (paragraph 4-12) are recommended to verify that the assembly is operating and that all other parts of the instrument are functioning properly. Also, if any casting was opened or any RF connectors removed during a repair, the Output Leakage Test should be performed. In general, the power supply voltages should be checked but not adjusted unless out of tolerance (see Power Supply Adjustment, paragraph 5-25).

Table 5-1. Factory Selected Components

Component	Service Sheet	Range of Values	Basis of Selection
A5R42	6	10kΩ to infinity	See paragraph 5-21a
A9C8	6	240—310 pF	See paragraph 5-21b
A10A2R3	11	51.1Ω—75.0Ω	See paragraph 5-21c
A10A2R6—8 R12-14 & R18-20	11		See paragraphs 5-21d—e
A26A3C3,C4, C5,C6	12, 12A	0.22 pF	See paragraph 5-21f
A26A1K2A	13A	————	See paragraph 5-21g

Table 5-2. Post-Repair Tests and Adjustments (1 of 3)

Assembly Repaired	Reference	Performance Tests and Adjustments	Notes
A1 Output Level Assembly NOTE 1. Perform if A1 replaced.	4-12 4-20 to 4-23 4-24 4-25 5-30	Basic Functional Checks (steps 1 and 5) Output Level Accuracy Tests Output Level Flatness Test Output Leakage Test Output Level and Meter Adjustment	1 1 1 1
A2 Meter Switch and Drive Assembly M1 Panel Meter NOTE 1. Perform for all A2 and M1 repairs.	4-12 5-28 5-30	Basic Functional Checks (steps 1 and 2) Meter Adjustments Output Level and Meter Adjustment	1 1
A3 RF Oscillator Assembly NOTES 1. Perform if A3 replaced 2. Perform if A3Q1 replaced. 3. Perform if A3A1A2 repaired. 4. Perform if A3R1 replaced or loosened.	4-13 4-14 4-16 4-19 4-24 4-25 4-34 4-35. 5-35 5-36 5-37 5-38 5-42 5-43 5-46	Frequency Range and Dial Accuracy Test Harmonic Distortion Test Single Sideband Phase Noise Test Residual FM Test Output Level Flatness Test Output Leakage Test FM Distortion Test FM Sensitivity and Accuracy Test V_T Pot Adjustment V_T Voltage Adjustment RF Oscillator End Stop Adjustment RF Oscillator Output Power Adjustment FM Linearity Adjustment (Alternate) FM Sensitivity Adjustment Mechanical Dial Installation and Adjustments	1 2 1, 3 4 1, 4 1, 2, 3 1 1 1
A5 FM Amplifier Assembly A7 FM Shaping Assembly NOTES 1. Perform if shapers repaired. 2. Perform if over-deviation detector repaired.	4-12 4-16 4-19 4-33 4-34 4-35 5-40 5-42 5-43	Basic Functional Checks (steps 1 and 2) Single Sideband Phase Noise Test Residual FM Test FM Bandwidth Test FM Distortion Test FM Sensitivity and Accuracy Test Preliminary FM Adjustments FM Linearity Adjustment (Alternate) FM Sensitivity Adjustment	2 1 1

Table 5-2. Post-Repair Tests and Adjustments (2 of 3)

Assembly Repaired	Reference	Performance Tests and Adjustments	Notes
A6 Annunciator Assembly	4-12	Basic Functional Checks (steps 1 and 2)	
A8 Mechanical Dial Assembly	4-12	Basic Functional Checks (steps 1 and 3)	
NOTES	4-13	Frequency Range and Dial Accuracy Test	
1. Perform for all A8 repairs.	5-46	Mechanical Dial Installation and Adjustments	1
A9 Peak Deviation and Range Switch Assembly	4-12	Basic Functional Checks (steps 1, 2, 3, and 7)	1
NOTE	4-33	FM Bandwidth Test	
1. Perform for all A9 repairs.	4-35	FM Sensitivity and Accuracy Test	
	5-34	Range Switch Adjustment	1
A10 Divider/Filter Assembly	4-14	Harmonic Distortion Test	1, 2
	4-24	Output Level Flatness Test	1, 2
NOTES	4-25	Output Leakage Test	1, 2
1. Perform if A10A1 repaired.	5-36	V_T Voltage Adjustment	2
2. Perform if A10A2 repaired.	5-39	RF Filter Adjustment	
A11 Fixed-Frequency Modulation Oscillator Assembly	4-26	Modulation Oscillator Frequency Accuracy Test	
A11 Variable-Frequency Modulation Oscillator Assembly (Option 001)	4-27	Internal Modulation Oscillator Distortion Test (Option 001)	
	5-26	Fixed-Frequency Modulation Oscillator Adjustment	
	5-27	Variable-Frequency Modulation Oscillator Adjustment (Option 001)	

Table 5-2. Post-Repair Tests and Adjustments (3 of 3)

Assembly Repaired	Reference	Performance Tests and Adjustments	Notes
A12 Rectifier Assembly	4-16	Single Sideband Phase Noise Test	
A14 Power Line Module	4-19	Residual FM Test	
A16 Fan Motor Assembly	5-25	Power Supply Adjustments	
A18 −5.2V Regulator and Fan Driver Assembly			
A20 +5.2 and +44.6V Regulator Assembly			
A22 +20V and −20V Regulator Assembly			
A21 Reverse Power Protection Assembly (Option 003)	4-21 or 23	Output Level Accuracy Tests	
	4-24	Output Level Flatness Test	1
NOTES	4-25	Output Leakage Test	
1. Perform for all A21 repairs.	5-44	Output Impedance Adjustment (Option 003)	2
2. Perform if relay (K1) replaced.	5-45	Reverse Power Level Sense Adjustment (Option 003)	1
A26 AM/AGC and RF Amplifier Assembly	4-12	Basic Functional Checks (steps 1 and 2)	
NOTES	4-14	Harmonic Distortion Test	1, 2, 3, 6
1. Perform if A26U1 replaced.			
2. Perform if A26U2 replaced.	4-15	Subharmonic Test (Option 002)	6
3. Perform if modulator repaired.	4-17	Single Sideband Broadband Noise Floor Test	
4. Perform if AM and leveling circuits (except for RF components) repaired.	4-18	Residual AM Test	4
	4-20 to 23	Output Level Accuracy Tests (steps 1 to 3)	4, 6
5. Perform if pulse circuits repaired.	4-24	Output Level Flatness Test	1, 2, 3, 6
6. Perform if doubler circuits repaired (Option 002).	4-25	Output Leakage Test	1,2,6
	4-28	AM Bandwidth Test	4
	4-29	AM Distortion Test	1,4
	4-30	AM Sensitivity and Accuracy Test	
	4-31	Pulse Modulation Test	5,6
	4-32	Pulse On/Off Ratio Test	3
	5-29	RF Detector Offset Adjustment	1, 4,6
	5-30	Output Level and Meter Adjustment	1, 4,6
	5-31	RF Detector Offset, Output Level Vernier, and Meter Adjustment (Option 002)	1, 4,6
	5-32	Doubler Gain Adjustment (Option 002)	1, 6
	5-33	AM Sensitivity Adjustment	1, 4

ADJUSTMENTS

5-25. POWER SUPPLY ADJUSTMENTS

REFERENCE: Service Sheets 22 and 23.

DESCRIPTION: A digital voltmeter is used to check the power supply voltages. They are then adjusted for the correct voltage. These voltages should be checked before making any other adjustment.

EQUIPMENT: Digital Voltmeter . . . . HP 3490A

PROCEDURE:

1. Set LINE switch to ON. The fan should run and five LED's located on power supply boards (A18, A20, and A22) should light.

2. Connect DVM to each of the test points listed below. The voltages should be within the tolerances shown; if not, adjust appropriate resistor for a reading within the indicated tolerances.

Test Point		Adjust	Voltage Level	
−5.2V	A18TP5	A18R2	−5.200V ± 10 mV ________	*
+5.2V	A20TP10	A20R16	+5.200V ± 10 mV ________	
+20V	A22TP4	A22R7	+20.000V ± 10 mV ________	**
−20V	A22TP9	A22R19	−20.000V ± 10 mV ________	***
+44.6V	A20TP4	A20R8	+44.600V ± 100 mV ________	

* For ambient temperatures other than 25°C, modify the voltage level setting by −4.2 mV/°C.

** Perform FM Cal adjustment (paragraph 5-40, step 7).

*** Perform VARACTOR BIAS adjustment (paragraph 5-40, step 11).

5-26. FIXED-FREQUENCY MODULATION OSCILLATOR ADJUSTMENT

REFERENCE: Service Sheet 9.

DESCRIPTION: A digital voltmeter is used to monitor the audio oscillator's output while setting its level. The AUDIO OUTPUT LEVEL dial is also adjusted.

NOTE

The frequency of oscillation can be fine adjusted by repositioning the orange, yellow, and green wires going to A11A1 Frequency Select Switch Assembly.

EQUIPMENT: Digital Voltmeter . . . . HP 3490A
600 Ohm Feedthrough . . . . HP 11095A

ADJUSTMENTS

5-26. FIXED-FREQUENCY MODULATION OSCILLATOR ADJUSTMENT (Cont'd)

PROCEDURE:

1. Connect DVM to A11TP3 (AM OUT). Set Signal Generator's controls as follows:

AM	INT
MODULATION FREQUENCY	1 kHz
FM	OFF
AUDIO OUTPUT LEVEL	Fully cw

2. Adjust OSC LEVEL adjustment, A11R6, for a 840 ±10 mVrms reading on DVM at A11TP3.

3. Connect DVM, through the 600 ohm feedthrough, to AM OUTPUT. Set AUDIO OUTPUT LEVEL to 100 mVrms as read on DVM. The AUDIO OUTPUT LEVEL dial should read 100 mVrms. If it does not, loosen setscrews on knob and align knob so that it does.

4. Set MODULATION FREQUENCY to 400 Hz. Set AUDIO OUTPUT LEVEL fully cw. The DVM should read greater than 1 Vrms.

5-27. VARIABLE-FREQUENCY MODULATION OSCILLATOR ADJUSTMENT (OPTION 001)

REFERENCE: Service Sheet 9A.

DESCRIPTION: A digital voltmeter and a frequency counter are used to monitor output voltage and frequency while adjusting the oscillator. The MODULATION FREQUENCY dial and the AUDIO OUTPUT LEVEL dial are adjusted.

EQUIPMENT:

Digital Voltmeter	HP 3490A
Frequency Counter	HP 5327C
600 Ohm Feedthrough	HP 11095A
Oscilloscope	HP 180C/1801A/1820C

PROCEDURE:

1. Check that the modulation oscillator and its covers are installed, and that the screw holding the capacitor housing to the Modulation/Metering Motherboard is in place.

2. If the knobs have been removed, turn MODULATION FREQUENCY vernier shaft fully cw. Install frequency dial on vernier shaft so that the gears mesh and number 200 on the dial is 10 to 20° to the right (cw) of the cursor. Turn MODULATION FREQUENCY switch shaft fully ccw and install range knob on switch shaft so that 400 Hz FIXED FREQ position is at the cursor (top). Install vernier knob. (The knobs should not touch each other).

ADJUSTMENTS

5-27. VARIABLE-FREQUENCY MODULATION OSCILLATOR ADJUSTMENT (Option 001) (Cont'd)

3. Set Signal Generator's controls as follows:

AM	INT
MODULATION FREQUENCY Switch	X100
MODULATION FREQUENCY Vernier	Fully ccw
FM	OFF
AUDIO OUTPUT LEVEL	Fully cw

4. Connect DVM to OSC OUT test point, A11TP4. The DVM should read 1.3 to 1.5 Vrms. If it does not, adjust A11R28 for 1.4 Vrms at A11TP4.

   1.37 ________ 1.48 Vrms

5. Connect frequency counter to AM OUTPUT jack. The counter should read 1.6 to 2.0 kHz.

6. Set MODULATION FREQUENCY vernier fully cw and adjust trim capacitors, A11C2 and C3, until voltage level at A11TP4 is within 0.1 Vrms of level read in step 4 and frequency at AM OUTPUT is 20 to 22 kHz.

   NOTE

   Turning C2 ccw decreases the output voltage while raising the frequency. Turning C3 ccw increases the output voltage while raising the frequency.

7. Set MODULATION FREQUENCY vernier for a frequency counter reading of 200 ± 0.02 kHz. Loosen setscrews in gear that meshes with frequency dial gear (vernier). Rotate dial gear so that dial reads 20 (at the cursor) and tighten setscrews in gear. The frequency counter should read 2.00 ± 0.02 kHz when dial reads 20 at the cursor. Record voltage level at A11TP4.

   ________ Vrms

8. Set MODULATION FREQUENCY vernier to 200. Adjust A11C2 and C3 until voltage level at A11TP4 is within 0.01 Vrms of level recorded in step 7 and frequency is 19.8 to 20.2 kHz.

9. Set MODULATION FREQUENCY vernier to 20. The counter should read 2.00 ±0.02 kHz and voltage level at A11TP4 should be within 0.01 Vrms of level recorded in step 7. Repeat steps 7 and 8 until voltage level and frequency are correct.

10. Monitor voltage at A11TP4 while using MODULATION FREQUENCY switch and vernier to tune oscillator from 2 kHz to 20 kHz. The voltage level at 2 kHz (on the X100 range) should be 1.37 to 1.48 Vrms and level at all other frequencies should be within ± 0.03 Vrms of level at 2 kHz.

    NOTE

    If level at A11TP4 is incorrect, adjust A11R28. Then repeat steps 7 through 10.

11. Set MODULATION FREQUENCY range switch to X3k and vernier to 200 and adjust HIGH FREQ capacitor A11C9 for a counter reading of 594 to 606 kHz.

ADJUSTMENTS

5-27. VARIABLE-FREQUENCY MODULATION OSCILLATOR ADJUSTMENT (Option 001) (Cont'd)

12. Connect DVM to AM OUT test point, A11TP5. Set FM to INT. Set MODULATION FREQUENCY range switch to X100 and the vernier to 20. Adjust AM-FM adjustment, A11R35, for 830 to 850 mVrms at A11TP5.

    830 ________850 mVrms

13. Connect DVM to the FM OUT test point, A11TP3. It should read within 5 mVrms of reading in step 12.

14. Use MODULATION FREQUENCY range switch and vernier to tune oscillator across each range (except 400 Hz and 1 kHz FIXED FREQ). Monitor voltage level at A11TP3; the DVM should read within ±25 mVrms of level noted at 20 on vernier dial from 20 Hz to 100 kHz. It should read within ±50 mVrms of level noted at 20 on vernier dial from 100 kHz to 600 kHz.

NOTE

Also observe the signal with an oscilloscope. On the X1 range set AM to OFF then INT. Signal level should stabilize after a few seconds; if it does not, readjust A11R28 slightly (too much adjustment will cause excessive distortion at 600 kHz), then repeat steps 12 through 14.

15. Set MODULATION FREQUENCY range switch to X3k and vernier to 20. Connect DVM to AM OUTPUT jack through 600 ohm feedthrough. Adjust AUDIO LEVEL adjustment, A11R40, for 3.10 ± 0.03 Vrms at the jack.

16. Set frequency range to 1 kHz (fixed). Set AUDIO OUTPUT LEVEL control to 100 mV. The DVM should read 100 ±10 mVrms. If it does not, loosen the setscrews in the AUDIO OUTPUT LEVEL knob and adjust the knob to match the DVM; then tighten setscrews.

17. Set AM to OFF and FM to INT. Connect DVM to FM OUTPUT jack through the 600 ohm feedthrough. The DVM should read 100 ±20 mVrms.

5-28. METER ADJUSTMENTS

REFERENCE: Service Sheet 14 and 17.

DESCRIPTION: The panel meter is mechanically zeroed. The meter circuitry is then adjusted at zero and full scale. Meter scale linearity is also checked.

EQUIPMENT: Digital Voltmeter . . . . HP 3490A

PROCEDURE:

1. With LINE switch set to OFF, place Signal Generator in its normal operating position (e.g., if its normal operating position is tilted up with the tilt stand locked down, place it that way).

2. Adjust mechanical zero adjustment screw beneath the panel meter face cw for a zero meter reading. Then turn screw slightly ccw to free mechanism from adjusting peg.

ADJUSTMENTS

5-28. METER ADJUSTMENTS (Cont'd)

3. Set generator's controls as follows:
   Meter Function . . . . AM
   AM . . . . OFF
   MODULATION FREQUENCY . . . . . . 1 kHz
   MODULATION . . . . Fully ccw
   LINE . . . . ON

4. Connect DVM to DC OUT test point, A2TP3 on A2 Meter Switch and Drive Assembly. Adjust DET OFFSET pot, A2R15, for 0 ± 1 mVdc at A2TP3.

5. Connect DVM to meter adjust test point A2TP4. Adjust METER OFFSET pot, A2R14, for 0 ±1 mVdc at A2TP4.

6. Connect DVM to AM IN test point, A26A2TP1. Set AM to INT. Adjust MODULATION control clockwise until DVM reads 0.707 Vrms at AM IN test point, A26A2TP1. Then adjust METER DRIVE pot, A2R28, for a full scale reading (10 on the 0–10 scale) on the panel meter.

7. Adjust the MODULATION control to give the panel meter readings indicated in the table below and check the voltage at A26A2TP1 against the listed tolerances. If a DVM reading falls out of limits, adjust METER DRIVE pot, A2R28, until all meter settings yield voltages within the ranges below.

Set Panel Meter (% AM)	Voltage at A26A2TP1 (mVrms)		
	Minimum	Nominal	Maximum
100	697	707	718
70	487	495	503
50	345	354	362
30	205	212	220

5-29. RF DETECTOR OFFSET ADJUSTMENT

REFERENCE: Service Sheets 12 and 13.
Service Sheets 12A and 13A (Option 002).

DESCRIPTION: A digital voltmeter is used to set the proper offset voltage out of the RF detector.

EQUIPMENT: Digital Voltmeter . . . . HP 3490A

PROCEDURE: 1. Connect DVM to DET test point, A26A4TP2, and set Signal Generator's controls as follows:
   AM . . . . OFF
   FM . . . . OFF
   RANGE . . . . 32–64 MHz
   RF ON/OFF . . . . OFF

ADJUSTMENTS

5-29. RF DETECTOR OFFSET ADJUSTMENT (Cont'd)

2. Set AGC switch, A26A4S1, to off. Adjust detector offset adjust pot (DET), A26A1R19, or A26A1R34 for Option 002, for −60±1 mVdc at DET test point, A26A4TP2.

3. Set AGC switch to on and set front panel RF ON/OFF switch to ON.

4. Perform Output Level and Meter Adjustment, paragraph 5-30.

5-30. OUTPUT LEVEL AND METER ADJUSTMENT

REFERENCE: Service Sheet 12.
Service Sheet 12A (Option 002).

DESCRIPTION: With the OUTPUT LEVEL vernier fully clockwise, the output level is adjusted for +13.2 dBm (on the +10 dBm range). Then the level is set to +13.0 dBm and the panel meter adjusted to correspond.

NOTE

Check that the Meter Adjustments (paragraph 5-28) and RF Detector Offset Adjustment (paragraph 5-29) are correct before performing this adjustment.

EQUIPMENT:

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

PROCEDURE:

1. Connect power sensor to generator's RF OUTPUT after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	32—64 MHz
FREQUENCY TUNE	50 MHz
OUTPUT LEVEL Switch	+10 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON

2. For Option 002, set DBLR OFFSET pot, A26A4R54 to the center of its range.

3. Adjust LVL pot, A26A4R1, for a +13.2 dBm reading on power meter.

4. Turn OUTPUT LEVEL vernier ccw until power meter reads +13.0 dBm. Adjust MET pot, A26A4R12, for a panel meter indication of +3 dB.

5. For Option 002, perform RF Detector Offset, Output Level and Meter Adjustment (paragraph 5-31).

ADJUSTMENTS

5-31. RF DETECTOR OFFSET, OUTPUT LEVEL, AND METER ADJUSTMENT (Option 002)

REFERENCE: Service Sheets 12A and 13A.

DESCRIPTION: The Signal Generator's output level is set to 13.0 dBm at 50 MHz. The generator is then switched to the doubler range and is adjusted to +13.0 dBm. The doubler offset is then adjusted at a low RF output vernier setting to improve low level accuracy.

NOTE

Check that the Meter Adjustments (paragraph 5-28), the RF Detector Offset Adjustment (paragraph 5-29), and the Output Level and Meter Adjustment (paragraph 5-30) are correct before performing this adjustment.

PROCEDURE:

1. Connect power sensor to generator's RF OUTPUT after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	32—64 MHz
FREQUENCY TUNE	50 MHz
OUTPUT LEVEL Switch	+10 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON

2. Set OUTPUT LEVEL vernier for a reading of +13.0 dBm on power meter. Turn RANGE switch fully cw to the 512—1024 MHz range. The output frequency should read 800 MHz.

3. Adjust DBLR LVL pot, A26A4R2, for a reading of +13 dBm on power meter.

4. Turn RANGE switch to 32-64 MHz range (output frequency of 50 MHz) and turn OUTPUT LEVEL vernier ccw until power meter reads +3 dBm. Return RANGE switch to the fully cw position (512—1024 MHz). If power meter does not indicate +3 dBm adjust DBLR OFFSET pot, A26A4R54, for a +3 dBm reading.

5. Turn RANGE switch to 32-64 MHz range and set OUTPUT LEVEL vernier fully cw. If the power meter does not indicate +13.2 dBm, readjust LVL pot A26A4R1 for +13.2 dBm on the power meter.

6. Repeat steps 2 through 5 until a level accuracy of ±0.2 dB referenced to 50 MHz is achieved at 800 MHz for both vernier settings.

7. Perform Doubler Gain Adjustment (Option 002) (paragraph 5-32).

ADJUSTMENTS

5-32. DOUBLER GAIN ADJUSTMENT (Option 002)

REFERENCE: Service Sheets 12A and 13A.

DESCRIPTION: The response of the doubler amplifier is adjusted at 700 MHz under open AGC Loop conditions. The AGC loop is then checked for closed loop stability by observing its response to pulses at the AM INPUT.

NOTE

Check that the Meter Adjustments (paragraph 5-28), the RF Detector Offset Adjustment (paragraph 5-29), the Output Level and Meter Adjustment (paragraph 5-30), and the RF Detector Offset, Output Level, and Meter Adjustment (paragraph 5-31) are correct before performing this adjustment.

EQUIPMENT:

Crystal Detector	HP 8471A
Oscilloscope	HP 180C/1801A/1820C
Power Meter	HP 435A
Power Sensor	HP 8482A
Pulse Generator	HP 8003A
600Ω Feedthrough	HP 11095A

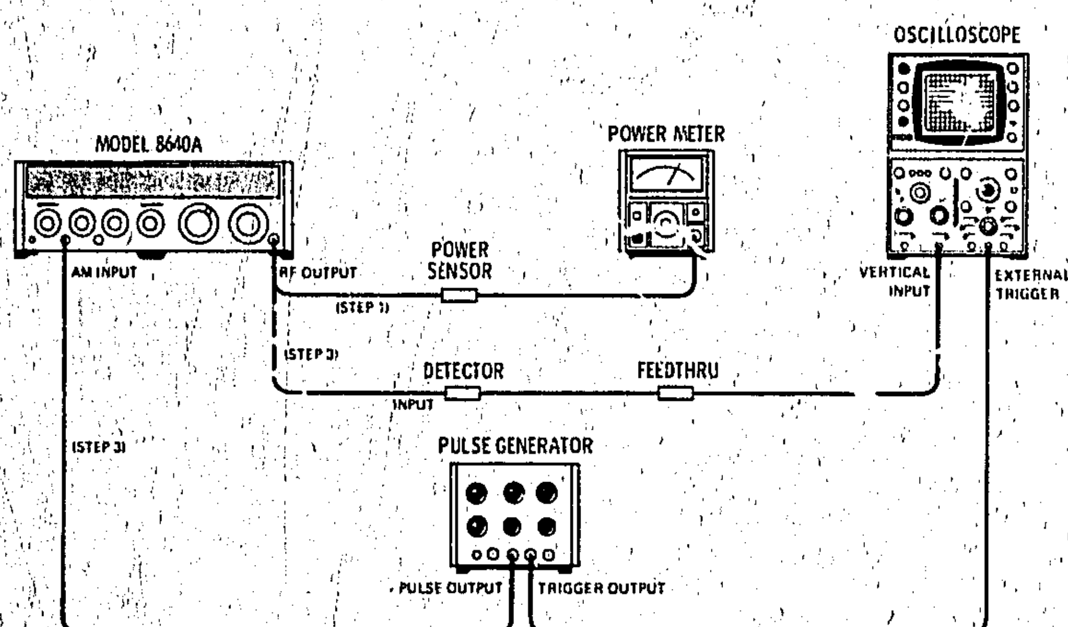


Figure 5-1. Doubler Gain Adjustment Test Setup (Option 002)

ADJUSTMENTS

5-32. DOUBLER GAIN ADJUSTMENT (Option 002) (Cont'd)

PROCEDURE:

1. Connect generator to power sensor and meter as shown in Figure 5-1. Set Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	512—1024 MHz
FREQUENCY TUNE	700 MHz
OUTPUT LEVEL Switch	+20 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON

2. Adjust A26A1C9 for maximum output, but not greater than +17 dBm, as read on the power meter.

3. Connect generator to detector, feedthrough, and oscilloscope and to pulse generator as shown in Figure 5-1 after setting Signal Generator's controls as follows:

Meter Function	AM
AM	AC
MODULATION	Fully cw
RANGE	512—1024 MHz
FREQUENCY TUNE	800 MHz
OUTPUT LEVEL Switch	+10 dBm
OUTPUT LEVEL Vernier	Meter reads 0 dB

4. Set pulse generator's output for a 1 kHz square wave and adjust pulse level for 40% AM as read on Signal Generator panel meter. (Generator's REDUCE PEAK POWER annunciator should be off throughout the test.) Set oscilloscope controls to observe detected RF output.

5. Observe generator's square wave response on oscilloscope for excessive ringing, or oscillation at various OUTPUT LEVEL vernier settings below +10 dBm (see Figure 5-2). Adjust A26A1C9 slightly to limit ringing and eliminate oscillations.

6. Tune across entire range at both high and low vernier settings and readjust A26A1C9 only as necessary to achieve a stable square wave response.

MINIMUM OVERSHOOT ACCEPTABLE RINGING UNACCEPTABLE RESPONSE

Figure 5-2. Detected Square Wave AM Showing AGC Loop Response (Doubler Range)

ADJUSTMENTS

5-32. DOUBLER GAIN ADJUSTMENT (Option 002) (Cont'd)

7. If A26A1C9 has been adjusted, check RF Detector Offset, Output Level, and Meter Adjustment (Option 002) (paragraph 5-31).

8. Perform Level Flatness Test (paragraph 4-24) and Subharmonic Test (Option 002) (paragraph 4-15).

NOTE

Doubler range flatness and subharmonics are affected by the setting of A26A1C9. If flatness or subharmonics are out of limits, slightly readjust A26A1C9, then recheck steps 3 thru 8 of this test. Also, DBLR LVL A26A4R2 may be readjusted so that maximum to minimum flatness variation across doubler range is centered at +13.0 dBm, referenced to 50 MHz.

5-33. AM SENSITIVITY ADJUSTMENT

REFERENCE: Service Sheet 14.

DESCRIPTION: AM sensitivity is adjusted while comparing the actual amount of amplitude modulation to the level of the input modulating signal. The AM is demodulated by a spectrum analyzer in a zero span mode. A digital voltmeter is used to measure the ac and dc voltages at the analyzer's vertical output. The dc voltage corresponding to the carrier level is set to 282.8 mVdc. The rms value of the demodulated signal is then a very accurate measure of AM percent (% AM is 1/2 the ac voltage in mVrms).

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Digital Voltmeter	HP 3490A
Test Oscillator	HP 651B
10 dB Step Attenuator	HP 355D

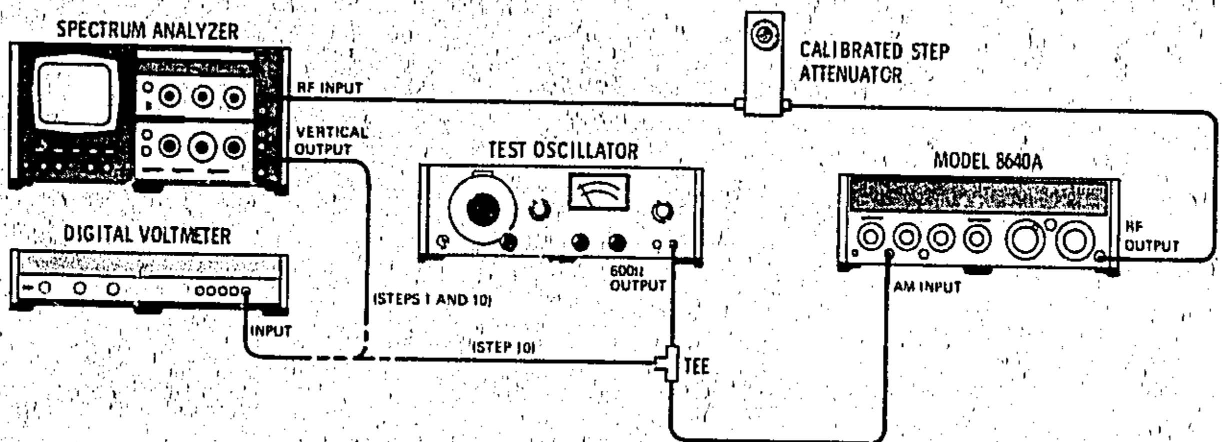


Figure 5-3. AM Sensitivity Adjustment Test Setup

ADJUSTMENTS

5-33. AM SENSITIVITY ADJUSTMENT (Cont'd)

PROCEDURE:

1. Connect equipment as shown in Figure 5-3 after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
MODULATION	Fully ccw
FM	OFF
RANGE	2–3 MHz
FREQUENCY TUNE	3 MHz
OUTPUT LEVEL Switch	−30 dBm
OUTPUT LEVEL Vernier	Meter reads +3 dB
RF ON/OFF	ON

2. Set step attenuator to 0 dB.

3. Set spectrum analyzer's resolution bandwidth to 300 kHz, input attenuation to 20 dB, frequency span per division (scan width) to 20 kHz (tuning stabilizer on), scale to linear, and adjust center frequency and scale reference level controls to center the 3 MHz signal on the display. Set frequency span per division to 0 Hz and display smoothing (video filter) to 10 kHz. Peak the signal on the display with center frequency controls.

4. Adjust analyzer's reference level controls for −500 mVdc indicated on DVM ($V_{DET\ 1}$).

5. Set step attenuator to 30 dB. Note DVM reading ($V_{DET\ 2}$).

6. Calculate V_{off}, where

$$V_{off} = \frac{V_{DET\ 2} - \alpha\, V_{DET\ 1}}{1 - \alpha}$$

and $\alpha = V_{RF\ 2}/V_{RF\ 1}$ (i.e., α = attenuation; for 20 dB it is 0.1),

therefore

$$V_{off} = \frac{V_{DET\ 2} + 50\ \text{mVdc}}{0.9} = \underline{\qquad}\ \text{mVdc}$$

7. Set step attenuator to 0 dB.

8. Set generator's controls as follows:

Meter Function	AM
AM	AC
RANGE	256–512 MHz
FREQUENCY TUNE	512 MHz

5-33. AM SENSITIVITY ADJUSTMENT (Cont'd)

9. Set analyzer's center frequency controls to 512 MHz and peak the signal on the display.

10. Set generator's MODULATION control fully cw. Connect DVM to tee on test oscillator output. Set test oscillator for a 1 kHz, 353.6 mVrms signal as read on DVM (50% AM). Disconnect DVM from test oscillator (leave oscillator connected to generator). Connect the DVM to spectrum analyzer's vertical output.

11. Use analyzer's reference level controls to set −282.8 mV + V_{off} at vertical output (as measured on the DVM). For example, if V_{off} is +50.0 mV, then set −282.8 mV + (+50.0 mV) or −232.8 mVdc at vertical output. (Check that signal is peaked on analyzer display.)

12. Set DVM to measure mVrms (ac only). Adjust % AM adjustment, A26A2R19, for a DVM indication of 100 mVrms.

5-34. RANGE SWITCH ADJUSTMENT

REFERENCE: Service Sheet 10.

DESCRIPTION: The frequency at RF OUTPUT is monitored with an external counter. The divider/filter cams are positioned so that the frequency at RF OUTPUT agrees with the frequency indicated on the counter's readout. The RANGE switch knob is then set to the correct range. This procedure should be performed whenever the A9 Peak Deviation and Range Switch Assembly or the A10 Divider/Filter Assembly has been removed or replaced.

NOTES

If the A9 Peak Deviation and Range Switch Assembly has been removed, set the Range switch fully ccw and the Mechanical Dial to the 0.5–1 MHz Range.

For A9 Peak Deviation and Range Switch Assembly removal and alignment procedures, see Service Sheet D.

EQUIPMENT: Frequency Counter . . . . HP 5327C

PROCEDURE:

1. Connect RF OUTPUT to external counter. Set Signal Generator's controls as follows:

AM	OFF
FM	OFF
RANGE	Fully ccw
FREQUENCY TUNE	0.5 MHz
OUTPUT LEVEL Switch	0 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON

2. Monitor generator's frequency with counter and compare with dial indication. Loosen shaft coupling between RANGE switch and divider/filter cams and check that the RANGE switch is rotated fully ccw. Rotate cam side of shaft until the

ADJUSTMENTS

5-34. RANGE SWITCH ADJUSTMENT (Cont'd)

dial indicates the same frequency as the counter (i.e., to approximately 500 kHz). Tighten shaft coupler.

NOTE

When the correct position of the cam shaft is determined, be sure it is centered in its own detent before tightening the coupler.

3. Loosen RANGE switch knob, position it so that it indicates that the range is 0.5—1 MHz, and tighten it.

4. Set RANGE switch to each of its other positions (from both directions). The frequency counter should display readings that agree with the dial readings. For the standard instrument, the correct frequency counter reading for the 512—1024 MHz EXT DOUBLER range is one half that indicated by dial. For the Option 002 the display in EXT for the 512—1024 MHz position may be incorrect above 550 MHz because of counter's limited range.

5-35. V_T POT ADJUSTMENT

REFERENCE: Service Sheets 5 and B.

DESCRIPTION: The V_T pot, A3R1, is aligned so that it will not hit either end-stop as the FREQUENCY TUNE control is tuned through its full range. This adjustment should be performed whenever the pot has been replaced and if the RF Oscillator end stops cannot be adjusted properly.

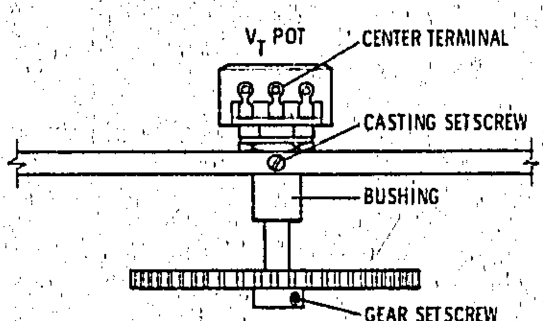


Figure 5-4. V_T Pot Adjustment

PROCEDURE:

1. Set FREQUENCY TUNE fully cw.

2. Hand tighten the bushing to V_T pot and set shaft fully cw.

3. Install pot with gear in casting so that center terminal (934 wire) is in line with casting setscrew (see Figure 5-4).

4. Tighten setscrews in gear and casting.

5. Perform V_T Voltage Adjustment (paragraph 5-36) and Frequency Range and Dial Accuracy Test (paragraph 4-13).

ADJUSTMENTS

5-36. V_T VOLTAGE ADJUSTMENT

REFERENCE: Service Sheets 5, 10, and 11.

DESCRIPTION: This procedure should be performed whenever either the V_T pot, the A3 RF Oscillator Assembly, or the A10A2 RF Divider Assembly has been replaced or repaired.

EQUIPMENT: Frequency Counter . . . . HP 5327C

PROCEDURE:

1. Connect AUX RF OUTPUT to counter's high frequency input after setting Signal Generator's controls as follows:

Meter Function	LEVEL
AM	OFF
FM	OFF
RANGE	256–512 MHz
FINE TUNE	Centered
OUTPUT LEVEL Switch	0 dBm
OUTPUT LEVEL Vernier	Meter reads 0 dB
RF ON/OFF	ON

2. Set FREQUENCY TUNE to 356.5 MHz by tuning cw; adjust V_T adjustment pot, A3A4R1 until the relays in the A10 assembly just actuate. When the relays actuate, they make a faint but audible click.

3. Tune FREQUENCY TUNE one turn ccw and then cw until relays actuate. The frequency at actuation should be 356-357 MHz.

4. Tune FREQUENCY TUNE from 256 to 512 MHz. The generator's panel meter should read 0 dBm through the entire frequency range.

5-37. RF OSCILLATOR END STOP ADJUSTMENT

REFERENCE: Service Sheets 5, 6, and 7.

DESCRIPTION: This procedure describes the adjustment of the high and low frequency end stops of the A3 RF Oscillator. Slight adjustment of the end stops may be necessary when the RF Oscillator or fine tune assembly has been repaired or replaced. No special tools are required.

NOTE

Normally, the adjustment can be made with the RF Oscillator in place. However, if the oscillator has already been removed, the adjustment is easier if the A3A4 Connector Board Assembly is plugged in and the oscillator set into place with the front resting on the front panel trim strip. Temporarily connect the RF cable (W3) to the divider/filter and install the FREQUENCY TUNE knob.

EQUIPMENT: Frequency Counter . . . . HP 5327C

5-37. RF OSCILLATOR END STOP ADJUSTMENT (Cont'd)

PROCEDURE:

1. Connect AUX RF OUTPUT to counter's high frequency input after setting Signal Generator's controls as follows:

   RANGE . . . . 0.5–1 MHz
   FINE TUNE . . . . Centered
   LINE . . . . OFF
   RF ON/OFF . . . . ON

2. Remove bottom cover.

3. Switch LINE to ON and let instrument warm up for one hour.

4. Check that Varactor Anode bias is −14.70 ± 0.01 Vdc at A7TP2. If adjustment is necessary, refer to paragraph 5-40, step 11.

5. Tune FREQUENCY TUNE fully ccw. Compare the position of the stop ring teeth with Figure 5-5.

NOTE

Notice how the teeth on the stop rings line up in a staircase at the end stops. The stop pin and the adjustable stop ring determine the lower frequency limit. The stop pin and forwardmost stop ring determine the high frequency limit, however, adjustment of this ring will also affect the low frequency limit.

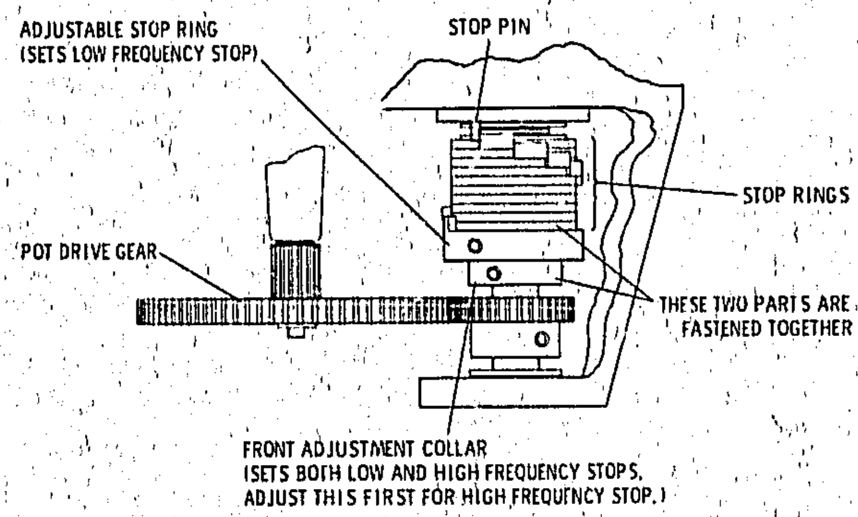


Figure 5-5. Locations of RF Oscillator Stop Adjustments Shown in Maximum CCW Position. Top View with Instrument Upside Down.

6. Adjust FREQUENCY TUNE fully cw. The frequency should read between 1.0752 and 1.0760 MHz. If it does not, note how far off the frequency is.

7. Adjust FREQUENCY TUNE ccw until first setscrew on front adjustment collar appears. Loosen setscrew.

ADJUSTMENTS

5-37. RF OSCILLATOR END STOP ADJUSTMENT (Cont'd)

8. Tune further ccw until second setscrew appears.

9. Loosen setscrew and rotate FREQUENCY TUNE up or down by the amount of correction needed (as noted in step 6), and tighten setscrew. Do not allow front adjustment collar to rotate.

10. Recheck high stop frequency and repeat preceding step as needed until stop frequency is correct. Then secure both setscrews.

NOTE

If the preceding steps have no effect, check that the V_T and FM Gain Compensation pots do not reach their stops first. If so, loosen the gear on the pot shaft and continue.

11. Adjust FREQUENCY TUNE fully ccw. The frequency should read between 0.4475 and 0.4482 MHz. If it does not, note how far off the frequency is.

12. Adjust FREQUENCY TUNE cw until first setscrew on adjustable stop ring appears. Loosen setscrew.

13. Tune further cw until second setscrew appears.

14. Loosen setscrew and rotate FREQUENCY TUNE up or down by the amount of correction needed (as noted in step 11), and tighten setscrew. Do not allow adjustable stop ring to rotate.

15. Recheck low stop frequency and repeat preceding step as needed until stop frequency is correct. Then secure both setscrews.

NOTE

If the preceding steps have no effect, check that the V_T and FM Gain Compensation pots do not reach their stops first. If so, loosen the gear on the pot shaft and continue.

16. Recheck both stop frequencies.

17. Perform the Frequency Range and Dial Accuracy Test (paragraph 4-13) and if either the V_T or FM Gain Compensation pots were altered, perform either the V_T Pot Adjustment (paragraph 5-36) or Preliminary FM Adjustment (paragraph 5-40). If the oscillator has been removed, perform the Mechanical Dial Installation and Adjustments (paragraph 5-46).

5-38. RF OSCILLATOR OUTPUT POWER ADJUSTMENT

REFERENCE: Service Sheet 5.

DESCRIPTION: The A3 RF Oscillator output will require adjustment if the power level varies beyond the limits −1.0 to +3.5 dBm. The power level is adjusted by changing the input loop penetration of the appropriate buffer amplifier in the oscillator cavity.

ADJUSTMENTS

5-38. RF OSCILLATOR OUTPUT POWER ADJUSTMENT (Cont'd)

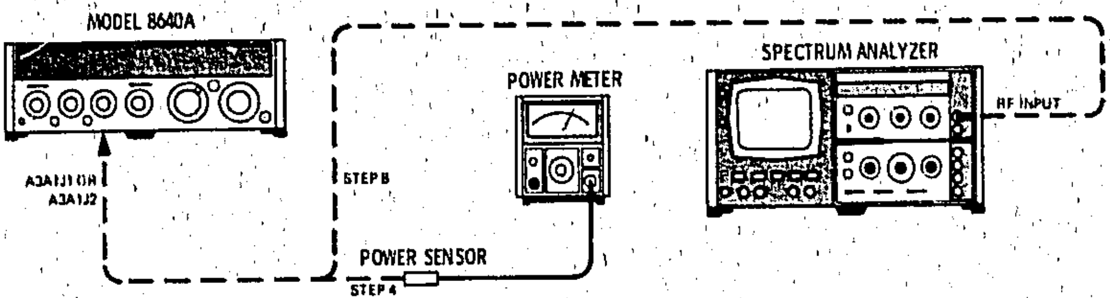


Figure 5-6. RF Oscillator Output Power Adjustment Test Setup

EQUIPMENT:

Power Meter	HP 435A
Power Sensor	HP 8482A
Spectrum Analyzer	HP 8554B/8552B/141T

PROCEDURE:

1. Remove A3 RF Oscillator from chassis and reinstall knob on FREQUENCY TUNE shaft. Refer to Service Sheet B for removal procedure.
2. Remove cover from the divider/filter buffer amplifier assembly.
3. Re-insert A3A4 Connector Board Assembly into place while keeping oscillator section free of chassis. (It may be necessary to unsnap the clip on the rear of the oscillator housing to free the wiring harness.)
4. Connect power meter sensor to oscillator output connector A3A1J1. See Figure 5-6.
5. Turn LINE to ON. Tune FREQUENCY TUNE across entire range and note point of minimum power as read on power meter. Tune to frequency of minimum power.
6. Loosen two screws on the buffer amplifier board and slide board forward or backward until power reads −1.0 dBm. (Pushing board forward will increase power.)
7. Tighten screws and check power level across band. Power should remain within the limits of −1.0 to +3.5 dBm.
8. Disconnect power sensor and connect spectrum analyzer to the buffer amplifier output.
9. Set analyzer's input attenuation to 50 dB, resolution bandwidth to 300 kHz, frequency controls to span 200 to 1200 MHz, and vertical sensitivity (reference level) controls to +10 dBm.
10. Tune oscillator across range and observe second and third harmonics, which should be more than 17 dB below fundamental for all frequencies.
11. Re-install RF Oscillator.

NOTE

Mechanical dial travel should not need readjustment.

ADJUSTMENTS

5-38. RF OSCILLATOR OUTPUT POWER ADJUSTMENT (Cont'd)

12. Perform Harmonic Distortion Test (paragraph 4-14), Output Level Flatness Test (paragraph 4-24), and Output Leakage Test (paragraph 4-25).

5-39. RF FILTER ADJUSTMENT

REFERENCE: Service Sheet 10.

DESCRIPTION: A spectrum analyzer and a tracking generator are used to measure the insertion loss and frequency response of each of the RF filters. Those filters that are adjustable are adjusted if necessary. A frequency counter, connected to the tracking generator's auxiliary output, is used to accurately set the analyzer's frequency. This procedure should be performed only when the RF filters have been repaired or are suspect.

The filters must meet specified pass band and stop band characteristics. Figure 5-7 illustrates the terms used in the procedure.

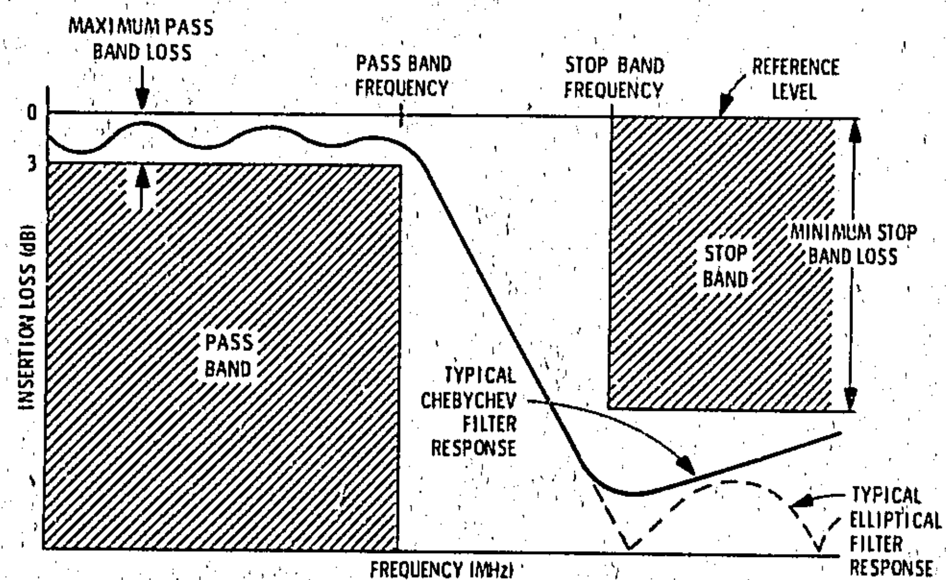


Figure 5-7. Filter Terminology

ADJUSTMENTS

5-39. RF FILTER ADJUSTMENT (Cont'd)

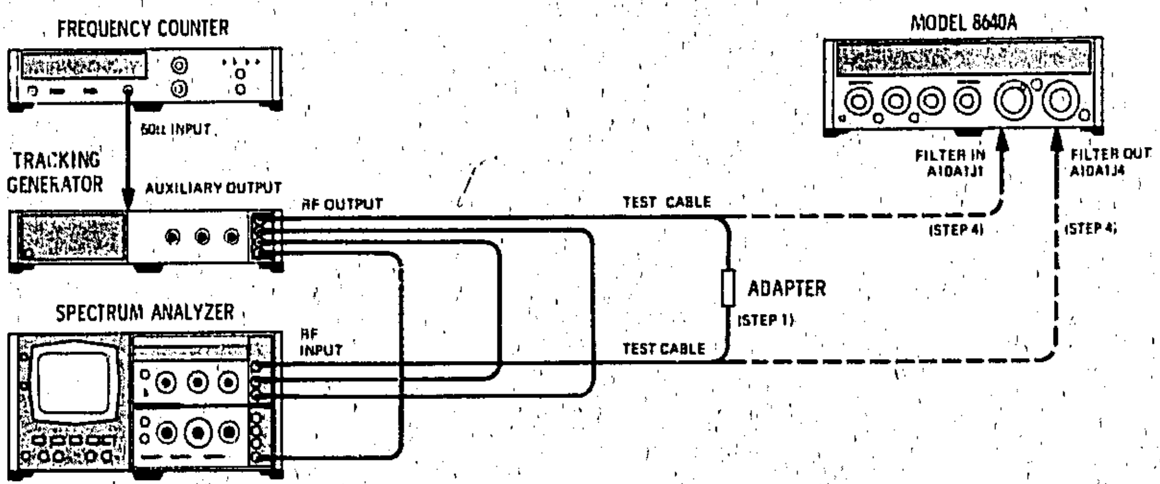


Figure 5-8. RF Filter Adjustment Test Setup

EQUIPMENT:

Spectrum Analyzer	HP 8554B/8552B/141T
Tracking Generator	HP 8444A
Frequency Counter	HP 5327C
Test Cable (2 required)	HP 11592-60001
Adapter	HP 1250-0827

PROCEDURE:

1. Connect equipment as shown in Figure 5-8 after setting Signal Generator's controls as follows:

RANGE	256—512 MHz
FREQUENCY TUNE	Fully cw
RF ON/OFF	OFF

2. Set spectrum analyzer center frequency to 550 MHz, frequency span (scan width) to 100 MHz per division, resolution bandwidth to 10 kHz, and input attenuation to 20 dB.

3. Set tracking generator's output level to 0 dBm. Adjust the tracking for maximum response in a 10 kHz resolution bandwidth. (Tracking should be checked periodically during this test.) Set analyzer's resolution bandwidth to 300 kHz.

4. For each of the frequency ranges listed in Table 5-3, perform the following:

   a. Connect spectrum analyzer's RF input to tracking generator's RF output (use test cables and adapter as shown in test setup). Set Signal Generator's RANGE and FREQUENCY TUNE controls as listed in the table. Set spectrum analyzer's frequency span (scan width) controls to zero Hz.

ADJUSTMENTS

5-39. RF FILTER ADJUSTMENT (Cont'd)

NOTE

Geometric mean switching (on the 8 to 512 MHz ranges) occurs near the middle of the frequency range. Switching is controlled by the position of the FREQUENCY TUNE control and switches between the high and low band filters for the frequency range. It can be noted either by listening for the faint but audible click of the RF relays or by observing a change in the spectrum analyzer's display when connected to the RF filters.

b. Adjust analyzer's center frequency controls for a frequency counter indication of the pass band frequency listed in the table. Adjust analyzer's vertical sensitivity controls to set trace to top (reference) graticule line on display (use 2 dB log per division); this sets the reference level for the filter check.

c. Set analyzer's frequency span controls as listed in the table. Connect test cables to RF filter input and output as shown in the test setup. Check maximum loss at pass band frequency (center vertical graticule line) and below; it should be as specified.

d. Set analyzer's frequency span controls to zero Hz. Adjust analyzer's center frequency controls for a frequency counter indication of the stop band frequency listed in the table. Then reset frequency span controls as listed in the table and set analyzer's display for 10 dB log per division.

NOTE

To measure the stop band frequency on the highest range it is necessary to set a frequency of 492 MHz at the second vertical graticule line to the left of center. This puts 692 MHz at the center (the counter will only read to 550 MHz).

e. Check minimum loss at stop band frequency (center vertical graticule line) and above; it should be as specified.

f. If necessary, on the 64—512 MHz ranges, adjust the appropriate filter components to set pass band and stop band insertion loss within the specified limits. Use a non-metallic tuning tool.

NOTE

The 256—512 MHz high band is the most difficult to adjust and usually takes many iterations. Start with the adjustment capacitors oriented as in Figure 5-9. Stop band minimum loss should be >30 dB from 692—1000 MHz.

ADJUSTMENTS

5-39. RF FILTER ADJUSTMENT (Cont'd)

Table 5-3. RF Filter Check

Signal Generator			Spectrum Analyzer Frequency Span per Division (MHz)	Pass Band		Stop Band		Adjustment (A10A1)
RANGE (MHz)	FREQUENCY TUNE	Filter		Frequency (MHz)	Maximum Loss (dB)	Frequency (MHz)	Minimum Loss (dB)	
256–512	Fully cw Fully ccw	High Low	100 50	550 356	3 3	692 460	30 30	C81–84 L43–45
128–256	Fully cw fully ccw	High Low	50 20	275 128	3 3	346 230	30 30	L40–42 L37–39
64–128	Fully cw Fully ccw	High Low	20 10	137 89	3 3	173 115	30 25	L31–33 None
32–64	Fully cw Fully ccw	High Low	10 5	69 45	3 3	86.5 58	25 25	None None
16–32	Fully cw Fully ccw	High Low	5 2	34 22	3 3	43.2 28.7	20 20	None None
8-16	Fully cw Fully ccw	High Low	2 2	17.0 11.0	3 3	21.6 14.3	15 15	None None
4–8	*	*	1	8.6	3	10.7	38	None
2–4	*	*	1	4.3	3	5.40	40	None
1–2	*	*	1	2.2	3	2.70	30	None
0.5–1	*	*	1	1.1	3	1.30	30	None

* The 0.5 to 8 MHz ranges have a single filter for each range. Geometric mean switching does not take place and the FREQUENCY TUNE control can be left at any position.

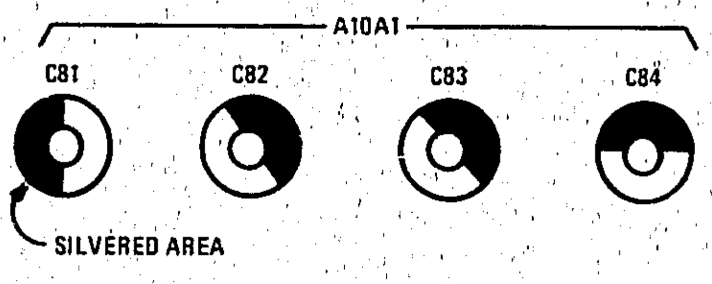


Figure 5-9. 256–512 MHz High Band Capacitor Adjustment Orientation

ADJUSTMENTS

5-40. PRELIMINARY FM ADJUSTMENTS

REFERENCE: Service Sheets 6 and 7.

DESCRIPTION: A digital voltmeter is used to correctly set the mechanical position of the FM compensation pot on the RF oscillator (this is necessary only if either the oscillator or the pot has been changed). Then the DVM is used to adjust the FM calibration voltage and the offset (balance) voltages in the FM amplifiers.

EQUIPMENT:

Digital Voltmeter	HP 3490A
Frequency Counter	HP 5327C

PROCEDURE:

1. Set Signal Generator's controls as follows:

Meter Function	FM
AM	OFF
FM	OFF
PEAK DEVIATION Switch	2.56 MHz
PEAK DEVIATION Vernier	Fully cw
RANGE	256–512 MHz
FREQUENCY TUNE	Fully ccw
OUTPUT LEVEL Switch	0 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON

NOTE

If compensation pot, A3R2, has been replaced or reoriented, continue with step 2; if not, continue with step 5.

2. To set the compensation pot, A3R2, turn generator's LINE switch to OFF. Loosen setscrews in the gear on pot's shaft. Set DVM to measure ohms, and connect it between 936 and 938 wires on the pot.

3. Without changing position of FREQUENCY TUNE knob, rotate compensation pot's shaft until DVM indicates between 0 and 9 ohms across the two wires.

4. Remove DVM, tighten setscrews, and set LINE to ON.

5. To adjust amplifier offset voltages, set FM switch to DC, and set FREQUENCY TUNE to 300 MHz. Connect DVM to BUFFER OUT test point, A5TP6, and adjust buffer offset adjustment, A5R23, for 0 ± 1.0 mVdc at A5TP2.

6. Connect DVM to OUTPUT test point, A5TP2, and adjust amplifier OFFSET adjustment, A5R8, for 0 ± 1.0 mVdc at A5TP2.

7. To adjust calibration voltage, set FM switch to CAL, set DVM to measure dc voltage, and connect DVM to FM BUFFER IN test point, A5TP5. Adjust FM CAL POT, A13R3, for 1.000 ± 0.001 Vdc at A5TP5.

8. Connect DVM to VARACTOR CATHODE test point, A7TP3, and set PEAK DEVIATION switch as shown below. The DVM should read as specified.

5-40. PRELIMINARY FM ADJUSTMENTS (Cont'd)

PEAK DEVIATION	DVM Reading at A7TP3
2.56 MHz	______ <±5.6 mVdc
1.28 MHz	______ <±5.6 mVdc
640 kHz	______ <±5.6 mVdc
320 kHz	______ <±5.6 mVdc
160 kHz	______ <±4.5 mVdc
80 kHz	______ <±2.2 mVdc
40 kHz	______ <±1.1 mVdc
20 kHz	______ <±0.6 mVdc
10 kHz	______ <±0.6 mVdc
5 kHz	______ <±0.6 mVdc

9. Reset PEAK DEVIATION switch to 2.56 MHz. Turn PEAK DEVIATION vernier and FREQUENCY TUNE control through their ranges. The voltage at A7TP3 should remain less than 5.6 mVdc.

10. Set FM switch to OFF and connect RF OUTPUT to counter's high frequency input. Note frequency displayed on counter. Set FM to DC; the frequency should change less than 5 kHz.

11. To set VAR pot (varactor bias), A7R19, connect DVM to VARACTOR ANODE test point, A7TP2, and check that voltage is −14.70 ± 0.01 Vdc. If it is not, adjust A7R19 until it is.

12. Perform the FM Linearity Adjustment, paragraph 5-41 or 5-42.

5-41. FM LINEARITY ADJUSTMENT

REFERENCE: Service Sheet 7.

DESCRIPTION: The positive and negative shaping circuits are adjusted to match the characteristics of the varactors in the RF oscillator. The reference output of a variable-phase generator is used to drive the Signal Generator's FM circuits; its variable phase output is used to drive an oscilloscope's horizontal circuits and the FM linearity circuit. A frequency meter is used to demodulate the FM and the demodulated signal is subtracted (i.e., summed 180° out of phase) from the modulation signal in the FM linearity circuit and fed to the oscilloscope's vertical circuits. The shaping circuits are then adjusted for the flattest trace possible on the oscilloscope's display. A reference signal generator and a mixer are used to down-convert the test generator's output to within the range of the frequency meter.

NOTES

The Preliminary FM Adjustment (paragraph 5-40) should be made before performing this adjustment.

A simpler method for adjusting FM linearity, using less test equipment, is presented in paragraph 5-42. This alternate method however, is not as effective for locating the source of FM distortion when used in troubleshooting.

5-41. FM LINEARITY ADJUSTMENT (Cont'd)

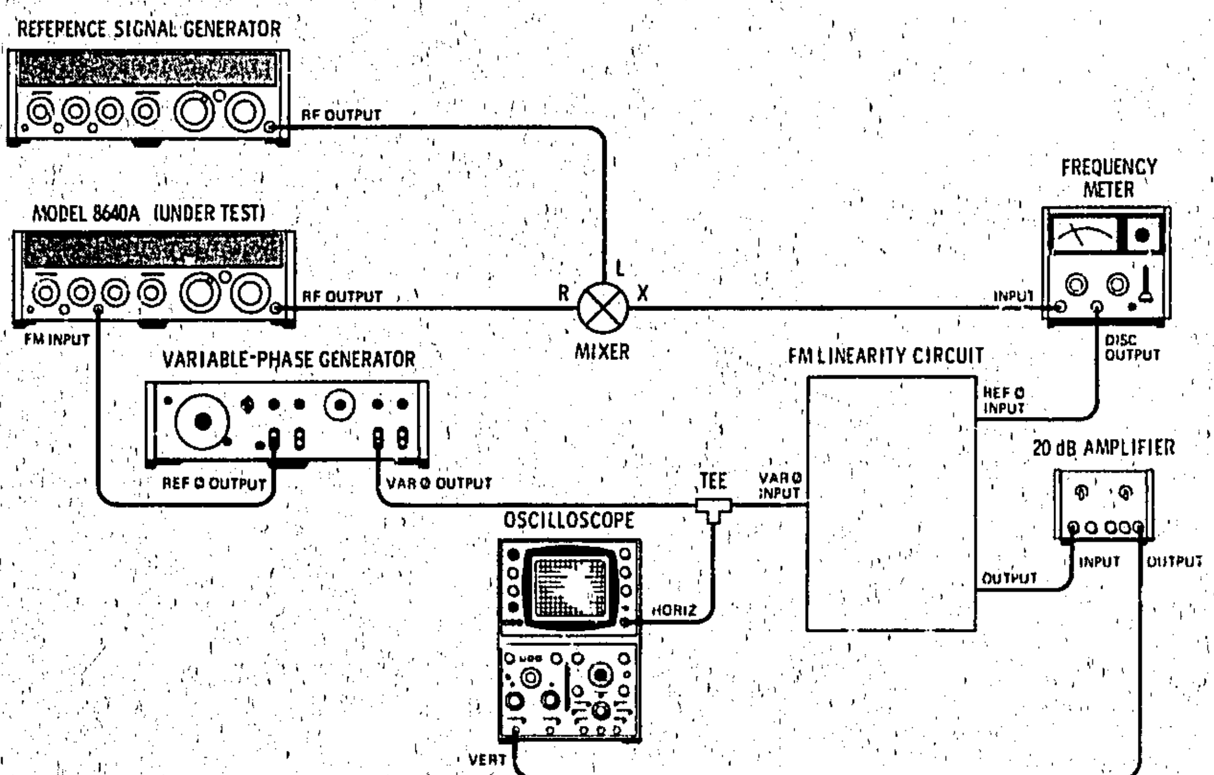


Figure 5-10. FM Linearity Adjustment Test Setup

EQUIPMENT:

Reference Signal Generator	HP 8640A
Mixer	HP 10514A
Frequency Meter	HP 5210A
Filter Kit (for Frequency Meter)	HP 10531A
Variable-Phase Generator	HP 203A
Oscilloscope	HP 180C/1801A/1820C
FM Linearity Circuit	HP 08640-60503
20 dB Amplifier	HP 465A

NOTE

The reference signal generator should have low RF drift, low residual FM (performance approximately equal to the Model 8640A) and be capable of producing 355 MHz at +7 dBm.

PROCEDURE:

1. Connect equipment as shown in Figure 5-10 after setting Signal Generator's controls as follows:

5-41. FM LINEARITY ADJUSTMENT (Cont'd)

Meter Function	FM
AM	OFF
FM	AC
PEAK DEVIATION Switch	2.56 MHz
PEAK DEVIATION Vernier	Fully cw
RANGE	256–512 MHz
FREQUENCY TUNE	360 MHz
OUTPUT LEVEL Switch	−10 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON

NOTE

If it is desired to optimize FM linearity at a frequency other than mid-band, proceed as follows:

a. Set RANGE and FREQUENCY TUNE to the desired frequency.

b. Set RANGE to 256–512 MHz.

c. Set the reference signal generator 5 MHz below the test generator's output frequency.

2. Set reference signal generator for a 355 MHz, CW signal at +7 dBm.

3. Calibrate the frequency meter; prepare a 20 kHz filter (from the filter kit) and install it in the frequency meter. Set FM linearity circuit's output switch to ref ϕ. Adjust variable-phase generator's variable phase output's amplitude and the oscilloscope's horizontal gain for full screen deflection on the display. Adjust reference signal generator for 5 MHz on the frequency meter.

4. Set variable-phase generator's reference phase output for a 1 kHz signal at an amplitude that gives a 2.56 MHz peak deviation indication on the Signal Generator's panel meter. Set linearity circuit's voltage divider switch to 100. Adjust generator's variable phase output's phase for a straight line on the display as shown in Figure 5-11. Adjust oscilloscope's vertical gain for ±1 division at edge of display.

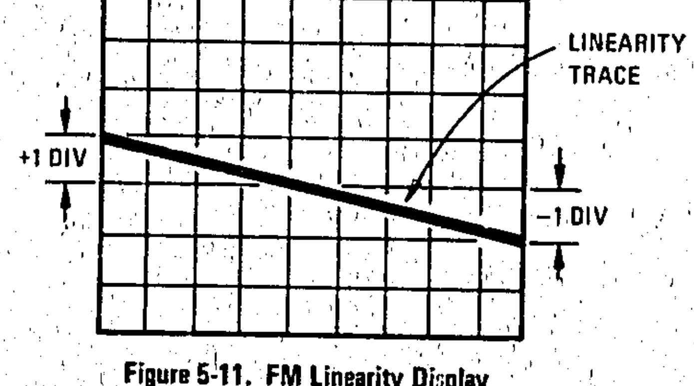


Figure 5-11. FM Linearity Display

5-41. FM LINEARITY ADJUSTMENT (Cont'd)

5. Set linearity circuit's output switch to ref ϕ + var ϕ and the voltage divider switch to 1. This calibrates the display for 1% error in linearity per division.

6. Adjust variable-phase generator's variable phase output's phase and linearity circuit's var ϕ level control for the best possible horizontal straight line over *center* portion of trace.

7. Adjust POS SHAPE and NEG SHAPE adjustments, A7R12 and A7R41, for the best possible horizontal straight line at both ends of the trace (but within ± one major division or ±1%).

8. Perform the FM Sensitivity Adjustment (paragraph 5-43).

5-42. FM LINEARITY ADJUSTMENT (Alternate)

REFERENCE: Service Sheet 7.

DESCRIPTION: The Signal Generator is modulated with a 1 kHz signal. The generator's RF output is then demodulated with a frequency meter and the distortion on the frequency meter output is observed with a spectrum analyzer. The shaping circuits are then adjusted for minimum distortion across the 0.5 to 1 MHz frequency range. (See paragraph 5-40 for another FM Linearity Adjustment which should be more useful in troubleshooting FM distortion).

NOTE

The preliminary FM Adjustment (paragraph 5-40) should be made before performing this adjustment.

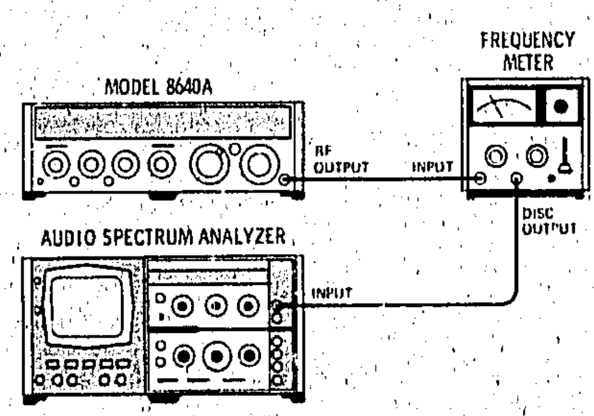


Figure 5-12. FM Linearity Adjustment (Alternate) Test Setup

EQUIPMENT:	Frequency Meter	HP 5210A
	Filter Kit (for Frequency Meter)	HP 10531A
	Audio Spectrum Analyzer	HP 8556A/8552B/141T

ADJUSTMENTS

5-42. FM LINEARITY ADJUSTMENT (Alternate) (Cont'd)

PROCEDURE:

1. Connect equipment as shown in Figure 5-12 after setting Signal Generator's controls as follows:

Meter Function	FM
AM	OFF
MODULATION FREQUENCY	1 kHz (Fixed)
FM	INT
PEAK DEVIATION Switch	5 kHz
PEAK DEVIATION Vernier	Fully cw
RANGE	0.5–1 MHz
FREQUENCY TUNE	0.7 MHz
OUTPUT LEVEL Switch	+10 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON

NOTE

If it is desired to optimize FM linearity at a frequency other than mid-band, proceed as follows:

a. Set RANGE and FREQUENCY TUNE to the desired frequency.

b. Set RANGE to 0.5–1 MHz.

2. Using the filter kit, prepare a 20 kHz Butterworth low-pass filter and install it in the frequency meter.

3. Set the frequency meter's range to 1 MHz and sensitivity to 1V.

4. Set spectrum analyzer's resolution bandwidth to 100 Hz and its center frequency controls for a 0 to 5 kHz span. Set the display for 10 dB per division.

5. Use generator's PEAK DEVIATION vernier to set 5 kHz of peak deviation (as read on panel meter). Use analyzer's display reference level controls to set the demodulated 1 kHz signal to the top (reference) graticule line on the display.

6. Adjust POS SHAPE and NEG SHAPE adjustments, A7R12 and A7R41, for minimum distortion. Observe both second and third harmonics.

7. Slowly tune from 0.5 to 1 MHz and observe distortion. If harmonics are less than 30 dB down (3% distortion) or if it is desired to minimize distortion across the band, adjust A7R12 and A7R41 for best compromise. However, harmonics must always be greater than 30 dB down.

8. Perform the FM Sensitivity Adjustment (paragraph 5-43).

ADJUSTMENTS

5-43. FM SENSITIVITY ADJUSTMENT

REFERENCE: Service Sheets 6 and 7.

DESCRIPTION: The Signal Generator is frequency modulated with an accurate, 1 Vpk, 16.63 kHz signal. The modulated RF output is monitored on a spectrum analyzer and FM sensitivity is adjusted for the first carrier (Bessel) null. The adjustments are made at mid-range and at both ends of the range. (Peak deviation = 2.405 x f_{mod} at first carrier null.)

NOTE

The FM Linearity Adjustment (paragraphs 5-41 or 5-42) should be made before performing this adjustment.

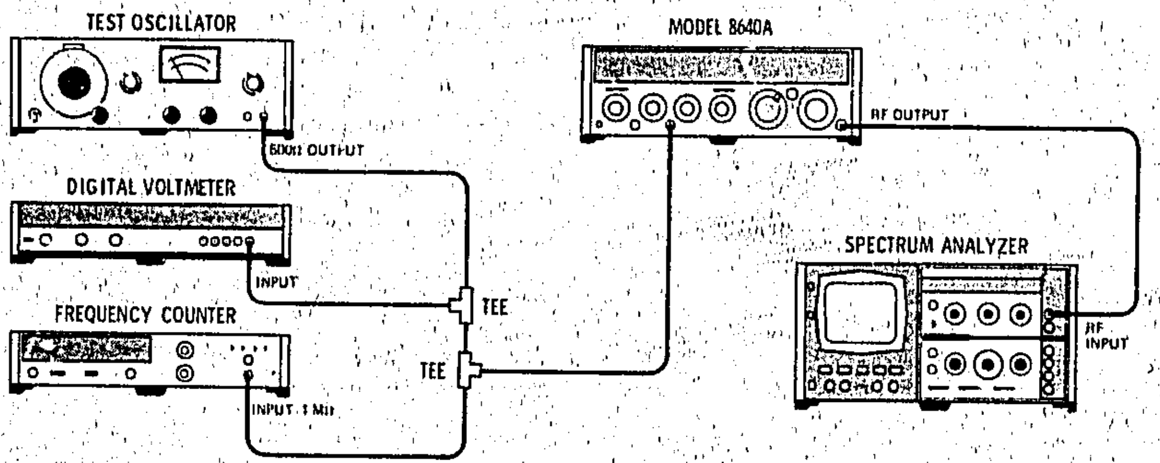


Figure 5-13. FM Sensitivity Adjustment Test Setup

EQUIPMENT:

Test Oscillator	HP 651B
Digital Voltmeter	HP 3490A
Frequency Counter	HP 5327C
Spectrum Analyzer	HP 8554B/8552B/141T

PROCEDURE:

1. Connect equipment as shown in Figure 5-13 after setting Signal Generator's controls as follows:

Meter Function	FM
AM	OFF
FM	OFF
PEAK DEVIATION Switch	40 kHz
PEAK DEVIATION Vernier	Fully cw
RANGE	16-32 MHz
FREQUENCY TUNE	24 MHz
OUTPUT LEVEL Switch	−40 dBm
OUTPUT LEVEL Vernier	Fully cw
RF ON/OFF	ON

5-43. FM SENSITIVITY ADJUSTMENT (Cont'd)

2. Set spectrum analyzer's center frequency to 24 MHz, resolution bandwidth to 3 kHz frequency span (scan width) per division to 20 kHz, and input attenuation to 0 dB. Center signal on display and use reference level controls (set for 10 dB/division) to set signal peak to top (0 dB reference) graticule line on display.

3. Set Signal Generator's FM switch to AC. Adjust test oscillator for a frequency counter reading of 16.63 kHz at 707 mVrms as read on DVM.

4. Adjust MID FM SENS adjustment, A3A4R3, for at least 50 dB of carrier null.

NOTE

The carrier is the center spectrum line on the display. A 50 dB null is when it drops 50 dB or more below its CW amplitude (set in step 2).

5. Set Signal Generator's FREQUENCY TUNE to 16 MHz. Adjust analyzer to center the carrier on the display. Adjust LOW FM SENS adjustment, A3A4R2 for at least 50 dB of carrier null.

6. Set Signal Generator's FREQUENCY TUNE to 32 MHz. Adjust analyzer to center the carrier on the display. Adjust HI FM SENS adjustment, A3A4R4, for at least 50 dB of carrier null.

7. Repeat steps 4 through 6 until carrier null of greater than 50 dB at 16, 24, and 32 MHz is obtained.

8. Perform the FM Distortion Test (paragraph 4-34) and FM Sensitivity and Accuracy Tests (paragraph 4-35).

5-44. OUTPUT IMPEDANCE ADJUSTMENT (Option 003)

REFERENCE: Service Sheet 13B.

DESCRIPTION: A tracking generator is used as an external 50Ω signal source to feed an SWR bridge. The output port of the bridge is connected to a spectrum analyzer. The through port of the bridge is connected to a short circuit to establish a reference, then to the output of A21 Reverse Power Protection Assembly. Return loss versus frequency is displayed on the spectrum analyzer.

5-44. OUTPUT IMPEDANCE ADJUSTMENT (Option 003) (Cont'd)

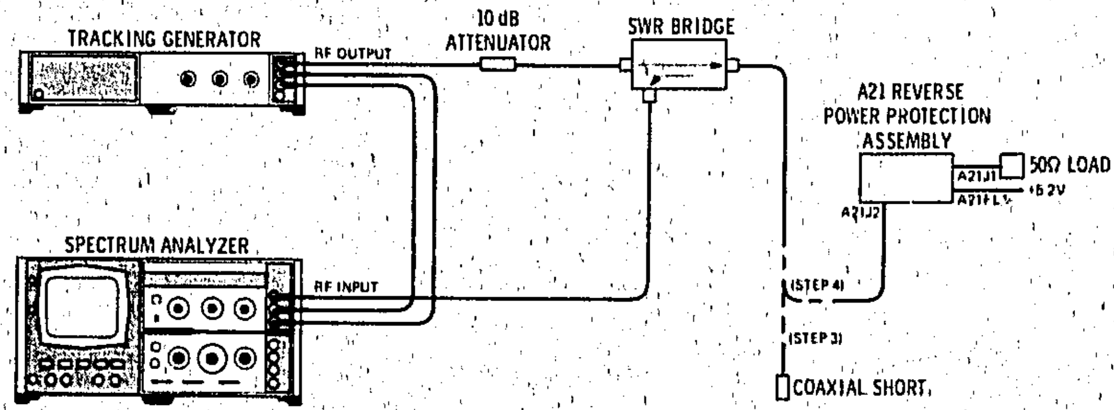


Figure 5-14. Output Impedance Adjustment Test Setup (Option 003)

EQUIPMENT:

Tracking Generator	HP 8444A
Spectrum Analyzer	HP 8554B/8552B/141T
SWR Bridge	Wiltron 60N50
Coaxial Short	HP 11512A
10 dB Attenuator	HP 8491A Option 010
50Ω Load	HP 908A

PROCEDURE:

1. Remove instrument bottom cover.

2. Remove cables and screws securing A21 Reverse Power Protection Assembly. Orient assembly so that circuit components are accessible and the +5.2V supply and ground (if needed) are connected.

3. Connect equipment as shown in Figure 5-14.

4. Set spectrum analyzer for a frequency span of 50 to 550 MHz, 300 kHz resolution bandwidth, 20 dB input attenuation, and 10 dB per division log display. Set tracking generator output level to 0 dBm.

5. To establish a reference level, connect coaxial short to bridge output port. Use the spectrum analyzer's vertical scale, logarithmic level controls to set the reference level trace to the top of the analyzer display.

6. Remove coaxial short and connect bridge output to output jack A21J2.

7. Set Signal Generator LINE to ON.

8. The level now shown on the spectrum analyzer should be greater than 18 dB down from the reference level set in step 5. If not, adjust FLATNESS ADJ, A21C9, or A21L1 and L2 for minimum level (i.e., maximum return loss). A21L1 and L2 can be adjusted by bending them, or raising and lowering them after they are desoldered.

ADJUSTMENTS

5-44. OUTPUT IMPEDANCE ADJUSTMENT (Option 003) (Cont'd)

NOTE

If adjustment seems necessary, check the return loss of the 50Ω load alone by connecting it to the bridge output. Return loss should be greater than 30 dB.

9. For Signal Generators with Option 002 and Option 003, set spectrum analyzer for 500 to 1000 MHz frequency span and repeat steps 3 through 8. Recheck return loss for 50 to 550 MHz if any adjustment was necessary.

5-45. REVERSE POWER LEVEL SENSE ADJUSTMENT (Option 003)

REFERENCE: Service Sheet 13B.

DESCRIPTION: The output jack, A21J2, of A21 Reverse Power Protection Assembly is driven by a 1 MHz source. Input jack A21J1 is monitored by a high impedance ac voltmeter. The LEVEL SENSE ADJ is set to trip the level sensor at a signal level of 6.1 Vrms.

NOTE

This procedure is also useful for verifying the operation of the reverse power protection without endangering the generator output circuitry. The procedure on Service Sheet 13B should be used to verify operation of the Limiter.

EQUIPMENT: Test Oscillator . . . . HP 651B
Digital Voltmeter . . . . HP 3490A

PROCEDURE:

1. Remove instrument bottom cover.
2. Remove cables and screws securing A21 Reverse Power Protection Assembly. Orient assembly so that circuit components are accessible and the +5.2V supply and ground (if needed) are connected.
3. Connect voltmeter to input jack A21J1.
4. Connect 50Ω output of test oscillator to output jack A21J2. Set test oscillator frequency to 1 MHz at approximately 3 Vrms into an open circuit.
5. Set Signal Generator LINE to ON.

CAUTION

Avoid setting the switching point below the stated limits. The Signal Generator's own output can trip the Level Sensor (particularly during low frequency, open-circuit operation). This condition can cause relay contact chatter and reduce contact life.

5-45. REVERSE POWER LEVEL SENSE ADJUSTMENT (Option 003) (Cont'd)

6. Slowly increase test oscillator level until the reading on the voltmeter switches to zero. Note the signal level at which this occurs. The signal level should be between 6.0 and 6.2 Vrms. If the signal level is incorrect, adjust LEVEL SENSE ADJ, A21R2, until switching occurs within the correct limits.

NOTE

Always approach switching point from a lower level. The level sensor has a small amount of hysteresis causing the switching point to be lower for a decreasing signal level than for an increasing level.

5-46. MECHANICAL DIAL INSTALLATION AND ADJUSTMENTS

REFERENCE: Service Sheet C.

DESCRIPTION: For access and dial cord replacement procedures refer to Service Sheet C.

The A8 Mechanical Dial Assembly is first installed and adjusted for proper gear meshing to minimize backlash. Then the cursor drive hub diameter is adjusted for correct length of cursor travel. Finally, cursor position is adjusted. Refer to Figure 5-15.

NOTE

If A8 assembly is already installed, begin adjustments with step 8.

EQUIPMENT: Frequency Counter . . . . HP 5327C

PROCEDURE:

1. Set Signal Generator on its side and set controls as follows:

   RANGE . . . . 0.5—1 MHz
   FREQUENCY TUNE . . . . Fully cw
   LINE . . . . OFF

2. Rotate dial scale gear located on underside of A8 assembly to show 0.5 to 1.0 MHz scale. Rotate cursor drive gear to set cursor at maximum frequency (approximately 1.07 MHz).

3. Loosen four screws that secure the range drum and cursor drive gear support blocks so they are free to slide.

4. Install dial assembly and secure it with one long screw on each end.

5. Position range drum drive gear support block so the gear meshes with the gear on the RANGE switch and tighten the exposed screw on support block.

6. Position cursor drive gear support block so the gear fully meshes with the gear on the FREQUENCY TUNE shaft and tighten exposed screw on support block. Check that backlash is minimum between gears.

5-46. MECHANICAL DIAL INSTALLATION AND ADJUSTMENTS (Cont'd)

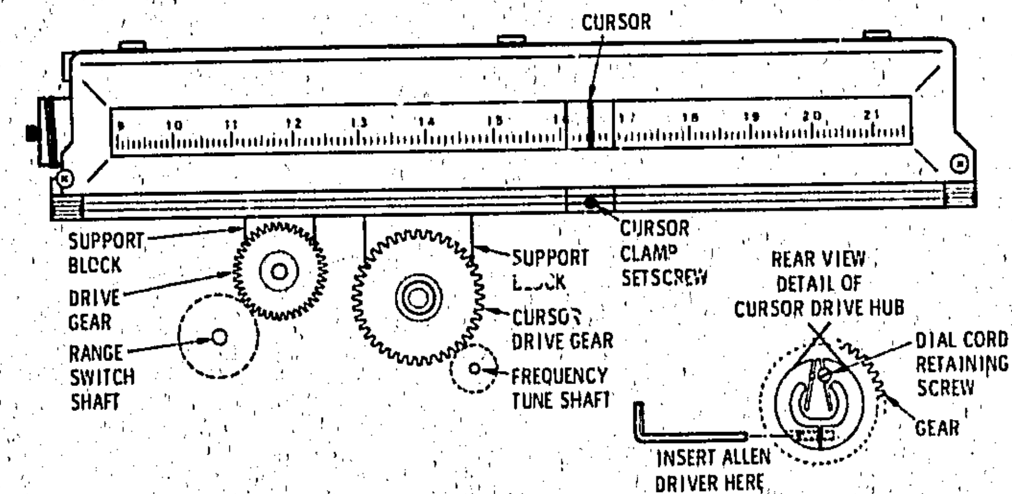


Figure 5-15. Mechanical Dial Assembly A8

CAUTION

Do not force the FREQUENCY TUNE control if it does not freely rotate. Check that cursor does not bind against front casting. The dial cord is coated with teflon which will peel off it it slips through the cursor clamp. Binding of the cursor will also cause excessive backlash.

7. Remove dial assembly and tighten remaining two screws on the support blocks. Set both the FREQUENCY TUNE and dial cursor to maximum frequency and re-install dial assembly (i.e., gear action not evident), securing it with all four screws. Cursor movement should feel smooth (i.e., gear action not evident). If it does not, readjust gear meshing by repeating steps 3 through 7 until proper feel is achieved.

8. Set Signal Generator controls as follows:

RANGE	1–2 MHz
FREQUENCY TUNE	Fully cw
FINE TUNE	Centered
AM	OFF
FM	OFF
RF ON/OFF	ON
LINE	ON

9. Connect frequency counter to rear panel AUX RF OUTPUT. Allow instruments to warm up for one hour.

5-46. MECHANICAL DIAL INSTALLATION AND ADJUSTMENTS (Cont'd)

NOTE

When setting the frequency in the following steps, always approach setting from the left (low end) of range.

10. Adjust the FREQUENCY TUNE for a dial reading of 2.150 MHz and note counter reading. Repeat for 0.900 MHz. If the difference in counter readings is not within 1.250 ± 0.008 MHz, the diameter of the cursor drive hub will have to be adjusted.

NOTE

If a dial setting of either 0.900 or 2.150 MHz cannot be obtained, partially lift out dial assembly and slip cursor gear by one cog.

11. To adjust diameter of the cursor drive hub, rotate FREQUENCY TUNE until the setscrew, which is accessible through a hole in surface of the hub, is located. Use a No. 4 allen driver to part dial cord and adjust setscrew. Driving the setscrew in increases the hub diameter which increases the length of cursor travel.

NOTE

Before checking adjustment, rotate the FREQUENCY TUNE through its range twice to equalize dial cord tension.

12. If, after adjustment of the hub diameter, the dial cord tension is too tight or too slack, loosen nylon dial cord retaining screw, release (or take up) a small amount of dial cord, tighten retaining screw, and run cursor twice through its range of travel to equalize dial cord tension. Reinstall dial assembly with FREQUENCY TUNE and dial cursor set to maximum frequency. Check the dial adjustment and repeat Step 11 if needed.

13. Tune the FREQUENCY TUNE for a counter reading of 1.500 MHz. Note indicated dial error.

14. If dial error is approximately one minor division or more, partially lift out dial assembly and slip cursor drive gear by one cog to correct the error. If dial error is small but more than ± 0.007 MHz, remove dial assembly. Loosen nylon cursor clamp setscrew and slide cursor to eliminate error. Use a 0.035 inch allen driver.

NOTE

The cursor clamp setscrew (HP 3030-0515) comes new with a protrusion which accepts a standard screwdriver blade. After insertion of setscrew, the protrusion must be cut off to prevent binding with front casting.

15. Reinstall dial assembly and secure it with all four screws.

16. Recheck the dial accuracy at 0.900, 1.500, and 2.150 MHz. The accuracy should be at least within ±1.0%, but adjustment should be made to minimize the error.

17. Perform the Frequency Range and Dial Accuracy Test (paragraph 4-13). If only a low frequency counter is available, only the low ranges need be checked.

18. Reinstall front window, trim strip, and covers.

PARTS LIST

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering parts. Table 6-2 lists abbreviations used in the parts list and throughout the manual. Table 6-3 lists all replaceable parts in reference designator order. Table 6-4 contains the names and addresses that correspond to the manufacturer's code numbers.

6-3. EXCHANGE ASSEMBLIES

6-4. Table 6-1 lists assemblies within the instrument that may be replaced on an exchange basis, thus affording a considerable cost saving. Exchange, factory-repaired and tested assemblies are available only on a trade-in basis; therefore, the defective assemblies must be returned for credit. For this reason, assemblies required for spare parts stock must be ordered by the new assembly part number.

6-5. ABBREVIATIONS

6-6. Table 6-2 lists abbreviations used in the parts list, schematics and throughout the manual. In some cases, two forms of the abbreviation are used, one all in capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always all capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lower case and upper case letters.

6-7. REPLACEABLE PARTS LIST

6-8. Table 6-3 is the list of replaceable parts and is organized as follows:

a. Electrical assemblies and their components in alpha-numercial order by reference designation.

b. Chassis-mounted parts in alpha-numerical order by reference designation.

c. Miscellaneous parts.

6-9. The information given for each part consists of the following:

a. The Hewlett-Packard part number.

b. The total quantity (Qty) in the instrument.

c. The description of the part.

d. A typical manufacturer of the part in a five-digit code.

e. The manufacturer's number for the part.

6-10. The total quantity for each part is given only once — at the first appearance of the part number in the list.

NOTE

Total quantities for optional assemblies are totaled by assembly and not integrated into the standard list.

6-11. ORDERING INFORMATION

6-12. To order a part listed in the replaceable parts table, quote the Hewlett-Packard Part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

6-13. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

6-14. SPARE PARTS KIT

6-15. Stocking spare parts for an instrument is often done to ensure quick return to service after a malfunction occurs. Hewlett-Packard has a "Spare Parts Kit" available for this purpose. The kit consists of selected replaceable assemblies and components for this instrument. The contents of the kit and the "Recommended Spares" list are based on failure reports and repair data, and provides parts support for one year. A complimentary "Recommended Spares" list for this instrument may be obtained on request and the "Spare Parts Kit" may be ordered through your nearest Hewlett-Packard office.

6-16. ILLUSTRATED PARTS BREAKDOWNS

6-17. Illustrated Parts Breakdowns for the following assemblies are given on the alphabetic foldout pages in this manual (located after the numbered, schematic foldouts):

- A1 Output Level Assembly
- A3 RF Oscillator Assembly
- A8 Mechanical Dial Assembly
- A9 Peak Deviation and Range Switch Assembly
- A10 Divider/Filter Assembly
- A11 Variable-Frequency Modulation Oscillator Assembly (Option 001)
- A26 AM/AGC and RF Amplifier Assembly

6-18. Figure 6-1 locates front panel mechanical parts. Figures 6-2 and 6-3 are breakdowns of the generator's cabinet parts and the parts that constitute the Type N connector, J1.

Table 6-1. Part Numbers for Exchange Assemblies

Reference Designation	Description	Part Number	
		Exchange Assy	New Assy
A1	Output Level Assembly	08640-60193	08640-60320
A1	Output Level Assembly (Option 002)	08640-60194	08640-60327
A3	RF Oscillator Assembly	08640-60182	08640-60181

Table 6-2. Reference Designations and Abbreviations (1 of 2)

REFERENCE DESIGNATIONS

- A . . . . assembly
- AT . . attenuator; isolator; termination
- B . . . . fan; motor
- BT . . . . battery
- C . . . . capacitor
- CP . . . . coupler
- CR . . . . diode; diode thyristor; varactor
- DC . . . directional coupler
- DL . . . . delay line
- DS . . . . annunciator; signaling device (audible or visual); lamp; LED
- E . . . . miscellaneous electrical part
- F . . . . fuse
- FL . . . . filter
- H . . . . hardware
- HY . . . . circulator
- J . . . . electrical connector (stationary portion); jack
- K . . . . relay
- L . . . . coil; inductor
- M . . . . meter
- MP . . . . miscellaneous mechanical part
- P . . . . electrical connector (movable portion); plug
- Q . . . . . . transistor: SCR; triode thyristor
- R . . . . resistor
- RT . . . . thermistor
- S . . . . switch
- T . . . . transformer
- TB . . . . terminal board
- TC . . . . thermocouple
- TP . . . . test point
- U . . . . . . integrated circuit; microcircuit
- V . . . . electron tube
- VR . . . . . . voltage regulator; breakdown diode
- W . . . . cable; transmission path; wire
- X . . . . socket
- Y . . . . crystal unit (piezo-electric or quartz)
- Z . . . . tuned cavity; tuned circuit

ABBREVIATIONS

- A . . . . ampere
- ac . . . . . alternating current
- ACCESS . . . . accessory
- ADJ . . . . adjustment
- A/D . . . . . analog-to-digital
- AF . . . . . . audio frequency
- AFC . . . . automatic frequency control
- AGC . . . . . . automatic gain control
- AL . . . . aluminum
- ALC . . . . . automatic level control
- AM . . . . amplitude modulation
- AMPL . . . . amplifier
- APC . . . . automatic phase control
- ASSY . . . . assembly
- AUX . . . . auxiliary
- avg . . . . average
- AWG . . . . American wire gauge
- BAL . . . . balance
- BCD . . . . binary coded decimal
- BD . . . . board
- BE CU . . . . beryllium copper
- BFO . . . . . . beat frequency oscillator
- BH . . . . binder head
- BKDN . . . . breakdown
- BP . . . . bandpass
- BPF . . . . . . bandpass filter
- BRS . . . . brass
- BWO . . . . . backward-wave oscillator
- CAL . . . . calibrate
- ccw . . . . counter-clockwise
- CER . . . . ceramic
- CHAN . . . . channel
- cm . . . . centimeter
- CMO . . cabinet mount only
- COAX . . . . coaxial
- COEF . . . . coefficient
- COM . . . . common
- COMP . . . . composition
- COMPL . . . . complete
- CONN . . . . connector
- CP . . . . cadmium plate
- CRT . . . . cathode-ray tube
- CTL . . . . complementary transistor logic
- CW . . . . . continuous wave
- cw . . . . clockwise
- cm . . . . centimeter
- D/A . . . . digital-to-analog
- dB . . . . decibel
- dBc . . decibels below carrier
- dBm . . . . . decibel referred to 1 mW
- dc . . . . direct current
- deg . . . . degree (temperature interval or difference)
- ° . . . . degree (plane angle)
- °C . . . . degree Celsius (centigrade)
- °F . . . . . degree Fahrenheit
- °K . . . . degree Kelvin
- DEPC . . . . deposited carbon
- DET . . . . detector
- diam . . . . diameter
- DIA . . . . diameter (used in parts list)
- DIFF AMPL . . . differential amplifier
- div . . . . division
- DPDT . . . . . . double-pole, double-throw
- DR . . . . drive
- DSB . . . . double sideband
- DTL . . . . . diode transistor logic
- DVM . . . . digital voltmeter
- ECL . . . . . emitter coupled logic
- EMF . . electromotive force
- EDP . . . . . . electronic data processing
- ELECT . . . . . . electrolytic
- ENCAP . . . . . encapsulated
- EXT . . . . external
- F . . . . farad
- FET . . . . field-effect transistor
- F/F . . . . flip-flop
- FH . . . . flat head
- FIL H . . . . fillister head
- FM . . frequency modulation
- FP . . . . front panel
- FREQ . . . . frequency
- FXD . . . . fixed
- g . . . . gram
- GE . . . . germanium
- GHz . . . . gigahertz
- GL . . . . glass
- GRD . . . . ground(ed)
- H . . . . henry
- h . . . . hour
- HET . . . . heterodyne
- HEX . . . . hexagonal
- HD . . . . head
- HDW . . . . hardware
- HF . . . . high frequency
- HG . . . . mercury
- HI . . . . high
- HP . . . . Hewlett-Packard
- HPF . . . . high pass filter
- HR . . . . hour (used in parts list)
- HV . . . . high voltage
- Hz . . . . Hertz
- IC . . . . integrated circuit
- ID . . . . inside diameter
- IF . . . . intermediate frequency
- IMPG . . . . impregnated
- in . . . . inch
- INCD . . . . incandescent
- INCL . . . . include(s)
- INP . . . . input
- INS . . . . insulation
- INT . . . . internal
- kg . . . . kilogram
- kHz . . . . kilohertz
- kΩ . . . . kilohm
- kV . . . . kilovolt
- lb . . . . pound
- LC . . . . inductance-capacitance
- LED . . light-emitting diode
- LF . . . . low frequency
- LG . . . . long
- LH . . . . left hand
- LIM . . . . limit
- LIN . . . . linear taper (used in parts list)
- lin . . . . linear
- LK WASH . . . . lock washer
- LO . . . . low; local oscillator
- LOG . . . . logarithmic taper (used in parts list)
- log . . . . logrithm(ic)
- LPF . . . . . . low pass filter
- LV . . . . low voltage
- m . . . . meter (distance)
- mA . . . . milliampere
- MAX . . . . maximum
- MΩ . . . . megohm
- MEG . . . . meg (10^6) (used in parts list)
- MET FLM . . . . . metal film
- MET OX . . . . metallic oxide
- MF . . . . medium frequency; microfarad (used in parts list)
- MFR . . . . manufacturer
- mg . . . . milligram
- MHz . . . . megahertz
- mH . . . . millihenry
- mho . . . . mho
- MIN . . . . minimum
- min . . . . minute (time)
- ′ . . . . minute (plane angle)
- MINAT . . . . miniature
- mm . . . . millimeter

NOTE

All abbreviations in the parts list will be in upper-case.

Table 6-2. Reference Designations and Abbreviations (2 of 2)

MOD	modulator
MOM	momentary
MOS	metal-oxide semiconductor
ms	millisecond
MTG	mounting
MTR	meter (indicating device)
mV	millivolt
mVac	millivolt, ac
mVdc	millivolt, dc
mVpk	millivolt, peak
mVp-p	millivolt, peak-to-peak
mVrms	millivolt, rms
mW	milliwatt
MUX	multiplex
MY	mylar
μA	microampere
μF	microfarad
μH	microhenry
μmho	micromho
μs	microsecond
μV	microvolt
μVac	microvolt, ac
μVdc	microvolt, dc
μVpk	microvolt, peak
μVp-p	microvolt, peak-to-peak
μVrms	microvolt, rms
μW	microwatt
nA	nanoampere
NC	no connection
N/C	normally closed
NE	neon
NEG	negative
nF	nanofarad
NI PL	nickel plate
N/O	normally open
NOM	nominal
NORM	normal
NPN	negative-positive-negative
NPO	negative-positive zero (zero temperature coefficient)
NRFR	not recommended for field replacement
NSR	not separately replaceable
ns	nanosecond
nW	nanowatt
OBD	order by description
OD	outside diameter
OH	oval head
OP AMPL	operational amplifier
OPT	option
OSC	oscillator
OX	oxide
oz	ounce
Ω	ohm
P	peak (used in parts list)
PAM	pulse-amplitude modulation
PC	printed circuit
PCM	pulse-code modulation; pulse-count modulation
PDM	pulse-duration modulation
pF	picofarad
PH BRZ	phosphor bronze
PHL	Phillips
PIN	positive-intrinsic-negative
PIV	peak inverse voltage
pk	peak
PL	phase lock
PLO	phase lock oscillator
PM	phase modulation
PNP	positive-negative-positive
P/O	part of
POLY	polystyrene
PORC	porcelain
POS	positive; position(s) (used in parts list)
POSN	position
POT	potentiometer
p-p	peak-to-peak
PP	peak-to-peak (used in parts list)
PPM	pulse-position modulation
PREAMPL	preamplifier
PRF	pulse-repetition frequency
PRR	pulse repetition rate
ps	picosecond
PT	point
PTM	pulse-time modulation
PWM	pulse-width modulation
PWV	peak working voltage
RC	resistance-capacitance
RECT	rectifier
REF	reference
REG	regulated
REPL	replaceable
RF	radio frequency
RFI	radio frequency interference
RH	round head; right hand
RLC	resistance-inductance-capacitance
RMO	rack mount only
rms	root-mean-square
RND	round
ROM	read-only memory
R&P	rack and panel
RWV	reverse working voltage
S	scattering parameter
s	second (time)
"	second (plane angle)
S-B	slow-blow (fuse) (used in parts list)
SCR	silicon controlled rectifier; screw
SE	selenium
SECT	sections
SEMICON	semiconductor
SHF	superhigh frequency
SI	silicon
SIL	silver
SL	slide
SNR	signal-to-noise ratio
SPDT	single-pole, double-throw
SPG	spring
SR	split ring
SPST	single-pole, single-throw
SSB	single sideband
SST	stainless steel
STL	steel
SQ	square
SWR	standing-wave ratio
SYNC	synchronize
T	timed (slow-blow fuse)
TA	tantalum
TC	temperature compensating
TD	time delay
TERM	terminal
TFT	thin-film transistor
TGL	toggle
THD	thread
THRU	through
TI	titanium
TOL	tolerance
TRIM	trimmer
TSTR	transistor
TTL	transistor-transistor logic
TV	television
TVI	television interference
TWT	traveling wave tube
U	micro (10^{-6}) (used in parts list)
UF	microfarad (used in parts list)
UHF	ultrahigh frequency
UNREG	unregulated
V	volt
VA	voltampere
Vac	volts, ac
VAR	variable
VCO	voltage-controlled oscillator
Vdc	volts, dc
VDCW	volts, dc, working (used in parts list)
V(F)	volts, filtered
VFO	variable-frequency oscillator
VHF	very-high frequency
Vpk	volts, peak
Vp-p	volts, peak-to-peak
Vrms	volts, rms
VSWR	voltage standing wave ratio
VTO	voltage-tuned oscillator
VTVM	vacuum-tube voltmeter
V(X)	volts, switched
W	watt
W/	with
WIV	working inverse voltage
WW	wirewound
W/O	without
YIG	yttrium-iron-garnet
Z_o	characteristic impedance

NOTE

All abbreviations in the parts list will be in upper-case.

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	08640-60320	1	OUTPUT LEVEL ASSEMBLY(EXCEPT OPT 002)	28480	08640-60320
A1	08640-60193		RESTORED 08640-60320,REQUIRES EXCHANGE	28480	08640-60193
A1	08640-60327	1	OUTPUT LEVEL ASSEMBLY(OPTION 002 ONLY) (SEE SERVICE SHEET A)	28480	08640-60327
A1	08640-60194		RESTORED 08640-60327,REQUIRES EXCHANGE	28480	08640-60194
A1MP1	08640-00112	1	SUPPORT, VARIABLE RESISTOR	28480	08640-00112
A1MP2	0380-0660	2	SPACER-RND 1.25LG .128ID .190D STL CD-PL	28480	0380-0660
A1MP3	3130-0038	1	COUPLER:SWITCH SST U-SHAPED	76854	12276-6
A1MP4	0510-0005	1	RETAINER-RING .25-DIA CD PL STL	0018A	1400-25-CD
A1MP5	3050-0103	1	WASHER-FL MTLC NO.-12 .125-IN-ID	28480	3050-0103
A1MP6	1460-0019	1	SPRING-CPRSN .384-OD .375-LG MUW	28480	1460-0019
A1MP7	08640-20249	1	SWITCH, ROTOR 3-C	28480	08640-20249
A1MP8	08640-00111	1	SUPPORT BOARD	28480	08640-.0111
A1MP9	08640-20266	1	SUPPORT, ATTENUATOR	28480	08640-20266
A1MP10	3130-0462	1	SHAFT, INNER 0.125" DIA. 9.38" LG	76854	A-3130-9008-1
A1MP11	2190-0016	2	WASHER-LK INTL T NO.-3/8 .377-IN-ID	28480	2190-0016
A1MP12	2950-0001	2	NUT-HEX-DBL-CHAM 3/8-32-THD .094-THK	28480	2950-0030
A1MP13	2200-0127	3	SCREW-MACH 4-40 1.75-IN-LG PAN-HD-POZI	28480	2200-0127
A1MP14	0550-0053	2	SCREW-MACH 5-40 .75-IN-LG PAN-HD-POZI	28480	0550-0055
A1MP15	2200-0109	8	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0109
A1MP16	2190-0019	13	WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0019
A1MP17	2190-0020	3	WASHER-LK HLCL NO.-5 .128-IN-ID	28480	2190-0020
A1MP18	08641-00004	1	COVER, ATTENUATOR	28480	08641-00004
A1R1	2100-2728	1	RESISTOR-VAR CONTROL C 1K 20% LIN	28480	2100-2728
A1A1	08640-60303	1	RF VERNIER ASSEMBLY (08640-60320 AND 08640-60327 IDENTICAL EXCEPT FOR A1A2).	28480	08640-60303
A1A1R1	0698-7532	1	RESISTOR 100 .25% .125W F TC=0+-100	19701	MF4C1/8-T0-100R-C
A1A1R2	0698-7794	1	RESISTOR 10K .25% .125W F TC=0+-100	19701	MF4C1/8-T0-1002-C
A1A1R3	0698-3449	2	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A1A1R4	0757-0280	15	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1A1TP1	1251-0600	16	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A1TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A2	08640-60205	1	OUTPUT ATTENUATOR ASSEMBLY (EXCEPT OPTION 002)	28480	08640-60205
A1A2	08640-60211	1	OUTPUT ATTENUATOR ASSEMBLY (OPTION 002 ONLY)	28480	08640-60211
A1A2C1			NSR		
A1A2J1			NSR		
A1A2J2			NSR		
A2	08640-60304	1	METER SWITCH AND DRIVE ASSEMBLY	28480	08640-60304
A2C1	0180-0197	9	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2C2	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A2C3	0160-0128	1	CAPACITOR-FXD 2.2UF +-20% 50WVDC CER	28480	0160-0128
A2C4	0160-3879	3	CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2C5	0160-2199	2	CAPACITOR-FXD 30PF +-5% 300WVDC MICA	28480	0160-2199
A2C6	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2C7	0180-2206	3	CAPACITOR-FXD 60UF+-10% 6VDC TA	56289	150D606X9006B2
A2C8	0180-0116	5	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A2C9	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A2CR1	1901-0040	4	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A2MP1	4040-0749	2	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-0073	6	PIN:DRIVE 0.250" LG	00000	OBD
A2Q1	1854-0019	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A2Q2	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A2Q3	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A2Q4	1854-0071	7	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A2Q5	1853-0020	4	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A2R1	0757-0420	2	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A2R2	0757-0346	18	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2R3	0757-0421	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A2R4	0757-0419	1	RESISTOR 681 1% .125W F TC=0+-100	24546	C4-1/8-T0-681R-F
A2R5	0698-7095	1	RESISTOR 11K .25% .125W F TC=0+-50	24546	NC55
A2R6	0698-3160	3	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A2R7	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A2R8	0757-0466	1	RESISTOR 110K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1103-F
A2R9	0757-0442	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A2R10	0698-3450	3	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2R11	0698-3440	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A2R12	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R13	0683-1065	1	RESISTOR 10M 5% .25W FC TC=-900/+1100	01121	CB1065
A2R14	2100-3353	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	32997	3386X-Y46-203
A2R15	2100-3207	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	72-145-0
A2R16	0698-3156	3	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A2R17	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R18	0683-4755	1	RESISTOR 4.7M 5% .25W FC TC=-900/+1100	01121	CB4755
A2R19	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A2R20	0757-0440	3	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A2R21	0698-3260	2	RESISTOR 464K 1% .125W F TC=0+-100	91637	CMF-55-1, T-1
A2R22	0683-1055	1	RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A2R23	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R24	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A2R25	0757-0200	3	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A2R26	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A2R27	0757-0422	3	RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A2R28	2100-3350	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	73138	72-141-0
A2R29	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2R30	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A2S1	3101-1728	1	SWITCH-PB 3-STATION 10MM C-C SPACING	28480	3101-1728
A2TP1	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A2TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A2TP3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A2TP4	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A2U1	1820-0223	1	IC LM 301A OP AMP	27014	LM301AH
A2U2	1826-0026	1	IC LM 311 COMPARATOR	27014	LM311H
A2VR1	1902-0025	2	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A2VR2	1902-0025		DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A3	08640-60181	1	RF OSCILLATOR ASSY(SEE SERVICE SHEET 8)	28480	08640-60181
A3	08640-60182		RESTORED 08640-60181, REQUIRES EXCHANGE	28480	08640-60182
A3MP1	0510-0052	4	RETAINER-RING .125-DIA STL CD-PL	97464	7100-12-CD
A3MP2	0510-0055	2	RETAINER-RING .438-DIA CD PL STL	0018A	1400-43-CD
A3MP3	1430-0537	1	GEAR SPUR	28480	1430-0537
A3MP4	1430-0759	4	GEAR SPUR	28480	1430-0759
A3MP5	08640-00085	1	GASKET, COVER(FINE TUNE)	28480	08640-00085
A3MP6	08640-20106	2	BUSHING, POT	28480	08640-20106
A3MP7	8160-0233	1	RFI PLUG BE CU AU PL .173-OD .18-L	28480	8160-0233
A3MP8	08640-20106		BUSHING, POT	28480	08640-20106
A3MP9	08640-20224	1	CAP, TRANSISTOR	28480	08640-20224
A3MP10	08640-60206	1	OSCILLATOR, FINE TUNE ASSEMBLY	28480	08640-60206
A3MP11	2200-0151	3	SCREW-MACH 4-40 .75-IN-LG PAN-HD-POZI	28480	2200-0151
A3MP12	2190-0019		WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0019
A3MP13	8160-0203	1	RFI ROUND STRIP NI ALY .06-OD	07700	20-90044
A3MP14	0510-0055		RETAINER-RING .438-DIA CD PL STL	0018A	1400-43-CD
A3MP15	3030-0007	12	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A3MP16	1430-0759		GEAR SPUR	28480	1430-0759
A3MP17	3030-0196	7	SCREW-SET 4-40 .188-IN-LG SMALL CUP-PT	28480	3030-0196
A3MP18	2190-0016		WASHER-LK INTL T NO.-3/8 .377-IN-ID	28480	2190-0016
A3MP19	3030-0196		SCREW-SET 4-40 .188-IN-LG SMALL CUP-PT	28480	3030-0196
A3MP20	2190-0016		WASHER-LK INTL T NO.-3/8 .377-IN-ID	28480	2190-0016
A3MP21	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A3MP22	2510-0135		SCREW-MACH 8-32 2.25-IN-LG PAN-HD-POZI	28480	2510-0135
A3MP23	3050-0001	1	WASHER-FL MTLC NO.-8 .172-IN-ID	28480	3050-0001
A3MP24	2190-0017	1	WASHER-LK HLCL NO.-8 .168-IN-ID	28480	2190-0017
A3MP25	08640-20193	1	SHAFT MOD. FINE TUNE	28480	08640-20193
A3MP26	0510-0015	2	RETAINER-RING .125-DIA CD PL STL	0018A	1500-12-CD
A3Q1	5086-4202	1	TRANSISTOR	28480	5086-4282
A3R1	2100-3265	1	RESISTOR-VAR 10K 20% C	71450	550
A3R2	2100-0541	1	RESISTOR-VAR PREC WW 1-TRN 1K 3% , NOTE: WHEN REPLACING A3R1,R2, ALSO REPLACE BUSHING A3MP6 OR MP8.	23480	2100-0541
A3A1			FILTER/BUFFER AMPLIFIER ASSY, NRFR		
A3A1C1			NSR		
A3A1FL1	0160-0204	7	FILTER-LP STUD-TERMS	01121	SMFB-A2
A3A1FL2	0160-0204		FILTER-LP STUD-TERMS	01121	SMFB-A2
A3A1FL3			NSR		
A3A1FL4			NSR		
A3A1FL5	0160-0204		FILTER-LP STUD-TERMS	01121	SMFB-A2

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A1FL6	0160-0204		FILTER-LP STUD-TERMS	01121	SMFB-A2
A3A1J1	1250-0830	2	CONNECTOR-RF SMC M SGL HOLE FR	2K497	701873
A3A1J2	1250-0830		CONNECTOR-RF SMC M SGL HOLE FR	2K497	701873
A3A1MP1	3030-0238	1	SCREW-SET 12-28 .25-IN-LG SMALL CUP-PT	28480	3030-0238
A3A1MP2	2510-0099	2	SCREW-MACH 8-32 .25-IN-LG PAN-HD-POZI	28480	2510-0099
A3A1MP3	2580-0003	2	NUT-HEX-W/LKWR 8-32-THD .125-THK	28480	2580-0006
A3A1MP4	8160-0229	4	GASKET, RFI	07700	48-90092
A3A1MP5	08640-00011	1	COVER, BUFFER BOARD	28480	08640-00011
A3A1MP6	8160-0229		GASKET, RFI	07700	48-90092
A3A1MP7	2200-0105	3	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A3A1MP8	3050-0105	10	WASHER-FL MTLC NO.-4 .125-IN-ID	28480	3050-0105
A3A1MP9	2740-0001	2	NUT-HEX-DBL-CHAM 10-32-THD .109-THK	28480	2740-0001
A3A1MP10	2190-0011	2	WASHER-LK INTL T NO.-10 .195-IN-ID	06791	1022
A3A1MP11	2740-0001		NUT-HEX-DBL-CHAM 10-32-THD .109-THK	28480	2740-0001
A3A1MP12	2190-0011		WASHER-LK INTL T NO.-10 .195-IN-ID	06791	1022
A3A1MP13	2200-0121	10	SCREW-MACH 4-40 1.125-IN-LG PAN-HD-POZI	28480	2200-0121
A3A1MP14	2190-0019		WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0019
A3A1MP15	2190-0019		WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0019
A3A1MP16	2200-0143	11	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0143
A3A1MP17			NSR		
A3A1A1			VARACTOR HEAD FILTER ASSY, NRFR		
A3A1A2	08640-60024	1	RF DIVIDER/FILTER BUFFER AMPLIFIER ASSY	28480	08640-60024
A3A1A2C1	0160-3456	31	CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A3A1A2C2	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A3A1A2C3	0160-3878	2	CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A3A1A2C4	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A3A1A2C5	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A3A1A2C6	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A3A1A2C7	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A3A1A2C8	0160-3873	1	CAPACITOR-FXD 4.7PF +-.5PF 200WVDC CER	28480	0160-3873
A3A1A2C9	0160-3876	1	CAPACITOR-FXD 47PF +-20% 200WVDC CER	28480	0160-3876
A3A1A2L1	9140-0142	2	COIL-MLD 2.2UH 10% Q=32 .095DX.25LG	99800	1025-28
A3A1A2L2	9140-0142		COIL-MLD 2.2UH 10% Q=32 .095DX.25LG	99800	1025-28
A3A1A2MP1	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A3A1A2Q1	1854-0247	4	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A3A1A2Q2	1854-0247		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A3A1A2R1	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A3A1A2R2	0698-7212	1	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A3A1A2R3	0698-7188	1	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T00-10R-G
A3A1A2R4	0698-3445	2	RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A3A1A2R5	0698-7214	2	RESISTOR 121 1% .05W F TC=0+-100	24546	C3-1/8-T0-121R-G
A3A1A2R6	0698-7224	3	RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-T0-316R-G
A3A1A2R7	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A3A1A2R8	0698-7193	1	RESISTOR 16.2 1% .05W F TC=0+-100	24546	C3-1/8-T00-16R2-G
A3A1A2R9	0698-3445		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A3A1A2R10	0698-7214		RESISTOR 121 1% .05W F TC=0+-100	24546	C3-1/8-T0-121R-G
A3A1A2T1	08640-00007	1	LOOP BUFFER INPUT	28480	08640-00007
A3A2			VARACTOR HEAD ASSY, NRFR		
A3A3			OSCILLATOR LOOP ASSY, NRFR		
A3A4	08640-60196	1	CONNECTOR BOARD ASSY	28480	08640-60196
A3A4C1	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X903582
A3A4C2	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X903582
A3A4L1	9100-1664	2	COIL-MLD 3MH 5% Q=70 .215DX.56LG	24226	22/302
A3A4L2	9100-1664		COIL-MLD 3MH 5% Q=70 .215DX.56LG	24226	22/302
A3A4MP1	08640-00036	1	SUPPORT, P.C. BOARD	28480	08640-00036
A3A4MP2	2200-0141	2	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0141
A3A4MP3	3050-0105		WASHER-FL MTLC NO.-4 .125-IN-ID	28480	3050-0105
A3A4MP4	2190-0009	2	WASHER-LK INTL T NO.-8 .168-IN-ID	06791	820-8C
A3A4MP5	2260-0009	2	NUT-HEX-W/LKWR 4-40-THD .094-THK .25-A/F	28480	2260-0011
A3A4R1	2100-3054	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-503
A3A4R2	2100-3109	2	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-202
A3A4R3	2100-3123	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	32997	3006P-1-501
A3A4R4	2100-3154	2	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-102
A3A4R5	0698-3439	1	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A3A4R6	0757-0416	5	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A3A4R7	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A4TP1	0360-1514	18	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A3A4TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A4			NOT ASSIGNED		
A5	08640-60029	1	FM AMPLIFIER ASSY (DOES NOT INCL A5MP3)	28480	08640-60029
A5C1	0160-2228	2	CAPACITOR-FXD 2700PF +-5% 300WVDC MICA	28480	0160-2228
A5C2	0160-2228		CAPACITOR-FXD 2700PF +-5% 300WVDC MICA	28480	0160-2228
A5C3	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C4	0180-1715	3	CAPACITOR-FXD 150UF+-10% 6VDC TA	56289	150D157X9006R2
A5C5	0180-0269	1	CAPACITOR-FXD 1UF+75-10% 150VDC AL	56289	30D105G150BA2
A5C6	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A5C7	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C8	0180-2211	1	CAPACITOR-FXD 5UF+50-10% 150VDC AL	56289	30D505F150CC2
A5C9	0160-0939	3	CAPACITOR-FXD 430PF +-5% 300WVDC MICA	28480	0160-0939
A5CR1-		2			
A5CR4			NOT ASSIGNED		
A5CR5	1901-0025	16	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR6	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR7	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR8	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR9	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5CR10	1901-0050	3	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A5CR11	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A5CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A5CR13	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A5K1	0490-1078	1	RELAY-REED 1A .5A 200V CONT 5V-COIL	28480	0490-1078
A5MP1	4040-0750	1	EXTRACTOR-PC BD RED POLYC .062-BD-THKNS	28480	4040-0750
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A5MP2	4040-0756	1	EXTRACTOR-PC BOARD, WHITE	28480	4040-0756
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A5MP3	0400-0418	1	CHANNEL GROMMET, 1.25" LG	28480	0400-0418
A5Q1	1854-0221	2	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A5Q2	1854-0221		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A5Q3	1854-0404	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A5Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A5Q5	1853-0038	4	TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
	1205-0011	3	HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
	1200-0173	14	INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A5Q6	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
	1205-0011		HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A5Q7	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A5Q8	1854-0039	1	TRANSISTOR NPN 2N3053 SI TO-5 PD=1W	04713	2N3053
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
	1205-0011		HEAT SINK TO-5/TO-39-PKG	28480	1205-0011
A5Q9	1854-0022	2	TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A5Q10	1854-0237	2	TRANSISTOR NPN SI TO-66 PD=20W FT=10MHZ	04713	2N3738
	0510-0002	2	THREADED INSERT-NUT 6-32 .062-LG	28480	0510-0002
	1205-0085	2	HEAT SINK TO-66-PKG	28480	1205-0085
	2360-0199	2	SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI	28480	2360-0199
	2420-0003	2	NUT-HEX-DBL-CHAM 6-32-THD .094-THK	28480	2420-0004
	2190-0018	2	WASHER-LK HLCL NO.-6 .141-IN-ID	28480	2190-0018
	2190-0007	2	WASHER-LK INTL T NO.-6 .141-IN-ID	78189	1906-00
A5Q11	1853-0012	1	TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW	01295	2N2904A
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A5Q12	1854-0237		TRANSISTOR NPN SI TO-66 PD=20W FT=10MHZ	04713	2N3738
	0510-0002		THREADED INSERT-NUT 6-32 .062-LG	28480	0510-0002
	1205-0085		HEAT SINK TO-66-PKG	28480	1205-0085
	2360-0199		SCREW-MACH 6-32 .438-IN-LG PAN-HD-POZI	28480	2360-0199
	2420-0003		NUT-HEX-DBL-CHAM 6-32-THD .094-THK	28480	2420-0004
	2190-0018		WASHER-LK HLCL NO.-6 .141-IN-ID	28480	2190-0018
	2190-0007		WASHER-LK INTL T NO.-6 .141-IN-ID	78189	1906-00
A5R1	0698-3162	2	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A5R2	0757-0180	2	RESISTOR 31.6 1% .125W F TC=0+-100	24546	C4, 7-0
A5R3	0757-0403	4	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A5R4	0757-0290	3	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A5R5	0757-0317	2	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A5R6	0698-3132	3	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A5R7	0698-3410	1	RESISTOR 3.16K 1% .5W F TC=0+-100	91637	MFF-1/2-10
A5R8	2100-3164	1	RESISTOR-TRMR 10 20% C SIDE-ADJ 17-TRN	32997	3006P-1-100
A5R9	0698-0085	5	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A5R10	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5R11	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A5R12	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A5R13	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	24546	C4, T-0
A5R14	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A5R15	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A5R16	0757-0401	10	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A5R17	0698-3446	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A5R18	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A5R19	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A5R20	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A5R21			NOT ASSIGNED		
A5R22	0698-3430	1	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A5R23	2100-3154		RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-102
A5R24	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A5R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A5R26	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A5R27	0757-0441	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A5R28	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A5R29	0698-3158	1	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A5R30	0757-0443	4	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A5R31	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A5R32	0757-0438	13	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A5R33	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A5R34	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A5R35	0757-0399	5	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A5R36	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A5R37	0698-3391	1	RESISTOR 21.5 1% .5W F TC=0+-100	19701	MF7C-1
A5R38	0757-0198	1	RESISTOR 100 1% .5W F TC=0+-100	19701	MF7C1/2-T0-101-F
A5R39	0698-5839	2	RESISTOR 9.1 5% .25W FC TC=-400/+500	01121	CB91G5
A5R40	0698-5839		RESISTOR 9.1 5% .25W FC TC=-400/+500	01121	CB91G5
A5R41	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	91637	CMF-55-1, T-1
A5R42	0698-3157	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A5TP1	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A5TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A5TP3	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A5TP4	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A5TP5	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A5TP6	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A5U1	1820-0158	1	IC LM 302 OP AMP	27014	LM302H
A6	08640-60328	1	ANNUNCIATOR ASSY	28480	08640-60328
A6DS1	2140-0427	6	LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS2	2140-0427		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS3	2140-0427		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS4	2140-0427		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS5	2140-0427		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6DS6	2140-0427		LAMP-INCAND 5VDC 60MA T-1-BULB	28480	2140-0427
A6R1	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7	08640-60047	1	FM SHAPING BOARD ASSY	28480	08640-60047
A7C1			NOT ASSIGNED		
A7C2			NOT ASSIGNED		
A7C3			NOT ASSIGNED		
A7C4			NOT ASSIGNED		
A7C5	0180-0141	2	CAPACITOR-FXD 50UF+75-10% 50VDC AL	56289	30D506G050DD2
A7C6	0180-1715		CAPACITOR-FXD 150UF+-10% 6VDC TA	56289	150D157X9006R2
A7C7	0160-2453	1	CAPACITOR-FXD .22UF +-10% 80WVDC POLYE	28480	0160-2453
A7C8	0180-1846	1	CAPACITOR-FXD 2.2UF+-10% 35VDC TA	56289	150D225X9035B2
A7C9	0160-2204	3	CAPACITOR-FXD 100PF +-5% 300WVDC MICA	28480	0160-2204
A7C10	0180-0141		CAPACITOR-FXD 50UF+75-10% 50VDC AL	56289	30D506G050DD2
A7C11	0180-1715		CAPACITOR-FXD 150UF+-10% 6VDC TA	56289	150D157X9006R2
A7C12	0160-2204		CAPACITOR-FXD 100PF +-5% 300WVDC MICA	28480	0160-2204
A7C13	0180-2206		CAPACITOR-FXD 60UF+-10% 6VDC TA	56289	150D606X9006B2
A7CR1	1901-0033	20	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR2	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR3	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR4	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR5	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR6	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR7	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR8	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR9	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR10	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7CR11	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR12	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR13	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR14	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR15	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR16	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR17	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR18	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR19	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR20	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7CR21	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A7J1	1250-0835	1	CONNECTOR-RF BNC M PC 50-OHM	98291	50-051-0000
A7K1	0490-1080	1	RELAY-REED 1C .25A 150V CONT 5V-COIL	28480	0490-1080
A7MP1	4040-0751	1	EXTRACTOR-PC BD ORN POLYC .062-BD-THKNS	28480	4040-0751
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A7MP2	4040-0748	1	EXTRACTOR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A7Q1	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7Q3	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A7Q4	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7Q5	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7Q6	1853-0038		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0038
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A7Q7	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7Q8	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A7R1- A7R10			NOT ASSIGNED		
A7R11	0757-0288	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-9091-F
A7R12			NOT ASSIGNED		
A7R13	0757-0279	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7R14			NOT ASSIGNED		
A7R15			NOT ASSIGNED		
A7R16	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A7R17	0698-3155	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7R18	0757-0123	2	RESISTOR 34.8K 1% .125W F TC=0+-100	24546	C4, T-0
A7R19	2100-3103	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-103
A7R20	0698-3152	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A7R21	0757-1094	3	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A7R22	0757-0278	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A7R23	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7R24	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A7R25	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A7R26	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A7R27	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A7R28	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A7R29	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7R30	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A7R31	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A7R32	0757-0395	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A7R33	0698-3435	1	RESISTOR 38.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-38R3-F
A7R34	0698-3432	2	RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A7R35	0757-0294	1	RESISTOR 17.8 1% .125W F TC=0+-100	19701	MF4C1/8-T0-17R8-F
A7R36	0698-3427	1	RESISTOR 13.3 1% .125W F TC=0+-100	03888	PME55-1/8-T0-13R3-F
A7R37	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7R38	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7R39	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A7R40	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A7R41	2100-3109		RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-202
A7R42	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7R43	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A7R44	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A7R45	0698-3159	1	RESISTOR 26.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2612-F
A7R46	0757-0123		RESISTOR 34.8K 1% .125W F TC=0+-100	24546	C4, T-0
A7R47	0698-3449		RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A7R48	0757-0199	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A7R49	0698-3136	1	RESISTOR 17.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1782-F
A7R50	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A7R51	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A7R52	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A7R53	0698-3151	2	RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7R54	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A7R55	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7R56	0698-3432		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
A7R57	0698-3433	1	RESISTOR 28.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0-28R7-F
A7R58	0698-3434	1	RESISTOR 34.8 1% .125W F TC=0+-100	24546	C4-1/8-T0-34R8-F
A7R59	0757-0316	1	RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A7R60	0757-0394	5	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A7R61	0757-0276	2	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A7R62	0757-0398	3	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A7R63	0757-0400	3	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A7R64	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A7R65	0757-0405	1	RESISTOR 162 1% .125W F TC=0+-100	24546	C4-1/8-T0-162R-F
A7R66	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7R67			NOT ASSIGNED		
A7R68			NOT ASSIGNED		
A7R69			NOT ASSIGNED		
A7R70	0698-3150	2	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7R71	0757-0424	1	RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1101-F
A7R72	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A7R73	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A7R74	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A7R75	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A7R76	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7R77	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A7R78	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A7R79	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A7TP1	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A7TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A7TP3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A7TP4	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A7U1			NOT ASSIGNED		
A7U2	1820-0125	1	IC UA 711C COMPARATOR	07263	711HC
A7U3	1820-0175	1	IC-DIGITAL SN7405N TTL HEX 1	01295	SN7405N
A7VR1			NOT ASSIGNED		
A7VR2	1902-3182	1	DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	28480	1902-3182
A8	08640-60070	1	MECHANICAL DIAL ASSEMBLY (SEE SERVICE SHEET C)	28480	08640-60070
	08640-00088	1	LABEL, MECHANICAL DIAL	28480	08640-00088
A8MP1	1410-0755	1	BALL:BEARING TYPE 0.250" DIA	00000	OBD
A8MP2	1430-0768	1	GEAR SPUR	28480	1430-0768
A8MP3	1460-1372	1	SPRING-TRSN	28480	1460-1372
A8MP4	1480-0078	10	PIN:SPIRAL 0.312" LG, TYPE 302	00000	OBD
A8MP5	8300-0012		CABLE:MECHANICAL	28480	8300-0012
A8MP6	08640-00010	1	COVER, DIAL	28480	08640-00010
A8MP7	08640-00075	1	SCALE, FREQUENCY	28480	08640-00075
A8MP8	08640-20056	10	PULLEY, CABLE	28480	08640-20056
A8MP9	08640-20121	1	DRUM, DIAL	28480	08640-20121
A8MP10	08640-20123	1	TRACK, CURSOR	28480	08640-20123
A8MP11	08640-20125	1	GEAR CURSOR DRIVER	28480	08640-20125
A8MP12	08640-40009	2	ENDCAP DRUM	28480	08640-40009
A8MP13	08640-40010	1	SUPPORT, DRUM, LEFT	28480	08640-40010
A8MP14	08640-40011	1	SUPPORT, DRUM, RIGHT	28480	08640-40011
A8MP15	08640-40012	1	CURSOR	28480	08640-40012
A8MP16	08640-40013	2	HUB, ADJUST DRIVE	28480	08640-40013
A8MP17	08640-40014	2	DRIVE BLOCK	28480	08640-40014
A8MP18	08640-40018	1	DRUM, DETENT HUB	28480	08640-40018
A8MP19	08640-40020	1	BEZEL, DIAL	28480	08640-40020
A8MP20	2200-0091	4	SCREW-MACH 4-40 .562-IN-LG PAN-HD-POZI	28480	2200-0091
A8MP21	2200-0166	2	SCREW-MACH 4-40 .312-IN-LG 82 DEG	28480	2200-0166
A8MP22	2190-0019		WASHER-LK HLCL NO. 4 .115-IN-ID	28480	2190-0019
A8MP23	3030-0058	2	SCREW-SET 4-40 .094-IN-LG OVAL-PT ALY	28480	3030-0058
A8MP24	3030-0196		SCREW-SET 4-40 .188-IN-LG SMALL CUP-PT	28480	3030-0196
A8MP25	3050-0105		WASHER-FL MTLC NO. 4 .125-IN-ID	28480	3050-0105
A8MP26	3050-0792	2	WASHER-SPRING NO. 5 .135 IN ID .37 IN OD	28480	3050-0792
A8MP27			NOT ASSIGNED		
A8MP28	08640-20161	2	RETAINER, DIAL CORD	28480	08640-20161
A8MP29	2200-0517	3	SCREW-MACH 4-40 .188-IN-LG FIL-HD	28480	2200-0517
A8MP30	3030-0515	1	SCREW-SET 4-40 .125-IN-LG PLAIN-PT SLTD	28480	3030-0515
A8MP31	2200-0107	2	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A8MP32	2200-0103	3	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A8MP33	2200-0143		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0143
A8MP34	2200-0518	4	SCREW-MACH 4-40 1.875-IN-LG 82 DEG FL-HD	28480	2200-0518
A8MP35	3050-0032	4	WASHER-FL MTLC NO. 8 .189-IN-ID	28480	3050-0032
A8MP36	3030-0006	2	SCREW-SET 6-32 .25-IN-LG SMALL CUP-PT	28480	3030-0006
A8MP37	08640-20197	1	SPACER, BUSHING	28480	08640-20197

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9	08640-60117	1	PEAK DEVIATION & RANGE SWITCH ASSEMBLY (EXCEPT OPT 002) (SEE SERVICE SHEET D)	28480	08640-60117
A9	08640-60073	1	PEAK DEVIATION & RANGE SWITCH ASSEMBLY (OPT 002 ONLY) (SEE SERVICE SHEET D)	28480	08640-60073
A9C1	0140-0191	5	CAPACITOR-FXD 56PF +-5% 300WVDC MICA	72136	DM15E560J0300WV1CR
A9C2	0140-0191		CAPACITOR-FXD 56PF +-5% 300WVDC MICA	72136	DM15E560J0300WV1CR
A9C3	0140-0191		CAPACITOR-FXD 56PF +-5% 300WVDC MICA	72136	DM15E560J0300WV1CR
A9C4	0140-0191		CAPACITOR-FXD 56PF +-5% 300WVDC MICA	72136	DM15E560J0300WV1CR
A9C5	0140-0191		CAPACITOR-FXD 56PF +-5% 300WVDC MICA	72136	DM15E560J0300WV1CR
A9C6			NOT ASSIGNED		
A9C7			NOT ASSIGNED		
A9C8	0140-0210	1	CAPACITOR-FXD 270PF +-5% 300WVDC MICA	72136	DM15F271J0300WV1CR
A9MP1	0510-0052		RETAINER-RING .125-DIA STL CD-PL	97464	7100-12-CD
A9MP2	1430-0759		GEAR SPUR	28480	1430-0759
A9MP3	1430-0772	2	GEAR:PLANET	28480	1430-0772
A9MP4	1430-0773	1	GEAR:COMBINATION	28480	1430-0773
A9MP5	1430-0774	1	GEAR:COMBINATION	28480	1430-0774
A9MP6	3050-0099	2	WASHER-FL MTLC NO.-12 .25-IN-ID .5-IN-OD	28480	3050-0099
A9MP7	5040-0218	1	COUPLER:SWITCH SHAFT	28480	5040-0218
A9MP8	08640-00019	1	SUPPORT, SWITCH (INCLUDES A9MP31 THRU 33)	28480	08640-00019
A9MP9	08640-40039	1	SHAFT, ADJUSTABLE	28480	08640-40039
A9MP10	08640-40045	1	SHAFT, SWITCH DELTA F BAND	28480	08640-40045
A9MP11	2200-0507	4	SCREW-MACH 4-40 2-IN-LG RD-HD-SLT STL	28480	2200-0508
A9MP12	0380-0409	2	SPACER-RND .125LG .114ID .154OD BRS	76854	3-5115-102
A9MP13	0380-0079	2	SPACER-RND .375LG .114ID .154OD STL	76854	8980-426
A9MP14	0380-0410	2	STANDOFF-RND .438LG .114ID .154OD STL (MAY REQUIRE ADDITIONAL SHIMMING)	76854	8980-428
A9MP15	3050-0082	2	WASHER-FL NM NO.-4 .116-IN-ID .188-IN-OD	76854	8942-3
A9MP16	0380-0426	2	SPACER-RND .5LG .116ID .156OD BRS (MAY REQUIRE ADDITIONAL SHIMMING)	76854	10918-432
A9MP17	2340-0003	6	NUT-HEX-DBL-CHAM 4-40-THD .094-THK	76854	22041-273
A9MP18	2950-0001		NUT-HEX-DBL-CHAM 3/8-32-THD .094-THK	28480	2950-0030
A9MP19	3130-1312	1	PLATE, SHIELD 1-3/8" DIA	76854	10008-614
A9MP20	2190-0555	1	WASHER-LK INTL T NO.-3/8 .384-IN-ID	28480	2190-0569
A9MP21	2190-0892	4	WASHER-LK HLCL NO.-4 .113-IN-ID	76854	12569-010
A9MP22	0540-0003	2	NUT-HEX-DBL-CHAM 5-40-THD .094-THK	76854	22081-275
A9MP23	2190-0020	2	WASHER-LK HLCL NO.-5 .128-IN-ID	28480	2190-0020
A9MP24	0380-0023	4	STANDOFF-RND .5LG .128ID .19OD STL CD-AU	76854	3457-432
A9MP25	0380-0021	2	STANDOFF-RND .312LG .128ID .19OD STL	76854	3457-420
A9MP26	0550-0004	2	SCREW-MACH 5-40 1.75-IN-LG RD-HD-SLT BRS	28480	0550-0004
A9MP27	0380-0075	2	SPACER-RND 1LG .114ID .154OD STL (MAY REQUIRE ADDITIONAL SHIMMING)	76854	8980-464
A9MP28	0380-0061	2	SPACER-RND .312LG .114ID .154OD STL	76854	8980-420
A9MP29	2200-0143		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0143
A9MP30	3030-0007		SCREW-SET 4-40-IN-LG SMALL CUP-PT	28480	3030-0007
A9MP31	0510-0015		RETAINER-RING .125-DIA CD PL STL (P/O A9MP8)	0018A	1500-12-CD
A9MP32	1430-0536	1	GEAR,SPUR (P/O A9MP8)	28480	1430-0536
A9MP33	08640-20095	1	SUPPORT, GEAR (P/O A9MP8)	28480	08640-20095
A9P1	1251-2799	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	251-15-30-400
A9R1	2100-3262	1	RESISTOR-VAR 2.5K 10% C	71450	550
A9R2			NOT ASSIGNED		
A9R3			NOT ASSIGNED		
A9R4	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R5	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A9R6	0757-0274	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A9R7	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A9R8	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A9R9	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R10	0698-8211	1	RESISTOR 2K .25% .25W F TC=0+-25	19701	MF52C1/4-T9-2001-C
A9R11	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A9R12	0698-8212	1	RESISTOR 6K .25% .125W F TC=0+-25	19701	MF4C1/4-T9-6001-C
A9R13	0698-5669	6	RESISTOR 1.5K .25% .125W F TC=0+-25	24546	NE55
A9R14	0698-8213	4	RESISTOR 3K .25% .125W F TC=0+-25	19701	MF4C1/4-T9-3001-C
A9R15	0698-5669		RESISTOR 1.5K .25% .125W F TC=0+-25	24546	NE55
A9R16	0698-8213		RESISTOR 3K .25% .125W F TC=0+-25	19701	MF4C1/4-T9-3001-C
A9R17	0698-5669		RESISTOR 1.5K .25% .125W F TC=0+-25	24546	NE55
A9R18	0698-8213		RESISTOR 3K .25% .125W F TC=0+-25	19701	MF4C1/4-T9-3001-C
A9R19	0698-5669		RESISTOR 1.5K .25% .125W F TC=0+-25	24546	NE55
A9R20	0698-8213		RESISTOR 3K .25% .125W F TC=0+-25	19701	MF4C1/4-T9-3001-C
A9R21	0698-5669		RESISTOR 1.5K .25% .125W F TC=0+-25	24546	NE55
A9R22	0698-5669		RESISTOR 1.5K .25% .125W F TC=0+-25	24546	NE55
A9R23	0698-8299	1	RESISTOR 4.259K .25% .125W F TC=0+-25	19701	MF4C1/8-T9-4259R-C
A9R24	0698-8298	1	RESISTOR 1.071K .25% .125W F TC=0+-25	19701	MF4C1/8-T9-1071R-C
A9R25	0698-8297	1	RESISTOR 1.284K .25% .125W F TC=0+-25	19701	MF4C1/8-T9-1284R-C

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9R26	0757-0398		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A9R27	0698-8296	1	RESISTOR 1.493K .25% .125W F TC=0+-25	19701	MF4C1/8-T9-1493R-C
A9R28	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A9R29	0698-8295	1	RESISTOR 1.556K .25% .125W F TC=0+-25	19701	MF4C1/8-T9-1556R-C
A9R30	0757-0400		RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A9R31	0757-0400		RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A9W1	08640-60107	1	CABLE ASSEMBLY, DF SWITCH BAND	28480	08640-60107
A10	08640-60105	1	DIVIDER/FILTER ASSY(SEE SERVICE SHEET E) (DOES NOT INCLUDE SHAFT COUPLER MP29)	28480	08640-60105
A10MP1	0403-0156	1	GUIDE-PC BD YEL POLYC .062-BD-THKNS 1-LG	28480	0403-0156
A10MP2	0403-0157	1	GUIDE-PC BD GRN POLYC .062-BD-THKNS 1-LG	28480	0403-0157
A10MP3	0403-0158	1	GUIDE-PC BD BLU POLYC .062-BD-THKNS 1-LG	28480	0403-0158
A10MP4	8160-0226		RFI ROUND STRIP NI ALY .062-OD	28480	8160-0226
A10MP5	08640-00047	1	SHIELD, SPRING #1	28480	08640-00047
A10MP6	08640-00048	1	SHIELD, SPRING #2	28480	08640-00048
A10MP7	08640-00049	1	SHIELD, SPRING #3	28480	08640-00049
A10MP8	08640-00050	1	SHIELD, SPRING #4	28480	08640-00050
A10MP9	08640-20268	1	CAST,TOP COVER, D/F	28480	08640-20268
A10MP10	08640-20269	1	CAST, CENTER, D/F	28480	08640-20269
A10MP11	2190-0003	1	WASHER-LK HLCL NO.-4 .115-IN-ID	28480	2190-0003
A10MP12	2200-0101	1	SCREW-MACH 4-40 .188-IN-LG PAN-HD-POZI	28480	2200-0101
A10MP13	2200-0121		SCREW-MACH 4-40 1.125-IN-LG PAN-HD-POZI	28480	2200-0121
A10MP14	2200-0147	1	SCREW-MACH 4-40 .5-IN-LG PAN-HD-POZI	28480	2200-0147
A10MP15	2200-0127		SCREW-MACH 4-40 1.75-IN-LG PAN-HD-POZI	28480	2200-0127
A10MP16	2190-0124	1	WASHER-LK INTL T NO.-10 .195-IN-ID	74163	500222
A10MP17	2950-0078	1	NUT-HEX-DBL-CHAM 10-32-THD .067-THK	74163	500220
A10MP18	2200-0129	2	SCREW-MACH 4-40 2-IN-LG PAN-HD-POZI	28480	2200-0129
A10MP19	0361-1071	1	RIVET:BLIND, DOME HD 0.125" DIA	11815	AAP-4-3
A10A1	08640-60204	1	RF FILTER ASSY	28480	08640-60204
A10A1C1	0160-2055	18	CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1C2	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1C9	0140-0219	2	CAPACITOR-FXD 180PF +-2% 300WVDC MICA	72136	DM15F181G0300WV1CR
A10A1C10	0140-0226	2	CAPACITOR-FXD 320PF +-1% 300WVDC MICA	72136	DM15F321F0300WV1C
A10A1C11	0140-0226		CAPACITOR-FXD 320PF +-1% 300WVDC MICA	72136	DM15F321F0300WV1C
A10A1C12	0140-0220	3	CAPACITOR-FXD 200PF +-1% 300WVDC MICA	72136	DM15F201F0300WV1CR
A10A1C13	0140-0195	2	CAPACITOR-FXD 130PF +-5% 300WVDC MICA	72136	DM15F131J0300WV1CR
A10A1C14	0140-0220		CAPACITOR-FXD 200PF +-1% 300WVDC MICA	72136	DM15F201F0300WV1CR
A10A1C15	0140-0220		CAPACITOR-FXD 200PF +-1% 300WVDC MICA	72136	DM15F201F0300WV1CR
A10A1C16	0140-0195		CAPACITOR-FXD 130PF +-5% 300WVDC MICA	72136	DM15F131J0300WV1CR
A10A1C17	0160-3156	2	CAPACITOR-FXD 750PF +-1% 300WVDC MICA	28480	0160-3156
A10A1C18	0160-3940	1	CAPACITOR-FXD 3200PF +-1% 100WVDC MICA	28480	0160-3940
A10A1C19	0160-2587	1	CAPACITOR-FXD 4000PF +-1% 100WVDC MICA	28480	0160-2587
A10A1C20	0160-4217	1	CAPACITOR-FXD 3900PF +-1% 500WVDC MICA	28480	0160-4217
A10A1C21	0160-2276	1	CAPACITOR-FXD 2780PF +-2% 300WVDC MICA	28480	0160-2276
A10A1C22	0140-0172	1	CAPACITOR-FXD 3000PF +-1% 100WVDC MICA	72136	DM19F302F0100WV1CR
A10A1C23	0160-2585	2	CAPACITOR-FXD 2000PF +-1% 100WVDC MICA	28480	0160-2585
A10A1C24	0160-2537	3	CAPACITOR-FXD 360PF +-1% 300WVDC MICA	28480	0160-2537
A10A1C25	0160-0341	2	CAPACITOR-FXD 640PF -1% 300WVDC MICA	28480	0160-0341
A10A1C26	0160-0341		CAPACITOR-FXD 640PF +-1% 300WVDC MICA	28480	0160-0341
A10A1C27	0140-0200	1	CAPACITOR-FXD 390PF +-5% 300WVDC MICA	72136	DM15F391J0300WV1CR
A10A1C28	0140-0199	2	CAPACITOR-FXD 240PF +-5% 300WVDC MICA	72136	DM15F241J0300WV1CR
A10A1C29	0160-0939		CAPACITOR-FXD 430PF +-5% 300WVDC MICA	28480	0160-0939
A10A1C30	0160-0939		CAPACITOR-FXD 430PF +-5% 300WVDC MICA	28480	0160-0939
A10A1C31	0140-0199		CAPACITOR-FXD 240PF +-5% 300WVDC MICA	72136	DM15F241J0300WV1CR
A10A1C32	0160-2537		CAPACITOR-FXD 360PF +-1% 300WVDC MICA	28480	0160-2537
A10A1C33	0160-3092	1	CAPACITOR-FXD 1600PF +-1% 100WVDC MICA	28480	0160-3092
A10A1C34	0160-2585		CAPACITOR-FXD 2000PF +-1% 100WVDC MICA	28480	0160-2585
A10A1C35	0160-3937	1	CAPACITOR-FXD 1916PF +-1% 100WVDC MICA	28480	0160-3937
A10A1C36	0160-3939	1	CAPACITOR-FXD 1400PF +-1% 100WVDC MICA	28480	0160-3939
A10A1C37	0160-3938	1	CAPACITOR-FXD 1470PF +-1% 100WVDC MICA	28480	0160-3938
A10A1C38	0160-2387	2	CAPACITOR-FXD 1000PF +-1% 500WVDC MICA	28480	0160-2387
A10A1C39	0160-0335	2	CAPACITOR-FXD 91PF +-1% 300WVDC MICA	28480	0160-0335
A10A1C40	0160-2206	2	CAPACITOR-FXD 160PF +-5% 300WVDC MICA	28480	0160-2206
A10A1C41	0160-2206		CAPACITOR-FXD 160PF +-5% 300WVDC MICA	28480	0160-2206
A10A1C42	0160-2204		CAPACITOR-FXD 100PF +-5% 300WVDC MICA	28480	0160-2204
A10A1C43	0140-0205	2	CAPACITOR-FXD 62PF +-5% 300WVDC MICA	72136	DM15E620J0300WV1CR
A10A1C44	0160-0839	2	CAPACITOR-FXD 110PF +-1% 300WVDC MICA	28480	0160-0839
A10A1C45	0160-0839		CAPACITOR-FXD 110PF +-1% 300WVDC MICA	28480	0160-0839

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10A1C46	0140-0205		CAPACITOR-FXD 82PF +-5% 300WVDC MICA	72136	DM15E820J0300WV1CR
A10A1C47	0140-0219		CAPACITOR-FXD 180PF +-2% 300WVDC MICA	72136	DM15F181G0300WV1CR
A10A1C48	0160-0342	1	CAPACITOR-FXD 800PF +-1% 300WVDC MICA	28480	0160-0342
A10A1C49	0160-2387		CAPACITOR-FXD 1000PF +-1% 500WVDC MICA	28480	0160-2387
A10A1C50	0160-3935	1	CAPACITOR-FXD 958PF +-1% 100WVDC MICA	28480	0160-3935
A10A1C51	0160-3936	1	CAPACITOR-FXD 700PF +-1% 100WVDC MICA	28480	0160-3936
A10A1C52	0160-3156		CAPACITOR-FXD 750PF +-1% 300WVDC MICA	28480	0160-3156
A10A1C53	0140-0234	2	CAPACITOR-FXD 500PF +-1% 300WVDC MICA	72136	DM15F501F0300WV1C
A10A1C54	0160-2307	1	CAPACITOR-FXD 47PF +-5% 300WVDC MICA	28480	0160-2307
A10A1C55	0160-0974	2	CAPACITOR-FXD 80PF +-2% 300WVDC MICA	28480	0160-0974
A10A1C56	0160-0974		CAPACITOR-FXD 80PF +-2% 300WVDC MICA	28480	0160-0974
A10A1C57	0160-2201	3	CAPACITOR-FXD 51PF +-5% 300WVDC MICA	28480	0160-2201
A10A1C58	0160-2306	1	CAPACITOR-FXD 27PF +-5% 300WVDC MICA	28480	0160-2306
A10A1C59	0160-2201		CAPACITOR-FXD 51PF +-5% 300WVDC MICA	28480	0160-2201
A10A1C60	0160-2201		CAPACITOR-FXD 51PF +-5% 300WVDC MICA	28480	0160-2201
A10A1C61	0160-2199		CAPACITOR-FXD 30PF +-5% 300WVDC MICA	28480	0160-2199
A10A1C62	0160-0335		CAPACITOR-FXD 91PF +-1% 300WVDC MICA	28480	0160-0335
A10A1C63	0140-0177	1	CAPACITOR-FXD 400PF +-1% 300WVDC MICA	72136	DM15F401F0300WV1CR
A10A1C64	0140-0234		CAPACITOR-FXD 500PF +-1% 300WVDC MICA	72136	DM15F501F0300WV1C
A10A1C65	0140-0233	1	CAPACITOR-FXD 680PF +-1% 300WVDC MICA	72136	DM15F681F0300WV1C
A10A1C66	0160-3934	1	CAPACITOR-FXD 350PF +-1% 100WVDC MICA	28480	0160-3934
A10A1C67	0160-2537		CAPACITOR-FXD 360PF +-1% 300WVDC MICA	28480	0160-2537
A10A1C68	0160-3046	1	CAPACITOR-FXD 250PF +-1% 100WVDC MICA	28480	0160-3046
A10A1C69	0160-2265	1	CAPACITOR-FXD 22PF +-5% 500WVDC CER	28480	0160-2265
A10A1C70	0140-0190	2	CAPACITOR-FXD 39PF +-5% 300WVDC MICA	72136	DM15E390J0300WV1CR
A10A1C71	0140-0190		CAPACITOR-FXD 39PF +-5% 300WVDC MICA	72136	DM15E390J0300WV1CR
A10A1C72	0160-2266	3	CAPACITOR-FXD 24PF +-5% 500WVDC CER	28480	0160-2266
A10A1C73	0160-2260	1	CAPACITOR-FXD 13PF +-5% 500WVDC CER	28480	0160-2260
A10A1C74	0160-2266		CAPACITOR-FXD 24PF +-5% 500WVDC CER	28480	0160-2266
A10A1C75	0160-2266		CAPACITOR-FXD 24PF +-5% 500WVDC CER	28480	0160-2266
A10A1C76	0160-2262	1	CAPACITOR-FXD 16PF +-5% 500WVDC CER	28480	0160-2262
A10A1C77	0160-2257	2	CAPACITOR-FXD 10PF +-5% 500WVDC CER	28480	0160-2257
A10A1C78	0160-2263	2	CAPACITOR-FXD 18PF +-5% 500WVDC CER	28480	0160-2263
A10A1C79	0160-2263		CAPACITOR-FXD 18PF +-5% 500WVDC CER	28480	0160-2263
A10A1C80	0160-2257		CAPACITOR-FXD 10PF +-5% 500WVDC CER	28480	0160-2257
A10A1C81	0121-0060	2	CAPACITOR-V TRMR-CER 2/8PF 350V PC-MTG	00868	304322 2/8PF NPO
A10A1C82	0121-0061	2	CAPACITOR-V TRMR-CER 5.5/18PF 350V	00868	304322 5.5/18PF NPO
A10A1C83	0121-0061		CAPACITOR-V TRMR-CER 5.5/18PF 350V	00868	304322 5.5/18PF NPO
A10A1C84	0121-0060		CAPACITOR-V TRMR-CER 2/8PF 350V PC-MTG	00868	304322 2/8PF NPO
A10A1C85	0160-0174	3	CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A10A1C86	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A1C87	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A10A1C88	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A1C89	0160-0174		CAPACITOR-FXD .47UF +80-20% 25WVDC CER	28480	0160-0174
A10A1C90	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A1C91	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A1FL1	0160-0204		FILTER-LP STUD-TERMB	01121	BMFB-A2
A10A1FL2	0160-0204		FILTER-LP STUD-TERMB	01121	BMFB-A2
A10A1FL3	0160-0204		FILTER-LP STUD-TERMB	01121	BMFB-A2
A10A1J1	1250-1220	4	CONNECTOR-RF SMC M PC	98291	50-051-0109
A10A1J2	1250-1220		CONNECTOR-RF SMC M PC	98291	50-051-0109
A10A1J3	1250-1220		CONNECTOR-RF SMC M PC	98291	50-051-0109
A10A1J4	1250-1220		CONNECTOR-RF SMC M PC	98291	50-051-0109
A10A1K1	0490-1073	4	RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A10A1K2	0490-1073		RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A10A1K3	0490-1073		RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A10A1K4	0490-1073		RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A10A1L1	9100-3375	2	COIL-MLD 462NH 5% Q=40 .19DX.385LG	0004A	AE-.462J-P
A10A1L2	9100-3365	2	COIL-MLD 500NH 5% Q=40 .19DX.385LG	0004A	AE-.500J-P
A10A1L3	9100-3375		COIL-MLD 462NH 5% Q=40 .19DX.385LG	0004A	AE-.462J-P
A10A1L4	9100-3361	2	COIL-MLD 300NH 5% Q=40 .19DX.385LG	28480	9100-3361
A10A1L5	9100-3362	1	COIL-MLD 323NH 5% Q=40 .2DX.385LG	0004A	AD-.323J-P
A10A1L6	9100-3361		COIL-MLD 300NH 5% Q=40 .19DX.385LG	28480	9100-3361
A10A1L7	9100-3364	1	COIL-MLD 6UH 5% Q=40 .2DX.385LG SRF=1MHZ	0004A	AH-6.00J-I
A10A1L8	9100-3374	2	COIL-MLD 4UH 5% Q=40 .19DX.385LG	0004A	AK-4.00J-P
A10A1L9	9100-3363	1	COIL-MLD 4.7UH 5% Q=40 .19DX.385LG	0004A	AK-4.7J-P
A10A1L10	9100-3369	2	COIL-MLD 924NH 5% Q=40 .19DX.385LG	0004A	AF-.924J-P
A10A1L11	9100-3370	3	COIL-MLD 1UH 5% Q=40 .19DX.385LG	0004A	AF-1.00J-P
A10A1L12	9100-3369		COIL-MLD 924NH 5% Q=40 .19DX.385LG	0004A	AF-.924J-P
A10A1L13	9100-3368	2	COIL-MLD 600NH 5% Q=40 .19DX.385LG	0004A	AE-.600J-P
A10A1L14	9100-3367	2	COIL-MLD 646NH 5% Q=40 .19DX.385LG	0004A	AE-.646J-P
A10A1L15	9100-3368		COIL-MLD 600NH 5% Q=40 .19DX.385LG	0004A	AE-.600J-P
A10A1L16	9100-3374		COIL-MLD 4UH 5% Q=40 .19DX.385LG	0004A	AK-4.00J-P
A10A1L17	9100-3372	2	COIL-MLD 2UH 5% Q=40 .19DX.385LG	0004A	AJ-2.00J-P
A10A1L18	9100-3373	1	COIL-MLD 2.37UH 5% Q=40 .19DX.385LG	0004A	AJ-2.37J-P
A10A1L19	9100-3359	2	COIL-MLD 231NH 5% Q=40 .19DX.385LG	0004A	AC-.231J-P
A10A1L20	9100-3360	1	COIL-MLD 250NH 5% Q=40 .19DX.385LG	0004A	AC-.250J-P

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10A1L21	9100-3359		COIL-MLD 231NH 5% Q=40 .19DX.385LG	0004A	AC-.231J-P
A10A1L22	9100-3357	2	COIL-MLD 150NH 5% Q=40 .19DX.385LG	0004A	AC-.150J-P
A10A1L23	9100-3358	1	COIL-MLD 162NH 5% Q=40 .19DX.385LG	0004A	AC-.162J-P
A10A1L24	9100-3357		COIL-MLD 150NH 5% Q=40 .19DX.385LG	0004A	AC-.150J-P
A10A1L25	9100-3372		COIL-MLD 2UH 5% Q=40 .19DX.385LG	0004A	AJ-2.00J-P
A10A1L26	9100-3370		COIL-MLD 1UH 5% Q=40 .19DX.385LG	0004A	AF-1.00J-P
A10A1L27	9100-3371	1	COIL-MLD 1.18UH 5% Q=40 .19DX.385LG	0004A	AG-1.18J-P
A10A1L28	9100-3355	2	COIL-MLD 115NH 5% Q=40 .19DX.385LG	0004A	AC-.115J-P
A10A1L29	9100-3356	1	COIL-MLD 125NH 5% Q=40 .19DX.385LG	0004A	AC-.125J-P
A10A1L30	9100-3355		COIL-MLD 115NH 5% Q=40 .19DX.385LG	0004A	AC-.115J-P
A10A1L31	9100-3513	3	COIL-FXD NON-MOLDED RF CHOKE 75UH	24226	8123-2
A10A1L32	9100-3513		COIL-FXD NON-MOLDED RF CHOKE 75UH	24226	8123-2
A10A1L33	9100-3513		COIL-FXD NON-MOLDED RF CHOKE 75UH	24226	8123-2
A10A1L34	9100-3370		COIL-MLD 1UH 5% Q=40 .19DX.385LG	0004A	AF-1.00J-P
A10A1L35	9100-3365		COIL-MLD 500NH 5% Q=40 .19DX.385LG	0004A	AE-.500J-P
A10A1L36	9100-3366	1	COIL-MLD 592NH 5% Q=40 .19DX.385LG	0004A	AE-.592J-P
A10A1L37	9100-3512	3	COIL-FXD NON-MOLDED RF CHOKE 50UH	24226	8123-1
A10A1L38	9100-3512		COIL-FXD NON-MOLDED RF CHOKE 50UH	24226	8123-1
A10A1L39	9100-3512		COIL-FXD NON-MOLDED RF CHOKE 50UH	24226	8123-1
A10A1L40	9100-3514	6	COIL-FXD NON-MOLDED RF CHOKE 30UH	24226	8123-3
A10A1L41	9100-3514		COIL-FXD NON-MOLDED RF CHOKE 30UH	24226	8123-3
A10A1L42	9100-3514		COIL-FXD NON-MOLDED RF CHOKE 30UH	24226	8123-3
A10A1L43	9100-3514		COIL-FXD NON-MOLDED RF CHOKE 30UH	24226	8123-3
A10A1L44	9100-3514		COIL-FXD NON-MOLDED RF CHOKE 30UH	24226	8123-3
A10A1L45	9100-3514		COIL-FXD NON-MOLDED RF CHOKE 30UH	24226	8123-3
A10A1L46			PART OF ETCHED CIRCUIT BOARD		
A10A1L47			PART OF ETCHED CIRCUIT BOARD		
A10A1L48			PART OF ETCHED CIRCUIT BOARD		
A10A1L49	9140-0144	2	COIL-FXD MOLDED RF CHOKE 4.7UH 10%	24226	10/471
A10A1L50	9140-0144		COIL-FXD MOLDED RF CHOKE 4.7UH 10%	24226	10/471
A10A1L51	08640-80001	4	FILTER, TOROID	28480	08640-80001
A10A1L52	08640-80001		FILTER, TOROID	28480	08640-80001
A10A1L53	08640-80001		FILTER, TOROID	28480	08640-80001
A10A1L54	08640-80001		FILTER, TOROID	28480	08640-80001
A10A1MP1	1480-0352	1	PIN:DETENT 0.055 X 0.750" DIA	00000	1480-0352
A10A1MP2	00335-20034	1	ROLLER, DETENT	28480	00335-20034
A10A1MP3	08640-00029	1	SPRING, DETENT	28480	08640-00029
A10A1MP4	08640-20082	1	SHAFT, CAM	28480	08640-20082
A10A1MP5	08640-20083	1	SHAFT, CAM FOLL	28480	08640-20083
A10A1MP6	08640-20274	1	DIVIDER/FILTER COVER (BOTTOM)	28480	08640-20274
A10A1MP7	08640-20214	1	BUSHING, CAM HOUSING	28480	08640-20214
A10A1MP8	08640-20283	1	COVER, CAM, ALC	28480	08640-20283
A10A1MP9	08640-40004	1	FOLLOWER, CAM	28480	08640-40004
A10A1MP10	08640-20261	1	CLAMP, SLIDER	28480	08640-20261
A10A1MP11	2200-0105	1	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A10A1MP12	08640-20133	1	SUPPORT, CLAMP	28480	08640-20133
A10A1MP13	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A10A1MP14	2200-0145	1	SCREW-MACH 4-40 .438-IN-LG PAN-HD-POZI	28480	2200-0145
A10A1MP15	08640-20206	1	RETAINER, SLIDER	28480	08640-20206
A10A1MP16	0510-0015		RETAINER-RING .125-DIA CD PL STL	0018A	1500-12-CD
A10A1R1	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1R2	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1R3	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1R4	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1R5	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1R6	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1R7	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1R8	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1R9	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A1S1	08640-60106	6	SWITCH, SLIDE D/F	28480	08640-60106
	3130-0480	6	CONTACT:SWITCH	28480	3130-0480
A10A1S2	08640-60106		SWITCH, SLIDE D/F	28480	08640-60106
	3130-0480		CONTACT:SWITCH	28480	3130-0480
A10A1S3	08640-60106		SWITCH, SLIDE D/F	28480	08640-60106
	3130-0480		CONTACT:SWITCH	28480	3130-0480
A10A1S4	08640-60106		SWITCH, SLIDE D/F	28480	08640-60106
	3130-0480		CONTACT:SWITCH	28480	3130-0480
A10A1S5	08640-60106		SWITCH, SLIDE D/F	28480	08640-60106
	3130-0480		CONTACT:SWITCH	28480	3130-0480
A10A1S6	08640-60106		SWITCH, SLIDE D/F	28480	08640-60106
	3130-0480		CONTACT:SWITCH	28480	3130-0480
A10A1W1	8120-1830	1	CABLE-COAX 50 OHM .086-OD	28480	8120-1830
A10A1W2	8120-1832	1	CABLE-COAX 50 OHM .086-OD	28480	8120-1832
A10A1W3	8120-1831	1	CABLE-COAX 50 OHM .086-OD	28480	8120-1831

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10A1XA10A3A	1251-2035	2	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-300
A10A1XA10A3B	1251-2026	2	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	71785	252-18-30-300
A10A2	08640-60023	1	RF DIVIDER ASSY	28480	08640-60023
A10A2C1	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C2	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C3	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C4	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C5			NOT ASSIGNED		
A10A2C6	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C7	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C8	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C11	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C13	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C14	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C15	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C16	0180-0100	2	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A10A2C17	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C18	0180-0100		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A10A2C19	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C20	0180-0374	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A10A2C21	0180-1743	10	CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C22			NOT ASSIGNED		
A10A2C23	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A10A2C24	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C25	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C26	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C27	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C28	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C29	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C30	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C31	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C32	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C33	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C34	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C35	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C38	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C39	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C41	0160-2055		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A10A2C42	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C43	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C44	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C45	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C46	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C47	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C48	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C49	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C50	0180-1743		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C51	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2C52	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C53	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C54	0160-3456		CAPACITOR-FXD 1000PF +-10% 1000WVDC CER	28480	0160-3456
A10A2CR1	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR2	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR3	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR4	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR5	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR6	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR7	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR8	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR9	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2L1			PART OF ETCHED CIRCUIT BOARD		
A10A2L2			NOT ASSIGNED		
A10A2L3	9100-1620	5	COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A10A2L4	9140-0096	1	COIL-MLD 1UH 10% Q=50 .155DX.375LG	99800	1537-12
A10A2L5	9100-1612	1	COIL-MLD 330NH 20% Q=45 .155DX.375LG	99800	1537-04
A10A2L6	9140-0094	1	COIL-MLD 680NH 10% Q=50 .155DX.375LG	24226	15/680
A10A2L7	9100-1615	1	COIL-MLD 1.2UH 10% Q=33 .155DX.375LG	24226	15/121
A10A2L8	9140-0098	1	COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	24226	15/221
A10A2L9	9100-1618	1	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	99800	1537-30
A10A2L10	9140-0114	1	COIL-MLD 10UH 10% Q=55 .155DX.375LG	99800	1537-36

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10A2L11	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A10A2L12	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A10A2L13	9100-1628	2	COIL-MLD 43UH 5% Q=60 .155DX.375LG	24226	15/432
A10A2L14	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A10A2L15	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A10A2L16	9100-1628		COIL-MLD 43UH 5% Q=60 .155DX.375LG	24226	15/432
A10A2Q1	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A10A2Q2	1853-0034	3	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A10A2Q3	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A10A2Q4	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A10A2Q5	1854-0345	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	04713	2N5179
A10A2R1	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R2	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R3	0757-0276		RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A10A2R4	0757-0984	9	RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R5	0757-0438	7	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R6	0698-7197	1	RESISTOR 23.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-23R7-G
A10A2R7	0698-7221	2	RESISTOR 237 1% .05W F TC=0+-100	24546	C3-1/8-T0-237R-G
A10A2R8	0698-7221		RESISTOR 237 1% .05W F TC=0+-100	24546	C3-1/8-T0-237R-G
A10A2R9	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R10	0757-0984		RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R11	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R12	0698-7200	2	RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A10A2R13	0698-7218	4	RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R14	0698-7218		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R15	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R16	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R17	0757-0984		RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R18	0698-7200		RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A10A2R19	0698-7218		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R20	0698-7218		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R21	0757-0398		RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A10A2R22	0757-0984		RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R23	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R24	0698-7224		RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-T0-316R-G
A10A2R25	0698-7219	2	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-G
A10A2R26	0698-7190	2	RESISTOR 12.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-12R1-G
A10A2R27	0698-7227	4	RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R28	0698-7227		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R29	0698-3437	1	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A10A2R30	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A10A2R31	0757-0984		RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R32	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R33	0698-7224		RESISTOR 316 1% .05W F TC=0+-100	24546	C3-1/8-T0-316R-G
A10A2R34	0698-7219		RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-G
A10A2R35	0698-7190		RESISTOR 12.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-12R1-G
A10A2R36	0698-7227		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R37	0698-7227		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R38			NOT ASSIGNED		
A10A2R39			NOT ASSIGNED		
A10A2R40	0757-0984		RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R41	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R42	0757-0984		RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R43	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R44	0757-0984		RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R45	0698-7253	2	RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A10A2R46	0698-7253		RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A10A2R47	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A2R48	0698-3444	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A2R49	0757-0379	1	RESISTOR 12.1 1% .125W F TC=0+-100	19701	MF4C1/8-T0-12R1-F
A10A2R50	0698-3447	2	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A2R51	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A2R52	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R53	0757-0984		RESISTOR 10 1% .5W F TC=0+-100	19701	MF7C1/2-T0-10R0-F
A10A2R54	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R55	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A10A2R56			NOT ASSIGNED		
A10A2R57	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A10A2R58	0698-3243	1	RESISTOR 178K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1783-F
A10A2R59	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R60	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R61	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R62	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10A2T1	08553-6012	5	TRANSFORMER,RF(CODE = BLUE)	28480	08553-6012
A10A2T2	08553-6012		TRANSFORMER,RF(CODE = BLUE)	28480	08553-6012
A10A2T3	08553-6012		TRANSFORMER,RF(CODE = BLUE)	28480	08553-6012
A10A2T4	08553-6012		TRANSFORMER,RF(CODE = BLUE)	28480	08553-6012
A10A2T5	08553-6012		TRANSFORMER,RF(CODE = BLUE)	28480	08553-6012
A10A2T6	08640-80002	1	TRANSFORMER, RF 12-TURN	28480	08640-80002
A10A2TP1	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A10A2TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A10A2TP3	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A10A2TP4	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A10A2U1	1826-0303	1	IC CA 741 OP AMP	02735	CA741CG
A10A2U2	1820-0102	4	IC-DIGITAL MC1013P ECL J-K	04713	MC1013P
A10A2U3	1820-0102		IC-DIGITAL MC1013P ECL J-K	04713	MC1013P
A10A2U4	1820-0102		IC-DIGITAL MC1013P ECL J-K	04713	MC1013P
A10A2U5	1820-0143	2	IC-DIGITAL MC1027P ECL J-K	04713	MC1027P
A10A2U6	1820-0535	1	IC-DIGITAL SN75451BP TTL DUAL 2 AND	01295	SN75451BP
A10A2U7	1820-0145	5	IC-DIGITAL MC1010P ECL QUAD 2 NOR	04713	MC1010P
A10A2U8	1820-0145		IC-DIGITAL MC1010P ECL QUAD 2 NOR	04713	MC1010P
A10A2U9	1820-0145		IC-DIGITAL MC1010P ECL QUAD 2 NOR	04713	MC1010P
A10A2U10	1820-0753	3	IC-DIGITAL ECL DUAL 3	28480	1820-0753
A10A2U11	1820-0982	1	IC 5084-0168 DIFF AMPL	28480	1820-0982
A10A2U12	1820-0736	1	IC-DIGITAL ECL DUAL BIN	28480	1820-0736
A10A2U13	1820-0753		IC-DIGITAL ECL DUAL 3	28480	1820-0753
A10A2U14	1820-1354	1	IC-DIGITAL ECL BIN	28480	1820-1354
A10A2U15	1820-0753		IC-DIGITAL ECL DUAL 3	28480	1820-0753
A10A2U16	1820-0557	1	IC-DIGITAL ECL D-M/S	28480	1820-0557
A10A2U17	1820-0145		IC-DIGITAL MC1010P ECL QUAD 2 NOR	04713	MC1010P
A10A2U18	1820-0143		IC-DIGITAL MC1027P ECL J-K	04713	MC1027P
A10A2U19	1820-0145		IC-DIGITAL MC1010P ECL QUAD 2 NOR	04713	MC1010P
A10A2U20	1820-0102		IC-DIGITAL MC1013P ECL J-K	04713	MC1013P
A10A2VR1	1902-3002	1	DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	15818	CD 35526
A10A2W1	8120-1823	1	CABLE-COAX 50 OHM ,086-OD	28480	8120-1823
A10A2W2	8120-1824	1	CABLE-COAX 50 OHM ,086-OD	28480	8120-1824
A10A2W3	8120-1825	1	CABLE-COAX 50 OHM ,086-OD	28480	8120-1825
A10A2W4	8120-1826	1	CABLE-COAX 50 OHM ,086-OD	28480	8120-1826
A10A2W5	8120-1828	1	CABLE-COAX 50 OHM ,086-OD	28480	8120-1828
A10A2W6	8120-1827	1	CAP,E-COAX 50 OHM ,086-OD	28480	8120-1827
A10A2W7	8120-1829	1	CABLE-COAX 50 OHM ,086-OD	28480	8120-1829
A10A3	08640-60022	1	RISER ASSY	28480	08640-60022
A10A3XA10A2A	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-300
A10A3XA10A2B	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	71785	252-18-30-300

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11	08640-60052	1	FIXED AUDIO OSCILLATOR ASSEMBLY (EXCEPT OPTION 001)	28480	08640-60052
A11C1	0160-3548	1	CAPACITOR-FXD .01UF +-1% 100WVDC MICA	28480	0160-3548
A11C2	0160-0336	1	CAPACITOR-FXD 100PF +-1% 300WVDC MICA	28480	0160-0336
A11C3	0180-0094	2	CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A11C4	0180-0094		CAPACITOR-FXD 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A11C5	0180-2206		CAPACITOR-FXD 60UF+-10% 6VDC TA	56289	150D606X9006B2
A11C6	0180-1746	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A11C7	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A11CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11MP1	4040-0749		EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A11Q1	1854-0003	4	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A11Q2	1854-0003		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A11Q3	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11Q4	1854-0003		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A11Q5	1854-0003		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A11Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11R1			NOT ASSIGNED		
A11R2	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11R3	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11R4	0698-3457	1	RESISTOR 316K 1% .125W F TC=0+-100	91637	CMF-55-1, T-1
A11R5	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A11R6	2100-1758	1	RESISTOR-TRMR 1K 5% WW SIDE-ADJ 1-TURN	80294	CT-106-4
A11R7	0698-3151		RESISTOR 2.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2871-F
A11R8	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11R9	0698-3453	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A11R10	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11R11	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11R12	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11R13	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A11R14	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A11R15	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R16	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R17	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R18	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R19	0698-0024		RESISTOR 2.61K 1% .5W F TC=0+-100	91637	MFF-1/2-10
A11R20	0698-0024		RESISTOR 2.61K 1% .5W F TC=0+-100	91637	MFF-1/2-10
A11R21	0698-0024		RESISTOR 2.61K 1% .5W F TC=0+-100	91637	MFF-1/2-10
A11R22	0698-0024		RESISTOR 2.61K 1% .5W F TC=0+-100	91637	MFF-1/2-10
A11R23	0757-1100		RESISTOR 600 1% .125W F TC=0+-100	24546	C4-1/8-T0-601-F
A11R24	0757-1100		RESISTOR 600 1% .125W F TC=0+-100	24546	C4-1/8-T0-601-F
A11R25	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R26	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11TP1	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP3	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP4	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP5	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP6	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11U1	1826-0007	1	IC UA 741 OP AMP	28480	1826-0007
A11VR1	1902-0049	2	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A11VR2	1902-0049		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A11A1	08640-60020	1	FIXED AUDIO OSCILLATOR BOARD ASSEMBLY	28480	08640-60020
A11A1MP1	08640-20218	1	HOUSING, GEAR SPROCKET, AUDIO	28480	08640-20218
A11A1R1	0698-8272	2	RESISTOR 157K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1573-F
A11A1R2	0757-0479	2	RESISTOR 392K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-3923-F
A11A1R3	0698-8272		RESISTOR 157K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1573-F
A11A1R4	0757-0479		RESISTOR 392K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-3923-F
A11A1S1	3100-3091	1	SWITCH:ROTARY	28480	3100-3091

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11	08640-60019	1	VARIABLE AUDIO OSCILLATOR ASSEMBLY (OPTION 001 ONLY,SEE SERVICE SHEET D) (DOES NOT INCLUDE MP91-MP93)	28480	08640-60019
A11C1	0121-0477	1	CAPACITOR-V AIR DIEL 10.1/365.7PF 350V (INCLUDES C2 AND C3)	80486	2112 MODIFIED
A11C2			(PART OF A11C1)		
A11C3			(PART OF A11C1)		
A11C4	0160-2257	1	CAPACITOR-FXD 10PF +-5% 500WVDC CER	28480	0160-2257
A11C5	0160-2261	2	CAPACITOR-FXD 15PF +-5% 500WVDC CER	28480	0160-2261
A11C6	0140-0213	2	CAPACITOR-FXD 2000PF +-1% 300WVDC MICA	72136	DM19F202F0300WV1CR
A11C7	0140-0213		CAPACITOR-FXD 2000PF +-1% 300WVDC MICA	72136	DM19F202F0300WV1CR
A11C8	0160-2055	1	CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A11C9	0121-0036	1	CAPACITOR-V TRMR-CER 5.5/18PF 350V	73899	DV11PR18A
A11C10	0180-0374	1	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X902082
A11C11	0160-2204	1	CAPACITOR-FXD 100PF +-5% 300WVDC MICA	28480	0160-2204
A11C12	0160-2199	1	CAPACITOR-FXD 30PF +-5% 300WVDC MICA	28480	0160-2199
A11C13	0180-0116	4	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A11C14	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A11C15	0180-1714	2	CAPACITOR-FXD 330UF+-10% 6VDC TA	56289	150D337X9006B2
A11C16	0180-1714		CAPACITOR-FXD 330UF+-10% 6VDC TA	56289	150D337X9006B2
A11C17	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A11C18	0180-0116		CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A11C19	0180-0228	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A11C20	0160-2261		CAPACITOR-FXD 15PF +-5% 500WVDC CER	28480	0160-2261
A11C21	0160-2236	1	CAPACITOR-FXD 1PF +-.25PF 500WVDC CER	28480	0160-2236
A11C22	0180-2207	2	CAPACITOR-FXD 100UF+-10% 10VDC TA	56289	150D107X9010R2
A11C23	0180-2207		CAPACITOR-FXD 100UF+-10% 10VDC TA	56289	150D107X9010R2
A11CR1	1901-0040	10	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR6	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR7	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR8	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR9	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A11MP1	0340-0037	2	TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0037
	0340-0039	2	TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
A11MP2	0340-0037		TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0037
	0340-0039		TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
A11MP3	1430-0764	1	GEAR: SPUR	28480	1430-0764
A11MP4	08640-00006	1	COVER, AUDIO OSCILLATOR	28480	08640-00006
A11MP5	08640-20090	1	SUPPORT, COVER, AUDIO OSCILLATOR	28480	08640-20090
A11MP6	08640-00008	1	COVER, BACK AUDIO OSCILLATOR	28480	08640-00008
A11MP7	08640-20062	1	SPACER, BUSHING	28480	08640-20062
A11MP8	2200-0103	1	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A11MP9	0570-0111	1	SCREW-MACH 6-32 .375-IN-LG RD-HD-SLT	95987	N-632-3/8
A11MP10	2190-0004	1	WASHER-LK INTL T NO.-4 .115-IN-ID	0G791	418-BC EVERLOCK WASHER
A11MP11	2260-0009	1	NUT-HEX-W/LKWR 8-40-THD .094-THK .25-A/F	28480	2260-0011
A11MP12	0403-0026	1	GLIDE:NYLON	28480	0403-0026
A11MP13	4040-0749	1	EXTR-PC RD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-0073	1	PIN:DRIVE 0.250" LG	00000	0BD
A11MP14	2950-0043	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-THK	73743	2X 28200
A11MP15	2190-0016	1	WASHER-LK INTL T NO.-3/8 .377-IN-ID	28480	2190-0016
A11MP16	3050-0067	1	WASHER-FL MTLC NO.-5/16 .375-IN-ID	73734	31550
A11MP17	08640-00087	1	INSULATOR, VAR AUD OSC.	28480	08640-00087
A11MP18	3050-0032	2	WASHER-FL MTLC NO.-8 .189-IN-ID	28480	3050-0032
A11MP19	2190-0363	1	WASHER-FL MTLC NO.-5 .13-IN-ID	28480	2190-0363
A11Q1	1853-0050	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A11Q2	1854-0071	3	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
	1200-0173	2	INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A11Q3	1853-0276	2	TRANSISTOR PNP SI TO-52 PD=360MW	04713	MM3906
A11Q4	1854-0351	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0351
A11Q5	1854-0003	2	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A11Q6	1854-0003		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A11Q7	1854-0351		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0351
A11Q8	1853-0276		TRANSISTOR PNP SI TO-52 PD=360MW	04713	MM3906
A11Q9	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11Q10	1853-0020	1	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A11Q11	1855-0062	1	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0062
A11Q12	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11R1	0698-8294	2	RESISTOR 21.5M 1% .5W F TC=0+-100	28480	0698-8294
A11R2	0698-3453	2	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A11R3	0698-4508	1	RESISTOR 78.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7872-F
A11R4	0698-8294		RESISTOR 21.5M 1% .5W F TC=0+-100	28480	0698-8294
A11R5	0698-3451	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A11R6	0757-0472	1	RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A11R7	0757-0401	8	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R8	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R9	0757-0441	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A11R10	0757-0447	1	RESISTOR 16.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1622-F
A11R11	0757-0199	5	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A11R12	0757-0442	6	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R13	0757-0279	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A11R14	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A11R15	0698-0082	2	RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A11R16	0757-0200	2	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A11R17	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R18	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R19	0757-0395	5	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A11R20	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R21	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A11R22	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A11R23	0757-0346	4	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11R24	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11R25	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R26	0698-3156	2	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A11R27	0757-0280	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11R28	2100-2574	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	30983	ET50X501
A11R29			NOT ASSIGNED		
A11R30	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11R31	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A11R32	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A11R33	0698-3453		RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A11R34	0698-3152	1	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
A11R35	2100-2521	2	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	30983	ET50X202
A11R36	0757-0290	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A11R37	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A11R38	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A11R39	0698-3150	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A11R40	2100-2521		RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	30983	ET50X202
A11R41	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	24546	C4-1/8-T0-4640-F
A11R42	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A11R43	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R44	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R45	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R46	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R47	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A11R48	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A11R49	0698-0024	2	RESISTOR 2.61K 1% .5W F TC=0+-100	91637	MFF-1/2-10
A11R50	0698-0024		RESISTOR 2.61K 1% .5W F TC=0+-100	91637	MFF-1/2-10
A11R51	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A11R52	0757-0395		RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A11R53	0757-1100	2	RESISTOR 600 1% .125W F TC=0+-100	24546	C4-1/8-T0-601-F
A11R54	0757-1100		RESISTOR 600 1% .125W F TC=0+-100	24546	C4-1/8-T0-601-F
A11R55	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11R56	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A11RT1	5080-1718	1	THERMISTOR	28480	5080-1718
A11TP1	0360-1514	6	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP3	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP4	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP5	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11TP6	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A11VR1	1902-3059	2	DIODE-ZNR 3.83V 5% DO-7 PD=.4W TC=-.051%	15818	CD 35586
A11VR2	1902-3059		DIODE-ZNR 3.83V 5% DO-7 PD=.4W TC=-.051%	15818	CD 35586
A11A1	08640-60185	1	VARIABLE SWITCH ASSEMBLY	28480	08640-60185
A11A1MP1	08640-20218	1	HOUSING, GEAR SPROCKET, AUDIO	28480	08640-20218
A11A1MP2	08640-20205	1	GEAR SPUR	28480	08640-20205
A11A1MP3	1430-0763	1	GEAR SPUR	28480	1430-0763
A11A1MP4	08640-20084	1	SHAFT, AUDIO OSCILLATOR	28480	08640-20084
A11A1MP5	3030-0196	1	SCREW-SET 4-40 .188-IN-LG SMALL CUP-PT	28480	3030-0196

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11A1MP6	3030-0007	1	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
A11A1R1	0698-4471	2	RESISTOR 7.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7151-F
A11A1R2	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A11A1R3	0698-3454	2	RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A11A1R4	0698-5903	2	RESISTOR 2.4M 1% .5W F TC=0+-100	91637	MFF-1/2-10
A11A1R5	0698-4471		RESISTOR 7.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7151-F
A11A1R6	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A11A1R7	0698-3454		RESISTOR 215K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2153-F
A11A1R8	0698-5903		RESISTOR 2.4M 1% .5W F TC=0+-100	91637	MFF-1/2-10
A11A1S1	3100-3081	1	SWITCH:ROTARY	28480	3100-3081

OPTION 001

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12	08640-60326	1	RECTIFIER ASSY	28480	08640-60326
A12C1	0160-0168	5	CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
A12C2	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
A12C3	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
A12C4	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
A12C5	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
A12CR1	1901-0418	20	DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR2	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR3	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR4	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR5	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR6	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR7	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR8	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR9	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR10	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR11	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR12	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR13	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR14	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR15	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR16	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR17	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR18	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR19	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12CR20	1901-0418		DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
A12MP1	0403-0026	3	GLIDE:NYLON	28480	0403-0026
A12Q1			NOT ASSIGNED		
A12R1			NOT ASSIGNED		
A12R2			NOT ASSIGNED		
A12R3	0757-0199	1	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A12R4	0757-0442	6	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R5	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R6	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A12R7	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A13	08640-60301	1	BOARD ASSEMBLY, AM/FM MOTHER	28480	08640-60301
A13C1	0180-2208	5	CAPACITOR-FXD 220UF+-10% 10VDC TA	56289	150D227X901082
A13C2	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	56289	150D227X901082
A13C3	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	56289	150D227X901082
A13C4	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	56289	150D227X901082
A13J1	1250-0257	3	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A13J2			NOT ASSIGNED		
A13J3	1250-0257		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A13J4	1250-0257		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A13MP1	0403-0026		GLIDE:NYLON	28480	0403-0026
A13MP2			NOT ASSIGNED		
A13MP3	08640-20211	2	GUIDE, CONNECTOR	28480	08640-20211
A13MP4			NOT ASSIGNED		
A13MP5	0361-0028	10	RIVET:SEMITUBULAR OVAL HEAD	00000	OBD
A13MP6	1251-0600	8	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A13R1	0757-0004	1	RESISTOR 681 1% .5W F TC=0+-100	19701	MF7C1/2-T0-681-F
A13R2	0757-0443	1	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
A13R3	2100-1986	1	RESISTOR-TRMR 1K 10% C TOP-ADJ 1-TRN	73138	62-206-1
A13R4	0757-0460	2	RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A13R5	0757-0460		RESISTOR 61.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6192-F
A13R6	0698-4014	1	RESISTOR 787 1% .125W F TC=0+-100	24546	C4-1/8-T0-787R-F
A13R7	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A13S1	08640-60152	1	SLIDE SWITCH, P.C. 4R (FM)	28480	08640-60152
	5040-3440	2	SPRING, DETENT	28480	5040-3440
	08640-40063	4	GUIDE, SLIDE SWITCH	28480	08640-40063
A13S2	08640-60153	1	SLIDE SWITCH, P.C. 3R (AM)	28480	08640-60153
	5040-3440		SPRING, DETENT	28480	5040-3440
	08640-40063		GUIDE, SLIDE SWITCH	28480	08640-40063
A13XA2	1251-2571		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	26742	91-6915-0702-00
A13XA5	1251-2571		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	26742	91-6915-0702-00
A13XA7	1251-2571		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	26742	91-6915-0702-00
A13XA11	1251-2571		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	26742	91-6915-0702-00

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A13XA15	1251-2035	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-300
A13XA3A4	1251-0472	1	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	71785	252-06-30-300
A14	0960-0443	1	LINE MODULE WITH FILTER, BLACK	28480	0960-0443
A14MP1	7120-4264	1	LABEL, INFO, LINE V, +5-10%; 48-440	28480	7120-4264
A14P1	5020-8157	1	LINE VOLTAGE SELECTION CARD	28480	5020-8157
A15	08640-60018	1	RISER ASSY	28480	08640-60018
A15MP1	0403-0153	1	GUIDE-PC BD BRN POLYC .062-BD-THKNS 1-LG	28480	0403-0153
A15MP2	0403-0154	1	GUIDE-PC BD RED POLYC .062-BD-THKNS 1-LG	28480	0403-0154
A15MP3	0403-0155	1	GUIDE-PC BD ORN POLYC .062-BD-THKNS 1-LG	28480	0403-0155
A15XA17	1251-3308	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-12-30-032
A16	08640-60119	1	FAN MOTOR ASSEMBLY	28480	08640-60119
A16B1	3140-0490	1	MOTOR BRUSHLESS 10VDC 2550-RPM	3H768	1A03001-0A
A16P1	1251-0198	1	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	71785	251-06-30-261
	5040-0327	1	HOOD:CONNECTOR	28480	5040-0327
A17	08640-60001	1	POWER SUPPLY MOTHER BOARD ASSY	28480	08640-60001
A17MP1	1251-2361	1	CONTACT-CONN MALE DPSLDR (OPTION 003 ONLY)	00779	86091-2
A17XA12	1251-2034	3	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	71785	252-10-30-300
A17XA18	1251-2571		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	26742	91-6915-0702-00
A17XA20	1251-2571		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	26742	91-6915-0702-00
A17XA22	1251-2571		CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	26742	91-6915-0702-00
A17XA24	1251-2034		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	71785	252-10-30-300
A17XA26	1251-2034		CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	71785	252-10-30-300
A18	08640-60004	1	REGULATOR & FAN DRIVER ASSY, -5.2V	28480	08640-60004
A18C1	0180-0229	3	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A18C2	0160-3534	1	CAPACITOR-FXD 510PF +-5% 100WVDC MICA	28480	0160-3534
A18C3	0180-2214	1	CAPACITOR-FXD 90UF+75-10% 16VDC AL	56289	30D906G016CC2
A18C4	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A18C5	0160-2055	1	CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2055
A18CR1	1901-0040	6	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR2	1901-0025	2	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A18CR3	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A18CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR6	1901-0159	3	DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A18CR7	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR8	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR9	1901-0049	2	DIODE-PWR RECT 50V 750MA DO-29	28480	1901-0049
A18CR10	1901-0049		DIODE-PWR RECT 50V 750MA DO-29	28480	1901-0049
A18CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A18CR12	1901-0050	4	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A18DS1	1990-0326	3	LED-VISIBLE LUM-INT=300UCD IF=50MA-MAX	28480	1990-0326
A18F1	2110-0425	4	FUSE 2A 125V SLO-BLO .25X.27	71400	GMW 2A
A18MP1	4040-0752	1	EXTR-PC BD YEL POLYC .062-BD-THKNS	28480	4040-0752
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A18Q1	1853-0020	2	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A18Q2	1854-0232	2	TRANSISTOR NPN SI TO-39 PD=1W FT=15MHZ	28480	1854-0232
	1200-0173	9	INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A18Q3	1884-0012	3	THYRISTOR-SCR JEDEC 2N3528	02735	2N3528
A18Q4	1854-0003	1	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A18Q5	1853-0027	4	TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0027
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A18Q6	1853-0050	4	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A18Q7	1853-0027		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0027
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A18Q8	1853-0050		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A18Q9	1853-0050		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A18Q10	1853-0027		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0027
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A18Q11	1853-0050		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A18Q12	1853-0027		TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0027
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A18R1	0757-0317	2	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A18R2	2100-3123	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	32997	3006P-1-501
A18R3	0757-0278	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A18R4	0683-0475	1	RESISTOR 4.7 5% .25W FC TC=-400/+500	01121	CB47G5
A18R5	0757-0420	4	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A18R6	0698-3440	2	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A18R7	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A18R8	0698-3161	1	RESISTOR 38.3K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3832-F
A18R9	0811-2813	3	RESISTOR 1 5% .75W PW TC=0+-50	91637	RS1/2-T2-1R0-J
A18R10	0757-0316	2	RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A18R11	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A18R12	0757-0397	3	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A18R13	0698-3447	3	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A18R14	0757-0290	1	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MFAC1/8-T0-6191-F
A18R15	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A18R16	0811-1553	1	RESISTOR .68 5% 2W PW TC=0+-800	75042	BWH2-11/16-J
A18R17	0698-3438	3	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A18R18	0698-3438		RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A18R19	0698-7246	2	RESISTOR 2.61K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2611-G
A18TP1	0360-1514	16	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A18TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A18TP3	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A18TP4	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A18TP5	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A18TP6	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A18U1	1826-0177	3	IC UA 723 V RGLTR	15818	723DE
A18VR1	1902-3005	2	DIODE-ZNR 2.43V 5% DO-7 PD=.4W TC=-.076%	04713	SZ 10939-5
A18VR2	1902-3094	1	DIODE-ZNR 5.11V 2% DO-7 PD=.4W TC=-.009%	04713	SZ 10939-99
A18VR3	1902-0049	2	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A18XF1A	1251-2313	6	CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A18XF1B	1251-2313		CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A19			NOT ASSIGNED		
A20	08640-60005	1	REGULATOR ASSEMBLY,+5.2V & +44.6V	28480	08640-60005
A20C1	0160-0153	1	CAPACITOR-FXD 1000PF +-10% 200WVDC POLYE	56289	292P10292
A20C2	0180-0229		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A20C3	0180-0234	1	CAPACITOR-FXD 33UF+-20% 75VDC TA	56289	109D336X0075F2
A20C4	0180-0228	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A20C5	0160-0300	1	CAPACITOR-FXD 2700PF +-10% 200WVDC POLYE	56289	292P27292
A20C6	0180-2208		CAPACITOR-FXD 220UF+-10% 10VDC TA	56289	150D227X9010B2
A20C7	0180-0229		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A20C8	0160-3094	1	CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A20CR1	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A20CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR3	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A20CR4	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A20DS1	1990-0326		LED-VISIBLE LUM-INT=300UCD IF=50MA-MAX	28480	1990-0326
A20DS2	1990-0326		LED-VISIBLE LUM-INT=300UCD IF=50MA-MAX	28480	1990-0326
A20F1	2110-0332	1	FUSE 3A 125V NORM-BLO .25X.27	71400	GMW 3
A20F2	2110-0047	1	FUSE 1A 125V NORM-BLO .25X.27	71400	GMW-1
A20MP1	4040-0748	1	EXTRACTOR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	1480-0073	3	PIN:DRIVE 0.250" LG	00000	OBD
A20MP2	4040-0753	1	EXTRACTOR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A20Q1	1884-0012		THYRISTOR-SCR JEDEC 2N3528	02735	2N3528
A20Q2	1854-0232		TRANSISTOR NPN SI TO-39 PD=1W FT=15MHZ	28480	1854-0232
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A20Q3	1854-0022	1	TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A20Q4	1853-0224	1	TRANSISTOR PNP SI TO-39 PD=1W FT=15MHZ	02735	2N5415
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A20Q5	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A20Q6	1854-0023	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A20Q7	1884-0012		THYRISTOR-SCR JEDEC 2N3528	02735	2N3528
A20R1	0698-3160	1	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3162-F
A20R2	0698-3438		RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A20R3	0757-0462	1	RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
A20R4	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A20R5	0698-3407	1	RESISTOR 1.96K 1% .5W F TC=0+-100	91637	MFF-1/2-10

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A20R6	0698-3155	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A20R7	0698-[illegible]49	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
A20R8	2100-3154	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	32997	3006P-1-102
A20R9	0757-0438	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A20R10	0811-2813		RESISTOR 1 5% .75W PW TC=0+-50	91637	RS1/2-T2-1R0-J
A20R11	0757-0158	1	RESISTOR 619 1% .5W F TC=0+-100	19701	MF7C1/2-T0-619R-F
A20R12	0757-0397		RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A20R13	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A20R14	0811-1666	3	RESISTOR 1 5% 2W PW TC=0+-800	75042	BWH2-1R0-J
A20R15	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A20R16	2100-3123		RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	32997	3006P-1-501
A20R17	0698-3150	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A20R18	0757-0416	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A20R19	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A20R20	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A20R21	0811-2813		RESISTOR 1 5% .75W PW TC=0+-50	91637	RS1/2-T2-1R0-J
A20R22	0757-0316		RESISTOR 42.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-42R2-F
A20R23	0757-0397		RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A20R24	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A20R25	0811-1666		RESISTOR 1 5% 2W PW TC=0+-800	75042	BWH2-1R0-J
A20R26	0811-1666		RESISTOR 1 5% 2W PW TC=0+-800	75042	BWH2-1R0-J
A20R27	0698-7246		RESISTOR 2.61K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2611-G
A20TP1	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP3	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP4	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP5	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP6	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP7	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP8	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP9	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20TP10	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A20U1	1826-0177		IC UA 723 V RGLTR	15818	723HE
A20U2	1826-0177		IC UA 723 V RGLTR	15818	723HE
A20VR1	1902-0025	1	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A20VR2	1902-3234	1	DIODE-ZNR 19.6V 5% DO-7 PD=.4W TC=+.073%	04713	SZ 10939-266
A20VR3	1902-0244	1	DIODE-ZNR 30.1V 5% DO-15 PD=1W TC=+.075%	28480	1902-0244
A20VR4	1902-3345	1	DIODE-ZNR 51.1V 5% DO-7 PD=.4W TC=+.081%	04713	SZ 10939-386
A20VR5	1902-3005		DIODE-ZNR 2.43V 5% DO-7 PD=.4W TC=-.076%	04713	SZ 10939-5
A20VR6	1902-0049		DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
A20XF1A	1251-2313		CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A20XF1B	1251-2313		CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A20XF2A	1251-2313		CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A20XF2B	1251-2313		CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A21	08640-60176	1	REVERSE POWER ASSEMBLY (OPTION 003 ONLY)	28480	08640-60176
A21FL1	9135-0002	2	FILTER-LP SOLDER-TERMS	28480	9135-0002
A21FL2	9135-0002		FILTER-LP SOLDER-TERMS	28480	9135-0002
A21J1	1250-0829	2	CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	98291	50-045-4610
A21J2	1250-0829		CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	98291	50-045-4610
A21L1	1460-1395	2	WIREFORM CU ALY	28480	1460-1395
A21L2	1460-1395		WIREFORM CU ALY	28480	1460-1395
A21MP1	08640-20191	1	HOUSING, REVERSE POWER ASSY	28480	08640-20191
A21MP2	2200-0103	4	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A21A1	08640-60049	1	POWER PROTECTOR BOARD ASSEMBLY	28480	08640-60049
A21A1C1	0160-0576	3	CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-0576
A21A1C2	0160-0576		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-0576
A21A1C3	0160-3879	2	CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A21A1C4	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A21A1C5	0160-3877	1	CAPACITOR-FXD 100PF +-20% 200WVDC CER	28480	0160-3877
A21A1C6	0160-0576		CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-0576
A21A1C7	0160-3875	1	CAPACITOR-FXD 22PF +-5% 200WVDC CER	28480	0160-3875
A21A1C8	0160-3873	1	CAPACITOR-FXD 4.7PF +-.5PF 200WVDC CER	28480	0160-3873
A21A1C9	0121-0448	1	CAPACITOR-V TRMR-CER 2.5/5PF 63V PC-MTG	00868	5S-TRIKO-04 2.5-5 PF-N033
A21A1C10	0160-0699	1	CAPACITOR-F.D 1PF +-.1PF 100WVDC CER	72982	8101-A112-COK-1098
A21A1C11	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A21A1CR1	1901-0050	4	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21A1CR2	1901-0518	2	DIODE-SCHOTTKY	28480	1901-0518
A21A1CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A21A1CR4	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A21A1K1	0490-1073	1	RELAY-REED 1A 250MA 120VAC 4.5VDC-COIL	28480	0490-1073
A21A1MP1	0363-0105	2	CONTACT	28480	0363-0105
A21A1MP2	0363-0105		CONTACT	28480	0363-0105
A21A1Q1	1854-0210	3	TRANSISTOR NPN 2N2222 SI TO-18 PD=500MW	04713	2N2222
A21A1Q2	1854-0210		TRANSISTOR NPN 2N2222 SI TO-18 PD=500MW	04713	2N2222
A21A1Q3	1854-0210		TRANSISTOR NPN 2N2222 SI TO-18 PD=500MW	04713	2N2222
A21A1R1	0698-7241	1	RESISTOR 1.62K 1% .05W F TC=0+-100	24546	C3-3, T-0
A21A1R2	2100-1986	1	RESISTOR-TRMR 1K 10% C TOP-ADJ 1-TRN	73138	62-206-1
A21A1R3	0683-1055	1	RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A21A1R4	0698-7277	2	RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-G
A21A1R5	0698-7212	1	RESISTOR 100 1% .05W F TC=0+-100	24546	C3-1/8-T0-100R-G
A21A1R6	0683-0275	1	RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A21A1R7	0698-7277		RESISTOR 51.1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5112-G
A21A1R8	0698-7236	1	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A21A1R9	0698-7229	2	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A21A1R10	0698-7229		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A21A1R11	0757-0346	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A21A1U1	1826-002[illegible]	1	IC LM 311 COMPARATOR	27014	LM311H
A21A1VR1	1902-0554	2	DIODE-ZNR 10V 5% DO-15 PD=1W TC=+.06%	28480	1902-0554
A21A1VR2	1902-0244	1	DIODE-ZNR 30.1V 5% DO-15 PD=1W TC=+.075%	28480	1902-0244
A21A1VR3	1902-0554		DIODE-ZNR 10V 5% DO-15 PD=1W TC=+.06%	28480	1902-0554

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A22	08640-60177	1	REGULATOR ASSY, +20V & -20V	28480	08640-60177
A22C1	0180-0229	2	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A22C2	0160-3534	2	CAPACITOR-FXD 510PF +-5% 100WVDC MICA	28480	0160-3534
A22C3	0160-0158	2	CAPACITOR-FXD 5600PF +-10% 200WVDC POLYE	56289	292P56292
A22C4	0180-0058	2	CAPACITOR-FXD 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A22C5	0180-0229		CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A22C6	0160-3534		CAPACITOR-FXD 510PF +-5% 100WVDC MICA	28480	0160-3534
A22C7	0160-0158		CAPACITOR-FXD 5600PF +-10% 200WVDC POLYE	56289	292P56292
A22C8	0180-0058		CAPACITOR-FXD 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A22CR1	1901-0025	2	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A22CR2	1901-0159	2	DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A22CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A22CR4	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A22CR5	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A22CR6	1901-0159		DIODE-PWR RECT 400V 750MA DO-41	04713	SR1358-4
A22DS1	1990-0326	2	LED-VISIBLE LUM-INT=300UCD IF=50MA-MAX	28480	1990-0326
A22DS2	1990-0326		LED-VISIBLE LUM-INT=300UCD IF=50MA-MAX	28480	1990-0326
A22F1	2110-0424	2	FUSE .75A 125V SLO-BLO .25X.27	71400	GMW 3/4A
A22F2	2110-0424		FUSE .75A 125V SLO-BLO .25X.27	71400	GMW 3/4A
A22MP1	4040-0748	1	EXTRACTOR-PC BD BLK POLYC .062-BD-THKNS	28480	4040-0748
	1480-0073	2	PIN:DRIVE 0.250" LG	00000	OBD
A22MP2	4040-0754	1	EXTRACTOR-PC BD BLU POLYC .062-BD-THKNS	28480	4040-0754
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A22Q1	1884-0012	2	THYRISTOR-SCR JEDEC 2N3528	02735	2N3528
A22Q2	1854-0232	2	TRANSISTOR NPN SI TO-39 PD=1W FT=15MHZ	28480	1854-0232
	1200-0173	2	INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A22Q3	1854-0232		TRANSISTOR NPN SI TO-39 PD=1W FT=15MHZ	28480	1854-0232
	1200-0173		INSULATOR-XSTR TO-5 .075-THK	28480	1200-0173
A22Q4	1884-0012		THYRISTOR-SCR JEDEC 2N3528	02735	2N3528
A22R1	0698-0085	2	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A22R2	0757-0280	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R3	0698-3154	2	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A22R4	0757-0401	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R5	0698-0084	2	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A22R6	0757-0438	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A22R7	2100-3123	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	32997	3006P-1-501
A22R8	0683-0275		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A22R9	0698-3439	2	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A22R10	0757-0397	2	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A22R11	0698-3447	2	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A22R12	0811-1668	2	RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J
A22R13	0757-0278	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A22R14	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A22R15	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A22R16	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A22R17	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A22R18	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A22R19	2100-3123		RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	32997	3006P-1-501
A22R20	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2151-F
A22R21	0683-0275		RESISTOR 2.7 5% .25W FC TC=-400/+500	01121	CB27G5
A22R22	0698-3439		RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-T0-178R-F
A22R23	0757-0397		RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A22R24	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A22R25	0811-1668		RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J
A22R26	0698-7260	2	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A22R27	0698-7260		RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A22R28	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A22TP1	0360-1514	10	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP3	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP4	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP5	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP6	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP7	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP8	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP9	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22TP10	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A22U1	1826-0177	2	IC UA 723 V RGLTR	15818	723BE
A22U2	1826-0177		IC UA 723 V RGLTR	15818	723BE

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A22VR1	1902-0202	2	DIODE-ZNR 15V 5% DO-15 PD=1W TC=+.057%	28480	1902-0202
A22VR2	1902-3256	2	DIODE-ZNR 23.7V 5% DO-7 PD=.4W TC=+.076%	04713	SZ 10939-290
A22VR3	1902-0761	2	DIODE-ZNR 1N821 6.2V 5% DO-7 PD=.25W	04713	1N821
A22VR4	1902-0202		DIODE-ZNR 15V 5% DO-15 PD=1W TC=+.057%	28480	1902-0202
A22VR5	1902-3256		DIODE-ZNR 23.7V 5% DO-7 PD=.4W TC=+.076%	04713	SZ 10939-290
A22VR6	1902-0761		DIODE-ZNR 1N821 6.2V 5% DO-7 PD=.25W	04713	1N821
A22XF1A	1251-2313	4	CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A22XF1B	1251-2313		CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A22XF2A	1251-2313		CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A22XF2B	1251-2313		CONNECTOR-SGL CONT SKT .04-DIA	00779	3-332070-5
A23			NOT ASSIGNED		
A24	08640-60007	1	SERIES REGULATOR SOCKET ASSY	28480	08640-60007
A24MP1	0403-0152	1	GUIDE-PC BD BLK POLYC .062-BD-THKNS 1-LG	28480	0403-0152
A24MP2	0361-0009	1	RIVET, SEMITUBULAR OVAL HD 0.188" LG	00000	OBD
A24XQ1	1200-0041	4	SOCKET-XSTR 2-CONT TO-3-PKG	22753	PTS-1
A24XQ2	1200-0041		SOCKET-XSTR 2-CONT TO-3-PKG	22753	PTS-1
A24XQ3	1200-0041		SOCKET-XSTR 2-CONT TO-3-PKG	22753	PTS-1
A24XQ4	1200-0041		SOCKET-XSTR 2-CONT TO-3-PKG	22753	PTS-1
A25			NOT ASSIGNED		

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26	08640-60318	1	AM CASTING ASSEMBLY(EXCEPT OPTION 002)	28480	08640-60318
			(SEE SERVICE SHEET F)		
			(DOES NOT INCLUDE A26U1,U2)		
A26C1	0160-2049	10	CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C2	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C3	0160-3219	3	CAPACITOR-FDTHRU 100PF 20% 500V CERAMIC	28480	0160-3219
A26C4	0160-3219		CAPACITOR-FDTHRU 100PF 20% 500V CERAMIC	28480	0160-3219
A26C5	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C6	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C7	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C8	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C9	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C10	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C11			NOT ASSIGNED		
A26C12			NOT ASSIGNED		
A26C13	0160-3961	1	CAPACITOR-FDTHRU 56PF 20% 500V CERAMIC	28480	0160-3961
A26C14	0160-3219		CAPACITOR-FDTHRU 100PF 20% 500V CERAMIC	28480	0160-3219
A26C15	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C16	0160-2049		CAPACITOR-FDTHRU 5000PF +80 -20% 500V	28480	0160-2049
A26C17	0160-2152	2	CAPACITOR-FDTHRU 10PF 20% 500V CERAMIC	28480	0160-2152
A26C18	0160-2152		CAPACITOR-FDTHRU 10PF 20% 500V CERAMIC	28480	0160-2152
A26J1	1250-0829	1	CONNECTOR-RF SMC M SGL-HOLE-FR 50-OHM	98291	50-045-4610
A26J2			NSR, P/O A26W4		
A26L1	9100-1620	8	COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A26L2	9100-1621	1	COIL-MLD 18UH 10% Q=75 .155DX.375LG	24226	15/182
A26L3	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A26L4	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A26L5	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A26L6			NOT ASSIGNED		
A26L7	9140-0178	1	COIL-MLD 12UH 10% Q=65 .155DX.375LG	24226	15/122
A26L8	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A26MP1	8160-0218	1	RFI STRIP NI ALY .787-W 5.728-L	28480	8160-0218
A26MP2	8160-0222	1	RFI STRIP NI ALY 2.027-W 3.053-L	28480	8160-0222
A26MP3	8160-0223	1	RFI STRIP NI ALY 1-W 2.19-L	28480	8160-0223
A26MP4	8160-0224	1	GASKET:MOD BOTTOM COVER	28480	8160-0224
A26MP5	08640-00012	1	COVER, ACCESS	28480	08640-00012
A26MP6	08640-00018	1	COVER, FILTER MODULE	28480	08640-00018
A26MP7			NOT ASSIGNED		
A26MP8	08640-20263	1	CASTING, MODULE	28480	08640-20263
A26MP9	08640-20264	1	COVER, BOTTOM MODULE	28480	08640-20264
A26MP10	08640-00013	1	COVER, AMPLIFIER FILTER	28480	08640-00013
			(EXCEPT OPTION 002, FOR OPT 002, SEE		
			SECOND A26 LISTING, A26A1MP1).		
A26MP11	0403-0153	1	GUIDE-PC BD GRN POLYC .062-BD-THKNS 1-LG	28480	0403-0153
A26MP12	0403-0156	1	GUIDE-PC BD YEL POLYC .062-BD-THKNS 1-LG	28480	0403-0156
A26MP13	0403-0157	1	GUIDE-PC BD ORN POLYC .062-BD-THKNS 1-LG	28480	0403-0157
A26MP14			NOT ASSIGNED		
A26MP15	1250-1423	1	CAP-COAX TO FIT F-BNC NON-SHTG 2.5-CM	24931	28PC107-1
A26MP16	2200-0107	34	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A26MP17	2950-0035	1	NUT-HEX-DBL-CHAM 15/32-32-THD .078-THK	28480	2950-0039
A26MP18	2190-0068	1	WASHER-LK INTL T NO.-1/2 .505-IN-ID	78189	1924-02
A26MP19	2200-0107		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A26MP20	1251-3231	2	CONNECTOR; PC EDGE; 15-CONT; WIRE WRAP	28480	1251-3231
A26MP21	2200-0107		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A26MP22	1251-1886	6	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-340
A26MP23			NOT ASSIGNED		
A26MP24	2200-0107		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A26MP25	0520-0173	6	SCREW-MACH 2-56 .188-IN-LG PAN-HD-POZI	28480	0520-0173
A26MP26			NOT ASSIGNED		
A26MP27	2360-0203	4	SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	28480	2360-0203
A26MP28	2190-0018	4	WASHER-LK HLCL NO.-6 .141-IN-ID	28480	2190-0018
A26MP29	3050-0066	4	WASHER-FL MTLC NO.-6 .147-IN-ID	28480	3050-0066
A26MP30	2360-0203		SCREW-MACH 6-32 .625-IN-LG PAN-HD-POZI	28480	2360-0203
A26MP31	2190-0018		WASHER-LK HLCL NO.-6 .141-IN-ID	28480	2190-0018
A26MP32	3050-0066		WASHER-FL MTLC NO.-6 .147-IN-ID	28480	3050-0066
A26MP33	08640-00002	2	HEAT SINK, MICROCIRCUITS	28480	08640-00002
A26MP34	2200-0105	12	SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A26MP35	2950-0078	4	NUT-HEX-DBL-CHAM 10-32-THD .067-THK	74163	500220
A26MP36	2190-0124	4	WASHER-LK INTL T NO.-10 .195-IN-ID	74163	500222
A26MP37	2950-0078		NUT-HEX-DBL-CHAM 10-32-THD .067-THK	74163	500220
A26MP38	2190-0124		WASHER-LK INTL T NO.-10 .195-IN-ID	74163	500222
A26MP39	2950-0078		NUT-HEX-DBL-CHAM 10-32-THD .067-THK	74163	500220
A26MP40	2190-0124		WASHER-LK INTL T NO.-10 .195-IN-ID	74163	500222

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HF Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26MP41	2950-0078		NUT-HEX-DBL-CHAM 10-32-THD .067-THK	74163	500220
A26MP42	2190-0124		WASHER-LK INTL T NO.-10 .195-IN-ID	74163	500222
A26MP43	2200-0105		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A26MP44	2200-0107		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A26MP45	2200-0107		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A26MP46	2200-0107		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	28480	2200-0107
A26MP47	2190-0034	1	WASHER-LK HLCL NO.-10 .194-IN-ID	28480	2190-0034
A26MP48	2200-0105		SCREW-MACH 4-40 .312-IN-LG PAN-HD-POZI	28480	2200-0105
A26R1	0757-0159	1	RESISTOR 1K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1R0-F
A26U1	08640-67002	1	OUTPUT AMPLIFIER (EXCEPT OPTION 002. FOR OPT 002, SEE SECOND A26 LISTING.)	28480	08640-67002
A26U2	08640-67003	1	MODULATOR PREAMPLIFIER	28480	08640-67003
A26W1	8120-1889	1	CABLE-COAX .086-OD	28480	8120-1889
A26W2	8120-1887	1	CABLE-COAX 50 OHM .086-OD	28480	8120-1887
A26W3	8120-1905	1	CABLE-COAX .086-OD	28480	8120-1905
A26W4	8120-1892	1	CABLE-COAX .086-OD	28480	8120-1892
A26A1	08640-60043	1	POWER AMPLIFIER & AGC DETECTOR ASSY (EXCEPT OPTION 002. FOR OPT 002, SEE SECOND A26 LISTING.) (INCLUDES A26W1 AND A26W2)	28480	08640-60043
A26A1C1	0160-3094	5	CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A26A1C2	0160-3094		CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A26A1C3	0160-3094		CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A26A1C4	0140-0198	1	CAPACITOR-FXD 200PF +-5% 300WVDC MICA	72136	DM15F201J0300WV1CR
A26A1C5	0160-2204	1	CAPACITOR-FXD 100PF +-5% 300WVDC MICA	28480	0160-2204
A26A1C6	0180-0197	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A26A1CR1	1901-0040	12	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR2	1901-0022	9	DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A1CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR6	1901-0539	3	DIODE-SCHOTTKY	28480	1901-0539
A26A1L1	9100-1620		COIL-MLD 15UH 10% Q=45 .155DX.375LG	24226	15/152
A26A1L2	9140-0180	1	COIL-MLD 2.7UH 10% Q=53 .155DX.375LG	24226	15/271
A26A1Q1	1853-0007	3	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A26A1Q2	1855-0049	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0049
A26A1Q3	1855-0020	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A26A1Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A26A1Q5	1854-0071	8	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q7	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q8	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q9	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1R1	0698-3447	2	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A26A1R2	0698-3446	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A26A1R3	0757-0420	8	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A26A1R4	0757-0317	2	RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A26A1R5	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8-T0-751-F
A26A1R6	0757-0280	4	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A26A1R7	0757-0441	2	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A26A1R8	0698-3443	1	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A26A1R9	0757-0199	2	RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A26A1R10	0757-0199		RESISTOR 21.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2152-F
A26A1R11	0757-0458	1	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A26A1R12	0683-3355	1	RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A26A1R13	0698-3450	3	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A26A1R14	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A26A1R15	0683-1055	4	RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A26A1R16	0698-3438	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F
A26A1R17	0698-3132	3	RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A26A1R18	0757-0438	13	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A1R19	2100-2061	1	RESISTOR-TRMR 200 10% C TOP-ADJ 1-TRN	73138	62-204-1
A26A1R20	0757-0442	13	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A1R21	0698-7233	1	RESISTOR 750 1% .05W F TC=0+-100	24546	C3-1/8-T0-750R-G
A26A1R22	0698-7272	1	RESISTOR 31.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3162-G
A26A1R23	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A26A1TP1	0360-1514	9	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A1TP2	0340-0044	1	TERMINAL-STUD DBL-TUR PRESS-MTG	98291	013-2001-00-0-479
A26A1VR1	1902-0188	2	DIODE-ZNR 16.2V 5% DO-7 PD=.4W TC=+.066%	04713	SZ 10939-242
A26A1VR2	1902-0048	1	DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	04713	SZ 10939-134

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26A1XA26U1A-E	1251-2613		CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	00779	50864-3
A26A2	08640-60014	1	AM OFFSET & PULSE SWITCHING ASSY	28480	08640-60014
A26A2C1	0180-0291	10	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A2C2	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A2C3	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A2C4	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A2C5	0160-3450	2	CAPACITOR-FXD 5000PF +-10% 250WVDC CER	28480	0160-3450
A26A2C6	0160-0161	2	CAPACITOR-FXD .01UF +-10% 200WVDC POLYE	56289	292P10392
A26A2C7	0160-3450		CAPACITOR-FXD 5000PF +-10% 250WVDC CER	28480	0160-3450
A26A2C8	0180-1743	1	CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A26A2C9			NOT ASSIGNED		
A26A2C10	0180-0100	1	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A26A2C11	0180-0116	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A26A2C12	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A2CR1	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A2CR2	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A2CR3	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A2CR4	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A2CR5			NOT ASSIGNED		
A26A2CR6			NOT ASSIGNED		
A26A2CR7	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR8			NOT ASSIGNED		
A26A2CR9	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A26A2CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR12	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR13	1901-0539		DIODE-SCHOTTKY	28480	1901-0539
A26A2CR14	1910-0022	4	DIODE-GE 5V 60MA 3.5NS DO-7	28480	1910-0022
A26A2CR15	1910-0022		DIODE-GE 5V 60MA 3.5NS DO-7	28480	1910-0022
A26A2CR16	1910-0022		DIODE-GE 5V 60MA 3.5NS DO-7	28480	1910-0022
A26A2CR17	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A2CR18	1910-0022		DIODE-GE 5V 60MA 3.5NS DO-7	28480	1910-0022
A26A2L1	9100-1641	4	COIL-MLD 240UH 5% Q=65 .155DX.375LG	24226	15/243
A26A2L2	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	24226	15/243
A26A2L3	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A26A2MP1	4040-0749	2	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-0073	4	PIN:DRIVE 0.250" LG	00000	OBD
A26A2MP2	4040-0752	1	EXTR-PC BD YEL POLYC .062-BD-THKNS	28480	4040-0752
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A26A2Q1	1854-0221	3	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A26A2Q2	1854-0404	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26A2Q3	1853-0034	6	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26A2Q4	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26A2Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26A2Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26A2Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A26A2Q8	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26A2Q9	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26A2R1	0757-0465	4	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A26A2R2	0757-0440	4	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A26A2R3	0757-044[illegible]		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A2R4	0757-044[illegible]		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A2R5	0698-31[illegible]		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A26A2R6	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A2R7	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A26A2R8	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	24546	C4-1/8-T0-909R-F
A26A2R9	0757-0421	3	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A26A2R10	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A26A2R11	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A2R12	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A2R13	0757-0401	3	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A26A2R14	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A26A2R15	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A2R16	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A26A2R17	0698-3440	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A26A2R18	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A2R19	2100-2413	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	30983	ET50X201
A26A2R20	0698-3157	2	RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A26A2R21	0757-0416	3	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A26A2R22	0757-0394	2	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A26A2R23	0698-3162	3	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A26A2R24	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A2R25	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26A2R26	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A2R27	0698-0085	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A26A2R28	0698-3162		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4642-F
A26A2R29	0698-3150	2	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A26A2R30	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A2R31	0698-3154	3	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A26A2R32	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A2R33	0698-3450		RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
A26A2R34	0757-0289	2	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A26A2R35	0698-3407		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A26A2R36	0698-0083	5	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A26A2R37	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A2R38	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A2R39	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A26A2R40	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1962-F
A26A2TP1	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A2TP2	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A2TP3	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A2TP4	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A2TP5	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A2TP6	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A2TP7	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A2TP8	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A26A2U1	1826-0114	1	IC UA 710 COMPARATOR	07263	710HP
A26A2U2	1820-0448	1	IC-DIGITAL SN5400N TTL QUAD 2 NAND	01295	SN5400N
A26A2U3	1820-0579	1	IC-DIGITAL SN74123N TTL DUAL	01295	SN74123N
A26A2VR1	1902-3139	1	DIODE-ZNR 8.25V 5% DO-7 PD=.4W TC=+.053%	04713	SZ 10939-158
A26A3	08640-60016	1	MODULATOR ASSY(INCLUDES A26A3)	28480	08640-60016
A26A3C1	0160-3094		CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A26A3C2	0160-3094		CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A26A3C3	0150-0048	4	CAPACITOR-FXD .22PF +-5% 500WVDC TI DIOX	95121	TYPE QC
A26A3C4	0150-0048		CAPACITOR-FXD .22PF +-5% 500WVDC TI DIOX	95121	TYPE QC
A26A3C5	0150-0048		CAPACITOR-FXD .22PF +-5% 500WVDC TI DIOX	95121	TYPE QC
A26A3C6	0150-0048		CAPACITOR-FXD .22PF +-5% 500WVDC TI DIOX	95121	TYPE QC
A26A3CR1	08640-60163	1	MATCHED DIODE SET (INCLUDES A26A3CR2 THRU 8, NSR)	28480	08640-60163
A26A3CR2			NSR, PART OF A26A3CR1.		
A26A3CR3			NSR, PART OF A26A3CR1.		
A26A3CR4			NSR, PART OF A26A3CR1.		
A26A3CR5			NSR, PART OF A26A3CR1.		
A26A3CR6			NSR, PART OF A26A3CR1.		
A26A3CR7			NSR, PART OF A26A3CR1.		
A26A3CR8			NSR, PART OF A26A3CR1.		
A26A3J1	1250-1425	1	CONNECTOR-RF SMC M SGL HOLE RR	2K497	700177-1
A26A3J2	1251-2194	5	CONNECTOR-SGL CONT SKT .021-IN-BSC-SZ	00779	3-331272-0
A26A3L1	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A26A3L2	9140-0112	1	COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	24226	15/471
A26A3R1	0698-7227	1	RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A26A3R2	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A26A3R3	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	24546	C4-1/8-T0-2610-F
A26A3R4	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A26A3R5	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A26A3T1	08640-80003	2	BALUN ASSY	28480	08640-80003
A26A3T2	08640-80003		BALUN ASSY	28480	08640-80003
			A26A3 MISCELLANEOUS		
	1251-2229	8	CONNECTOR-SGL CONT SKT .033-DIA	00779	1-331677-3
A26A3XA26U1A-E	1251-2613	10	CONNECTOR-SGL CONT SKT .033-IN-BSC-SZ	00779	50864-3
A26A4	08640-60337	1	AGC AMPLIFIER ASSY(EXCEPT OPTION 002) (FOR OPT 002, SEE SECOND A26 LISTING.)	28480	08640-60337
A26A4C1	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C2	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C3	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C4	0160-2307	2	CAPACITOR-FXD 47PF +-5% 300WVDC MICA	28480	0160-2307
A26A4C5	0160-2307		CAPACITOR-FXD 47PF +-5% 300WVDC MICA	28480	0160-2307
A26A4C6	0160-3458	1	CAPACITOR-FXD 5000PF +-10% 250WVDC CER	28480	0160-3458
A26A4C7	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C8	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A26A4C9	0160-0161		CAPACITOR-FXD .01UF +-10% 200WVDC POLYE	56289	292P10392
A26A4C10	0160-0302	1	CAPACITOR-FXD .018UF +-10% 200WVDC POLYE	56289	292P18392

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26A4C11	0160-0159	1	CAPACITOR-FXD 6800PF +-10% 200WVDC POLYE	56289	292P68292
A26A4C12	0140-0191	1	CAPACITOR-FXD 56PF +-5% 300WVDC MICA	72136	DM15E560J0300WV1CR
A26A4C13	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C14	0160-0576	1	CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-0576
A26A4C15	0160-0297	1	CAPACITOR-FXD 1200PF +-10% 200WVDC POLYE	56289	292P12292
A26A4C16	0160-3534	1	CAPACITOR-FXD 510PF +-5% 100WVDC MICA	28480	0160-3534
A26A4C17	0160-3459	1	CAPACITOR-FXD .02UF +-20% 100WVDC CER	28480	0160-3459
A26A4CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR3			NOT ASSIGNED		
A26A4CR4			NOT ASSIGNED		
A26A4CR5	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A4CR6	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A4CR7	1901-0518	5	DIODE-SCHOTTKY	28480	1901-0518
A26A4CR8	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A26A4CR9	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A26A4CR10	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A4CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR12	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A4CR13	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A26A4CR14	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A26A4L1	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	24226	15/243
A26A4L2	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	24226	15/243
A26A4MP1	4040-0749		EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A26A4MP2	4040-0753	1	EXTRACTOR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A26A4Q1	1854-0221		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A26A4Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A4Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A26A4Q4	1854-0221		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A26A4Q5	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26A4Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A4Q7	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26A4Q8			NOT ASSIGNED		
A26A4Q9	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A4R1	2100-2521	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	30983	ET50X202
A26A4R2			NOT ASSIGNED		
A26A4R3	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A26A4R4	0757-0290	2	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MFAC1/8-T0-6191-F
A26A4R5			NOT ASSIGNED		
A26A4R6	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A26A4R7	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A26A4R8	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A26A4R9	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A26A4R10	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R11	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R12	2100-2514		RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	30983	ET50W203
A26A4R13	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A26A4R14	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R15	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A26A4R16	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R17	0698-3453	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A26A4R18	0698-3153	2	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A26A4R19	0757-0464	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A26A4R20	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R21	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R22	0757-0278	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A26A4R23	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MFAC1/8-T0-6191-F
A26A4R24	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A26A4R25	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A26A4R26	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R27	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A26A4R28			NOT ASSIGNED		
A26A4R29	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R30	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A26A4R31	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A26A4R32	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R34	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A26A4R35	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A26A4R36	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A26A4R37	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A26A4R38	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A26A4R39	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A26A4R40	0698-3437	1	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26A4R41	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A26A4R42	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A26A4R43	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A26A4R44	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A26A4R45	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R46	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A26A4R47	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A26A4R48	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A26A4R49	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A26A4R50	0698-3451	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A26A4R51			NOT ASSIGNED		
A26A4R52	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A26A4R53	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A26A4S1	3101-0860	1	SWITCH-SL DPDT-NS MINTR .5A 125VAC/DC PC	79727	GF126-0064B
A26A4TP1	1251-0600	8	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A4TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A4TP3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A4TP4	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A4TP5	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A4TP6	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A4TP7	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A4TP8	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A4U1	1826-0092	1	IC MC 1458 OP AMP	28480	1826-0092
A26A4U2	1826-0026	1	IC LM 311 COMPARATOR	27014	LM311H
A26A4U3	1820-0328	1	IC-DIGITAL SN7402N TTL QUAD 2 NOR	01295	SN7402N
A26A4U4	1820-0471	1	IC-DIGITAL SN7406N TTL HEX 1	01295	SN7406N
A26A4VR1	1902-0025	1	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A26A4VR2	1902-0184		DIODE-ZNR 16.2V 5% DO-7 PD=.4W TC=+.066%	04713	SZ 10939-242
A26A5	08640-60302	1	RISER ASSY	28480	08640-60302
A26A5XA26A6	1251-3231		CONNECTOR; PC EDGE; 15-CONT; WIRE WRAP	28480	1251-3231
A26A6	08640-60011	1	AM MOTHER BOARD ASSY	28480	08640-60011
A26A6XA26A2	1251-1886		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-340
A26A6XA26A4	1251-1886		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	71785	252-15-30-340

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26	08640-60316	1	AM/AGC & RF AMPLIFIER ASSEMBLY (OPTION 002 ONLY, SEE SERVICE SHEET F) (DOES NOT INCLUDE A26U1 OR U2)	28480	08640-60316
A26U1	08640-67007	1	OUT PUT AMPLIFIER(OPTION 002 ONLY)	28480	08640-67007
A26U2			SAME AS A26U2 IN STANDARD INSTRUMENT		
A26A1	08640-60048	1	OUTPUT AMPL,DOUBLER,& AGC DETECTOR ASSY (OPTION 002 ONLY)	28480	08640-60048
A26A1C1	0160-3094	3	CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A26A1C2	0160-3094		CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A26A1C3	0160-3094		CAPACITOR-FXD .1UF +-10% 100WVDC CER	28480	0160-3094
A26A1C4	0160-3879	2	CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A26A1C5	0160-3877	1	CAPACITOR-FXD 100PF +-20% 200WVDC CER	28480	0160-3877
A26A1C6	0160-3878	8	CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A26A1C7	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A26A1C8	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A26A1C9	0121-0448	1	CAPACITOR-V TRMR-CER 2.5/5PF 63V PC-MTG	[illegible]	58-TRIKO-04 2.5-5 PF-N033
A26A1C10	0160-3879		CAPACITOR-FXD .01UF +-20% 100WVDC CER	28480	0160-3879
A26A1C11	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A26A1C12	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A26A1C13	0160-3876	2	CAPACITOR-FXD 47PF +-20% 200WVDC CER	28480	0160-3876
A26A1C14	0160-3878		CAPACITOR-FXD 1000PF -20% 100WVDC CER	28480	0160-3878
A26A1C15	0160-2209	1	CAPACITOR-FXD 360PF +-5% 300WVDC MICA	28480	0160-2209
A26A1C16	0160-2204	1	CAPACITOR-FXD 100PF +-5% 300WVDC MICA	28480	0160-2204
A26A1C17	0180-0197	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A26A1C18	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A26A1C19	0160-3878		CAPACITOR-FXD 1000PF +-20% 100WVDC CER	28480	0160-3878
A26A1C20	0160-3876		CAPACITOR-FXD 47PF +-20% 200WVDC CER	28480	0160-3876
A26A1C21	0160-4399	1	CAPACITOR-FXD .68PF +-.25PF 50WVDC CER	28480	0160-4399
A26A1CR1	5080-0271	1	DIODE:SILICON MATCHED QUAD	28480	5080-0271
A26A1CR2			NSR, PART OF A26A1CR1		
A26A1CR3			NSR, PART OF A26A1CR1		
A26A1CR4			NSR, PART OF A26A1CR1		
A26A1CR5	1901-0535	3	DIODE-SCHOTTKY	28480	1901-0535
A26A1CR6	1901-0039	1	DIODE-SWITCHING 50V 300MA 8NS	28480	1901-0039
A26A1CR7	1901-0040	10	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR8	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A26A1CR9	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A1CR12	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A26A1J1	1250-1425	[illegible]	CONNECTOR-RF SMC M SGL HOLE RR	2K497	700177-1
A26A1K1	0490-0565	[illegible]	RELAY 2C 12VDC-COIL	28480	0490-0565
A26A1K2	0490-0565		RELAY 2C 12VDC-COIL	28480	0490-0565
A26A1L1	9100-1620	1	COIL-MLD 15UH 10% Q=65 .155DX.375LG	24226	15/152
A26A1L2	9100-2247	3	COIL-FXD MOLDED RF CHOKE .1UH 10%	24226	10/100
A26A1L3	9100-2247		COIL-FXD MOLDED RF CHOKE .1UH 10%	24226	10/100
A26A1L4			NOT ASSIGNED		
A26A1L5			PART OF ETCHED CIRCUIT BOARD		
A26A1L6	9100-2247		COIL-FXD MOLDED RF CHOKE .1UH 10%	24226	10/100
A26A1L7	9140-[illegible]	1	COIL-MLD 2.7UH 10% Q=33 .155DX.375LG	24226	15/271
A26A1MP1	[illegible]	[illegible]	COVER, FILTER/AMPLIFIER(OPTION 002 ONLY)	28480	08640-20164
A26A1MP2	[illegible]-0103	[illegible]	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
A26A1Q1	[illegible]	2	TRANSISTOR PACKAGE, HP-12	28480	35853E
A26A1Q2	[illegible]		TRANSISTOR PACKAGE, HP-12	28480	35853E
A26A1Q3	1853-[illegible]	2	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A26A1Q4	1853-[illegible]		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A26A1Q5	1854-0071	8	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q7	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q8	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q9	1853-0007	3	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A26A1Q10	1855-0020	1	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A26A1Q11	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A1Q12	1855-0049	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0049
A26A1Q13	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A26A1R1	0698-7253	2	RESISTOR 5.11K 1% .05W F TC=0+-100	24546	C3-1/8-T0-5111-G
A26A1R2	0698-7264	1	RESISTOR 14.7K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1472-G
A26A1R3	0698-7195	1	RESISTOR 19.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-19R6-G
A26A1R4	0698-7198	1	RESISTOR 26.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-26R1-G
A26A1R5	0757-1002	1	RESISTOR 61.9 1% .5W F TC=0+-100	19701	MF7C1/2-T0-61R9-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26A1R6	0698-7236	4	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A26A1R7	0698-7236		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A26A1R8	0757-0403	2	RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A26A1R9	0698-7211	1	RESISTOR 90.9 1% .05W F TC=0+-100	24546	C3-1/8-T00-90R9-G
A26A1R10	0698-7201	1	RESISTOR 34.8 1% .05W F TC=0+-100	24546	C3-1/8-T00-34R8-G
A26A1R11	0698-7236		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-G
A26A1R12	0683-1055	4	RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A26A1R13	0698-7272	1	RESISTOR 31.6K 1% .05W F TC=0+-100	24546	C3-1/8-T0-3162-G
A26A1R14	0698-3446	1	RESISTOR 383 1% .125W F TC=0+-100	24546	C4-1/8-T0-383R-F
A26A1R15	0698-3447	1	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A26A1R16	0698-7233	3	RESISTOR 750 1% .05W F TC=0+-100	24546	C3-1/8-T0-750R-G
A26A1R17	0698-7233		RESISTOR 750 1% .05W F TC=0+-100	24546	C3-1/8-T0-750R-G
A26A1R18	0757-0317	2	RESISTOR 1.33K 1% .125W F TC=0+-100	245[illegible]	C4-1/8-T0-1331-F
A26A1R19	0698-7233		RESISTOR 750 1% .05W F TC=0+-100	2[illegible]	C3-1/8-T0-750R-G
A26A1R20	0698-7223	1	RESISTOR 287 1% .05W F TC=0+-100	2[illegible]46	C3-1/8-T0-287R-G
A26A1R21	0698-7268	2	RESISTOR 21.5K 1% .05W F TC=0+-100	2[illegible]	C3-1/8-T0-2152-G
A26A1R22	0698-7258	1	RESISTOR 8.25K 1% .05W F TC=0+-100	24546	C3-1/8-T0-8251-G
A26A1R23	0698-7268		RESISTOR 21.5K 1% .05W F TC=0+-100	2[illegible]46	C3-1/8-T0-2152-G
A26A1R24	0698-7236		RESISTOR 1K 1% .05W F TC=0+-100	[illegible]	C3-1/8-T0-1001-G
A26A1R25	0698-7277	1	RESISTOR 51.1K 1% .05W F TC=0+-100	[illegible]	C3-1/8-T0-5112-G
A26A1R26	0683-3355	1	RESISTOR 3.3M 5% .25W FC TC=-900/+1100	01121	CB3355
A26A1R27	0698-7275	2	RESISTOR 42.2K 1% .05W F TC=0+-100	24546	C3-1/8-T0-4222-G
A26A1R28	0698-7275		RESISTOR 42.2K 1% .05W F TC=0+-100	24546	C3-1/8-T0-4222-G
A26A1R29	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	[illegible]	CB1055
A26A1R30	0698-7253		RESISTOR 5.11K 1% .05W F TC[illegible]	[illegible]	C3-1/8-T0-5111-G
A26A1R31	0698-7216	1	RESISTOR 147 1% .05W F TC=0+-100	24546	C3-1/8-T0-147R-G
A26A1R32	0698-7222	1	RESISTOR 261 1% .05W F TC=0+-100	24546	C3-1/8-T0-261R-G
A26A1R33	0698-7260	1	RESISTOR 10K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1002-G
A26A1R34	2100-2061	1	RESISTOR-TRMR 200 10% C TOP-ADJ [illegible]	73138	62-204-1
A26A1R35	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	24546	C4-1/8-T0-121R-F
A26A1T1	08640-80004	1	BALUN ASSY	28480	08640-80004
	1251-2194	5	CONNECTOR-SGL CONT [illegible] .021-IN-BSC-SZ	00779	3-331272-0
A26A1TP1	1251-0600	1	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A26A1TP2	0340-0044	1	TERMINAL-STUD [illegible]	98291	013-2001-00-0-479
A26A1VR1	1902-0184	2	DIODE-ZNR 16.2V [illegible] TC=+.066%	04713	SZ 10939-242
A26A1VR2	1902-0058	1	DIODE-ZNR [illegible]V [illegible]-7 PD[illegible] TC=+.043%	04713	SZ 10939-134
A26A1W1	8120-1971	1	CABLE-COAX [illegible]	28480	8120-1971
A26A1W2			(SEE STANDARD A2[illegible])		
A26A1XA26U1A-E	1251-2613	5	CONNECTOR-SGL CONT [illegible] .033-IN-BSC-SZ	00779	50864-3
A26A2			[illegible] AS [illegible] IN STANDARD INSTRUMENT.		
A26A3			SAME AS A2[illegible] IN STANDARD INSTRUMENT.		
A26A4	08640-60336	1	AGC AMPLIFIER BOARD ASSEMBLY (OPTION [illegible] ONLY)	28480	08640-60336
A26A4C1	0180-0291	5	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C2	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C3	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C4	0160-2307	[illegible]	CAPACITOR-FXD 47PF +-5% 300WVDC MICA	28480	0160-2307
A26A4C5	0160-2307		CAPACITOR-FXD 47PF +-5% 300WVDC MICA	28480	0160-2307
A26A4C6	0160-3458	1	CAPACITOR-FXD 5000PF +-10% 250WVDC CER	28480	0160-3458
A26A4C7	0180-0291		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C8	01[illegible]		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A26A4C9	0[illegible]	[illegible]	CAPACITOR-FXD .01UF +-10% 200WVDC POLYE	56289	292P10392
A26A4C10	01[illegible]0300	[illegible]	CAPACITOR-FXD .018UF +-10% 200WVDC POLYE	56289	292P18392
A26A4C11	[illegible]0159	[illegible]	CAPACITOR-FXD 6800PF +-10% 200WVDC POLYE	56289	292P68292
A26A4C12	01[illegible]91	1	CAPACITOR-FXD 56PF +-5% 300WVDC MICA	72136	DM15E560J0300WV1CR
A26A4C13	01[illegible]		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A26A4C14	0160-[illegible]	1	CAPACITOR-FXD .1UF +-20% 50WVDC CER	28480	0160-0576
A26A4C15	0160-[illegible]	1	CAPACITOR-FXD 1200PF +-10% 200WVDC POLYE	56289	292P12292
A26A4C16	0160-3534	1	CAPACITOR-FXD 510PF +-5% 100WVDC MICA	28480	0160-3534
A26A4C17	0160-3459	1	CAPACITOR-FXD .02UF +-20% 100WVDC CER	28480	0160-3459
A26A4CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR5	1901-0022	4	DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A4CR6	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A4CR7	1901-0518	5	DIODE-SCHOTTKY	28480	1901-0518
A26A4CR8	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A26A4CR9	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A26A4CR10	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26A4CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4CR12	1901-0022		DIODE-STABISTOR 10V 250MA	28480	1901-0022
A26A4CR13	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A26A4CR14	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A26A4CR15	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A26A4K1	0490-1080	1	RELAY-REED 1C .25A 150V CONT 5V-COIL	28480	0490-1080
A26A4L1	9100-1641	2	COIL-MLD 240UH 5% Q=65 .155DX.375LG	24226	15/243
A26A4L2	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	24226	15/243
A26A4MP1	4040-0753	1	EXTRACTOR-PC BD GRN POLYC .062-BD-THKNS	28480	4040-0753
	1480-0073	2	PIN:DRIVE 0.250" LG	00000	OBD
A26A4MP2	4040-0749	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	1480-0073		PIN:DRIVE 0.250" LG	00000	OBD
A26A4Q1	1854-0221	2	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A26A4Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A4Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	04713	2N3251
A26A4Q4	1854-0221		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A26A4Q5	1853-0034	2	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26A4Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A4Q7	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A26A4Q8	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A26A4R1	2100-2521	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	30983	ET50X202
A26A4R2	2100-2489	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	19701	ET50X502
A26A4R3	0757-0401	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A26A4R4	0757-0290	3	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A26A4R5	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A26A4R6	0757-0440	2	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A26A4R7	0698-3154	3	RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A26A4R8	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A26A4R9	0757-0465	3	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A26A4R10	0757-0442	6	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R11	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R12	2100-2514	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	30983	ET50W203
A26A4R13	0698-3156	2	RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A26A4R14	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R15	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1472-F
A26A4R16	0757-0438	5	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R17	0698-3453	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1963-F
A26A4R18	0698-3153	2	RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A26A4R19	0757-0464	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
A26A4R20	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R21	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R22	0757-0278	2	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A26A4R23	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A26A4R24	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A26A4R25	0757-0458	2	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A26A4R26	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R27	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
A26A4R28	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A26A4R29	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R30	0757-04[illegible]	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A26A4R31	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1331-F
A26A4R32	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A26A4R34	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A26A4R35	0683-1055		RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A26A4R36	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A26A4R37	0757-0394	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A26A4R38	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3831-F
A26A4R39	0757-0280	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A26A4R40	0698-3437	1	RESISTOR 133 1% .125W F TC=0+-100	24546	C4-1/8-T0-133R-F
A26A4R41	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A26A4R42	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A26A4R43	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1961-F
A26A4R44	0757-0421	1	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
A26A4R45	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A26A4R46	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4221-F
A26A4R47	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A26A4R48	0757-0289	1	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
A26A4R49	0698-3150	1	RESISTOR 2.37K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2371-F
A26A4R50	0698-3451	1	RESISTOR 133K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1333-F
A26A4R51			NOT ASSIGNED		
A26A4R52	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A26A4R53	0757-0278		RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A26A4R54	2100-2517	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	30983	ET50X503
A26A4R55	0698-3260	1	RESISTOR 464K 1% .125W F TC=0+-100	91637	CMF-55-1, T-1

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A26A4S1	3101-0860	1	SWITCH-SL DPDT-NS MINTR .5A 125VAC/DC PC	79727	GF126-0064B
A26A4U1	1826-0092	1	IC MC 1458 OP AMP	28480	1826-0092
A26A4U2	1826-0026	1	IC LM 311 COMPARATOR	27014	LM311H
A26A4VR1	1902-0025	1	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A26A4VR2	1902-0184		DIODE-ZNR 16.2V 5% DO-7 PD=.4W TC=+.066%	04713	SZ 10939-242
A26A5			SAME AS A26A5 IN STANDARD INSTRUMENT.		
A26A6			SAME AS A26A6 IN STANDARD INSTRUMENT.		

OPTION 002

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CHASSIS PARTS		
C1	0180-2530	2	CAPACITOR-FXD 3900UF+75-10% 50VDC AL	56289	36D392G050AC2B
C2	0180-2530		CAPACITOR-FXD 3900UF+75-10% 50VDC AL	56289	36D392G050AC2B
C3	0180-2334	1	CAPACITOR-FXD 3900UF+75-10% 75VDC AL	56289	36D392F075BB2B
C4	0180-2277	2	CAPACITOR-FXD 8200UF+75-10% 25VDC AL	56289	36D822G025AC2A
C5	0180-2277		CAPACITOR-FXD 8200UF+75-10% 25VDC AL	56289	36D822G025AC2A
C6	0160-4048	1	CAPACITOR-FXD .022UF +-20% 250WVAC MET	C0633	PME 271 M 522
DS1	2140-0244	1	LAMP-GLOW AIM 65/105VDC 1MA T-2-BULB	28480	2140-0245
F1	2110-0002	1	FUSE 2A 250V FAST-BLO 1.25X.25 UL IEC (FOR 100/120V OPERATION)	75915	312002.
F1	2110-0094	1	FUSE 1.25A 250V FAST-BLO 1.25X.25 UL IEC (FOR 220/240V OPERATION)	75915	3121.25
FL1	0955-0052	1	FILTER, LOW PASS, 1120 MHZ (OPTION 002 ONLY)	11882	TLP-1120-5XX1
J1	08640-60103	1	CONNECTOR ASSEMBLY,OUTPT(SEE FIG. 6-3)	28480	08640-60103
J2			NSR, P/O W4		
J3			NSR, P/O W12		
M1	1120-0539	1	METER	28480	1120-0539
	0360-0053	2	TERMINAL-LUG-SLDR 10 SCR .204/.094 ID	83330	1410-10
MP1	0340-0486	1	INSULATOR-COVER TO- 3 .33-THK	0011J	A22-2003
MP2	0370-2376	1	KNOB, FREQUENCY RANGE(EXCEPT OPTION 002)	28480	0370-2376
MP2	0370-2377	1	KNOB, FREQUENCY RANGE(OPT 002 ONLY)	28480	0370-2377
MP3	0370-2378	1	KNOB, FM VERNIER	28480	0370-2378
MP4	0370-2379	1	KNOB, AM VERNIER	28480	0370-2379
MP5	0370-2380	1	KNOB, PEAK DEVIATION	28480	0370-2380
MP6	0370-2381	1	KNOB, AUD OUT 3V(OPTION 001 ONLY)	28480	0370-2381
MP7	0370-2382	1	KNOB, AUD FXD FREQ(EXCEPT OPTION 001)	28480	0370-2382
MP8	0370-2623	1	KNOB, FINE TUNE	28480	0370-2623
MP9	0370-2387	1	KNOB, AUD OUT 1V(EXCEPT OPTION 001)	28480	0370-2387
MP10	0370-2445	1	KNOB, RND OUTPUT LEVEL VERNIER	28480	0370-2445
MP11	0370-2446	1	KNOB-CONC-RND .5 IN JGK MGP-DECAL MOD. FREQ. VERNIER (OPTION 001 ONLY)	28480	0370-2446
MP12	0403-0026	4	GLIDE:NYLON	28480	0403-0026
MP13	0590-1011	3	NUT-KNRLD-R 15/32-32-THD .12-THK .61-WD (FRONT PANEL CONNECTORS)	28480	0590-1011
MP14			NOT ASSIGNED		
MP15			NOT ASSIGNED		
MP16	4040-0976	1	CLAMP:CAP	00000	OBD
MP17	3150-0203	1	FILTER-CARTRIDGE EXP AL 3.6-W 6-L	28480	3150-0203
MP18	5001-0135	1	WRENCH:COMB	28480	5001-0135
MP19	5060-0109	1	CONNECTOR:15 CONTACTS	28480	5060-0109
MP20	08640-00106	1	PANEL, FRONT	28480	08640-00106
MP21	08640-00021	1	SHIELD, FM AMPLIFIER	28480	08640-00021
MP22	08640-40044	1	SCREW, METER ZERO	28480	08640-40044
MP23	08640-00022	1	SUPPORT, P.C. BOARD	28480	08640-00022
MP24	08640-00030	1	SUPPORT, MODULATOR	28480	08640-00030
MP25			NOT ASSIGNED		
MP26	08640-00059	1	INSULATOR, CONNECTOR	28480	08640-00059
MP27	08640-20078	1	EXTRUSION, TOP	28480	08640-20078
MP28			NOT ASSIGNED		
MP29	08640-20085	1	COUPLER, SHAFT (FILTER CAM)	28480	08640-20085
MP30	08640-20204	1	CASTING, FRONT	28480	08640-20204
MP31	08640-40016	1	CLAMP, METER	28480	08640-40016
MP32	0370-2916	1	KNOB/DIAL ASSY, OUTPUT LEVEL	28480	0370-2916
MP33	08640-40046	3	LENS, DIFFUSING	28480	08640-400[illegible]
MP34	08640-40047	1	KNOB/DIAL ASSEMBLY, MOD FREQ (OPTION 001 ONLY)	28480	08640-[illegible]047
MP35	08640-20315	1	WINDOW, FRONT	28480	08640-20315
MP36	08640-20296	1	DIAL-GEAR ASSEMBLY (OPTION 001 ONLY) (MOD FREQ. VERNIER SKIRT)	28480	08640-20296
MP37	08640-40043	1	TUNE KNOB AND SKIRT	28480	08640-40043
MP38	3101-0559	1	CAP-PB TRL WHITE; ZIG-ZAG 90 DEG TO	28480	3101-0559
MP39			NOT ASSIGNED		
MP40	5040-0388	1	BUTTON, X10%	28480	5040-0388
MP41	5040-0389	1	BUTTON, K/MHZ	28480	5040-0389
MP42	5040-0390	1	BUTTON, VOLTS	28480	5040-0390
MP43	3030-0007	23	SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT (FRONT PANEL KNOB)	28480	3030-0007
MP44	0624-0267	8	SCREW-TPG 6-20 .625-IN-LG PAN-HD-POZI	28480	0624-0277
MP45	0626-0002	2	SCREW-TPG 6-20 .5-IN-LG PAN-HD SLT-REC	28480	0626-0002

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
MP46	1200-0043	5	INSULATOR-XSTR ALUMINUM	76530	322047
MP47	3160-0217	1	FAN BLADE .76-THK 3-OD .079-ID	28480	3160-0217
MP48	5040-0170	2	GUIDE:PLUG-IN PC BOARD	28480	5040-0170
MP49	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT	28480	3030-0007
MP50	5040-0447	2	FOOT, REAR PANEL	28480	5040-0447
MP51			NOT ASSIGNED		
MP52	08620-20016	1	HEAT SINK, TRANS	28480	08620-20016
MP53	08640-00014	1	DECK, TRANSFORMER	28480	08640-00014
MP54	08640-00015	1	DECK, MAIN	28480	08640-00015
MP55	08640-00065	1	SHIELD, ATTENUATOR	28480	08640-00065
MP56	0400-0005	1	GROMMET:RUBBER FOR 0.562" DIA HOLE	73734	#1660
MP57	0403-0026		GLIDE:NYLON	28480	0403-0026
MP58	8160-0238	1	RFI RING MNL .75-IN-OD .218-IN-ID	28480	8160-0238
MP59	8160-0239	1	RFI RING MNL .63-IN-OD .12-IN-ID	28480	8160-0239
MP60	08640-20228	1	COLLAR, RETAINING	28480	08640-20228
MP61	08640-40052	1	SWITCH, LEVER SLIDE	28480	08640-40052
MP62	08640-20057	8	INSUALTOR, TRANSISTOR SCREW	28480	08640-20057
MP63-MP66			NOT ASSIGNED		
MP67	1400-0558	1	CLAMP-CA .5-DIA 1-WD PVC (OPTION 002 ONLY)	06915	HKU-8
MP68	08640-00072	1	BRACKET, FAN TOP	28480	08640-00072
MP69	08640-00073	1	BRACKET, FAN, BOTTOM	28480	08640-00073
MP70	08640-00074	1	FOAM STRIP, BOTTOM COVER	28480	08640-00074
MP71			NOT ASSIGNED		
MP72	7120-4294	1	LABEL, WARNING	28480	7120-4294
MP73			NOT ASSIGNED		
MP74	3030-0007		SCREW-SET 4-40 .125-IN-LG SMALL CUP-PT (FINE TUNE COLLAR)	28480	3030-0007
MP75			NOT ASSIGNED		
MP76	8160-0245	1	RFI GASKET NI ALY 1.56-W 3.97-L (OPTION 003 ONLY)	28480	8160-0245
MP77	7120-4657	1	LABEL, INFO (REV POWER)(OPTION 003 ONLY)	28480	7120-4657
MP78	1400-0510	4	CLAMP-CA .15-DIA .62-WD NYL (OPTION 003 ONLY)	02768	8511-01-00-9909
MP79	2200-0103	6	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI (FOR CAM COVER, EXCEPT OPTION 003)	28480	2200-0103
MP79	2200-0171	6	SCREW-MACH 4-40 .75-IN-LG 82 DEG (FOR CAM COVER,(OPTION 003 ONLY)	28480	2200-0171
MP80	1430-0761	1	GEAR SPUR (OUTPUT LEVEL SHAFT)	28480	1430-0761
MP81	08640-00037	2	INSULATOR, BOTTOM COVER	28480	08640-00037
MP82	08640-00037		INSULATOR, BOTTOM COVER	28480	08640-00037
MP83	3030-0343	1	SCREW-SET 1/4-28 .25-IN-LG HALF DOG-PT (AM CASTING, BOTTOM COVER PLUG)	28480	3030-0343
MP84	08640-40068	1	TRANSFORMER COVER, PROTECTIVE	28480	08640-40068
MP85	0380-0004	2	SPACER-RND .188LG .18ID .250D BRS NI-PL (FOR TRANSFORMER COVER)	28480	0380-0005
MP86	2510-0194	1	SCREW-MACH 8-32 .625-IN-LG PAN-HD-POZI	28480	2510-0194
	3050-0001	1	WASHER-FL MTLC NO.-8 .172-IN-ID	28480	3050-0001
	2190-0019	2	WASHER-LK HLCL NO.-4 .115-IN-ID (FOR TRANSFORMER COVER)	28480	2190-0019
MP87			NOT ASSIGNED		
MP88	1400-0510		CLAMP-CA .15-DIA .62-WD NYL (USED ON PULSE CABLE)	02768	8511-01-00-9909
MP89	08640-00109	1	FOAM STRIP, TOP COVER	28480	08640-00109
MP90	08640-00114	1	FOAM STRIP, TOP COVER	28480	08640-00114
MP91	2200-0143	1	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI (OPTION 001 ONLY)	28480	2200-0143
MP92	2190-0019		WASHER-LK HLCL NO.-4 .115-IN-ID (OPTION 001 ONLY)	28480	2190-0019
MP93	3050-0105	1	WASHER-FL MTLC NO.-4 .125-IN-ID (OPTION 001 ONLY)	28480	3050-0105
Q1	1854-0063	4	TRANSISTOR NPN 2N3055 SI TO-3 PD=115W	28480	1854-0064
Q2	1854-0063		TRANSISTOR NPN 2N3055 SI TO-3 PD=115W	28480	1854-0064
Q3	1854-0250	1	TRANSISTOR NPN SI TO-3 PD=115W	28480	1854-0250
Q4	1854-0063		TRANSISTOR NPN 2N3055 SI TO-3 PD=115W	28480	1854-0064
Q5	1854-0063		TRANSISTOR NPN 2N3055 SI TO-3 PD=115W	28480	1854-0064
R1	2100-3325	1	RESISTOR-VAR DUAL 20K-10%-CC 2K-10%-CC	28480	2100-3325
R2			PART OF R1		
R3	0698-3449	1	RESISTOR 28.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2872-F
S1	3101-1395	1	SWITCH-PB DPDT-DB ALTNG 10.5A 250VAC (LINE)	0050I	53-67280-121/AIH
S2	3101-0070	1	SWITCH-SL DPDT-NS MINTR .5A 125VAC/DC (RF ON/OFF)	79727	GF-126-0000
S3	3101-0163	1	SWITCH-TGL SUBMIN SPDT NS 5A 115VAC (TIME BASE)	09353	Z-11

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
T1	9100-0658	1	TRANSFORMER, POWER	28480	9100-0658
W1	8120-1378	1	CABLE ASSY 18AWG 3-CNDCT JGK-JKT .25-OD	28480	8120-1378
W2			NOT ASSIGNED		
W3	8120-1890	1	CABLE ASSY-COAX 5.253-LG (OSC. TO DIVIDER)	28480	8120-1890
W4	08640-60180	1	CABLE ASSEMBLY,(FM INPUT/OUTPUT)	28480	08640-60180
W5			NOT ASSIGNED		
W6	8120-1881	1	CABLE-COAX .086-OD (MOD. TO FILTER)	28480	8120-1881
W7	8120-1882	1	CABLE-COAX .086-OD (DIVIDER TO MOD.)	28480	8120-1882
W8	8120-0580	1	CABLE-COAX .085-OD (FILTER OUTPUT)	28480	8120-0580
W9			NOT ASSIGNED		
W10	8120-0581	1	CABLE-COAX .086-OD (EXCEPT OPTION 002)	28480	8120-0581
W11	8120-1885	1	CABLE-COAX (EXCEPT OPTION 003)	28480	8120-1885
W11	08640-20245	1	CABLE ASSEMBLY,(OUTPUT, OPTION 003 ONLY)	28480	08640-20245
W12	08640-60128	1	CABLE ASSEMBLY,(AM INPUT/OUTPUT)	28480	08640-60128
W13	08640-60192	1	CABLE ASSEMBLY,(PULSE MOD.)	28480	08640-60192
W14			NOT ASSIGNED		
W15			NOT ASSIGNED		
W16	8120-1593	1	CABLE-SHLD 22AWG 5-CNDCT JGK-JKT .26-OD	28480	8120-1593
W17			NOT ASSIGNED		
W18			NOT ASSIGNED		
W19	08640-20244	1	CABLE ASSEMBLY,ATTEN (OPTION 003 ONLY)	28480	08640-20244

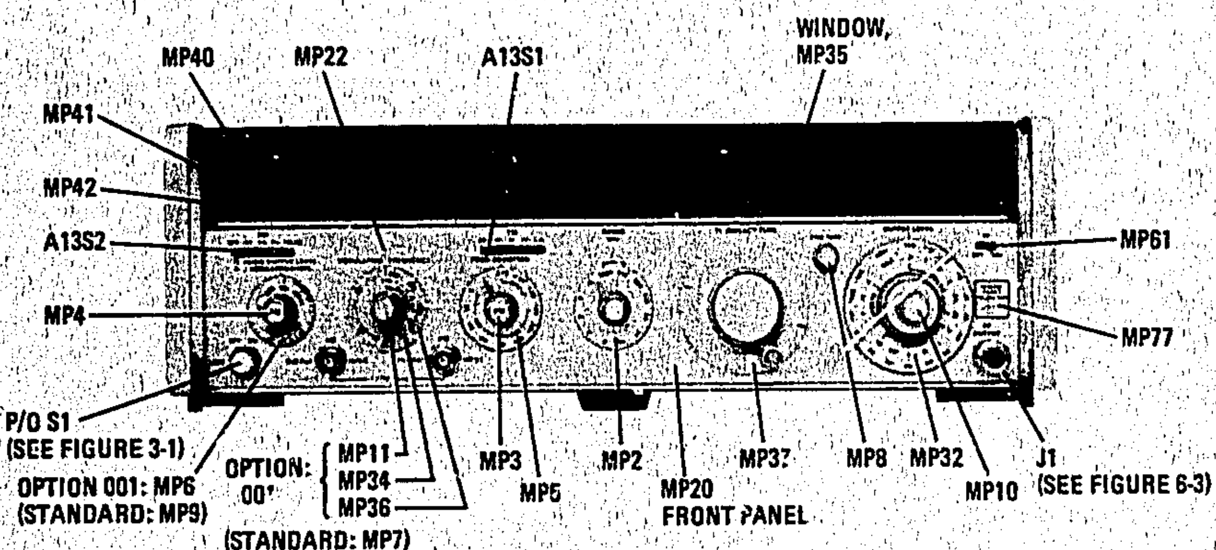


Figure 6-1. Front Panel Mechanical Parts

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			FIGURE 6-2. CABINET PARTS		
1	08640-20075	2	FRAME ASSY, 5 X 16	28480	08640-20075
	0510-0075	8	NUT-SHMET-U 6-32-THD .5-WD STL	78553	C11351-632-24B
2	08640-20204	3	FRONT CASTING, 5H FM	28480	08640-20204
3	08640-00026	1	PANEL, REAR	28480	08640-00026
4	5000-8705	2	COVER, REAR SIDE, NOT PERFORATED	28480	5000-8705
5	5000-8707	2	COVER:FRONT SIDE, NOT PERFORATED	28480	5000-8707
6	08640-00115	1	COVER, TOP	28480	08640-00115
7	08640-00116	1	COVER, BOTTOM	28480	08640-00116
8	5060-0222	2	HANDLE ASSY:5H SIDE	28480	5060-0222
9	5060-8737	2	HANDLE:RETAINER	28480	5060-8737
10	5060-0767	5	FOOT ASSY:FM	28480	5060-0767
11	1490-0030	1	TILT STAND	28480	1490-0030
12	5000-0051	2	TRIM STRIP	28480	5000-0051
13	5060-8740	1	KIT:RACK MOUNT, 5H(MINT GRAY)	28480	5060-8740
14	5000-8711	1	COVER:FRONT SIDE, PERFORATED	28480	5000-8711

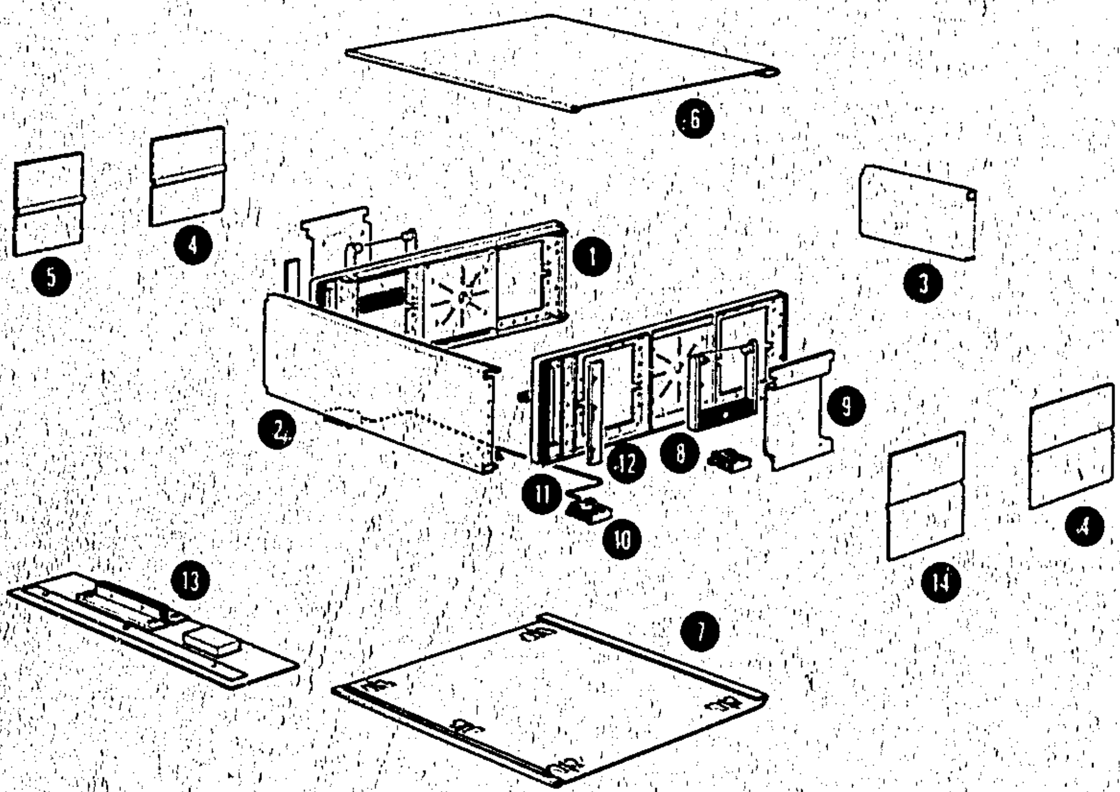


Figure 6-2. Cabinet Parts

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			FIGURE 6-3. TYPE N CONNECTOR		
J1MP1	1250-0914	1	CONNECTOR-RF APC-N FEM UNMTD 50-OHM	90949	131-150
J1MP2	1250-0915	1	CONTACT, RF CONNECTOR, FEMALE CENTER	71785	131-149
J1MP3	2190-0104	1	WASHER-LK INTL T NO.-7/16 .439-IN-ID	78189	1922-04
J1MP4	2950-0132	1	NUT-HEX-DBL-CHAM 7/16-28-THD .094-THK	73734	76500NP
J1MP5	5040-0306	1	INSULATOR	28480	5040-0306
J1MP6	08555-20093	2	CENTER CONDUCTOR	28480	08555-20093
J1MP7	08555-20094	1	BODY, BULKHEAD	28480	08555-20094
J1MP8	08761-2027	1	INSULATOR	28480	08761-2027

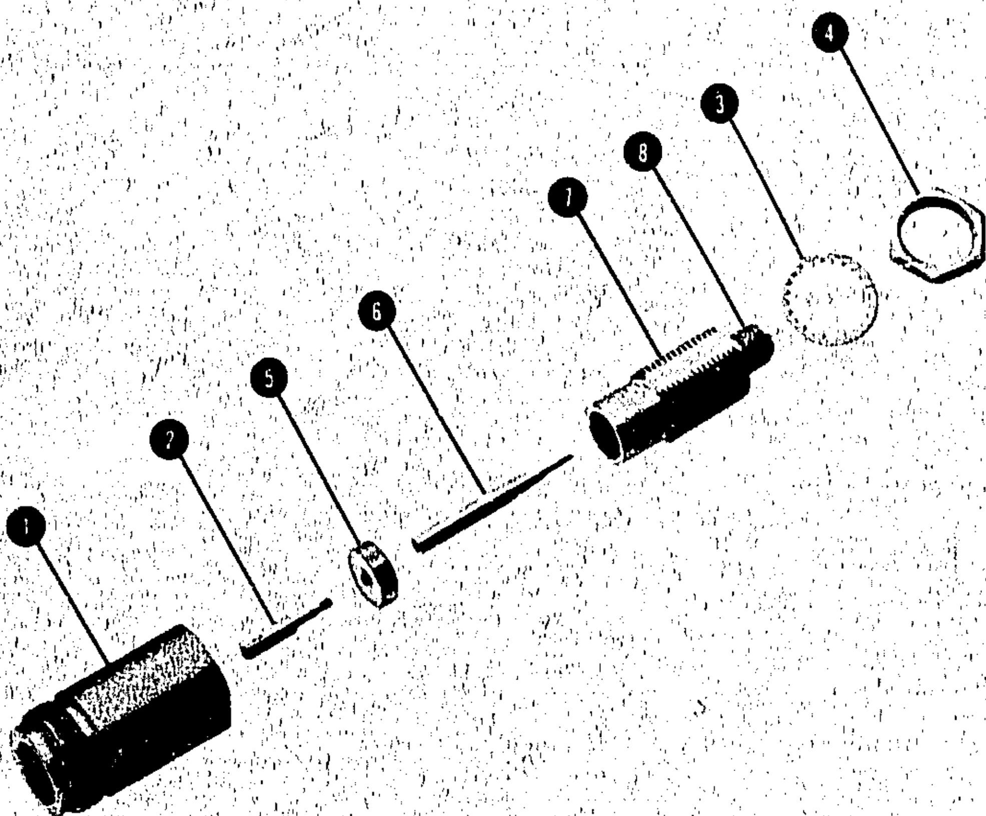


Figure 6-3. Type N Connector

See introduction to this section for ordering information

Table 6-4. Code List of Manufacturers

Mfr Code	Manufacturer Name	Address	Zip Code
C0633	AKTIEBOLAGET BIFA	BROMMA SWEDEN	16111
GB027	NEOHM	ENGLAND	
0G791	THOMPSON BREMER DIV VAPE	CHICAGO IL	60622
00000	U.S.A. COMMON	ANY SUPPLIER OF THE U.S.	
00088	ARIZONA COIL INC	NOGALES AZ	85621
0011J	JERMYN INDUSTRIES		
00188	AP TECH PACKAGING CORP	LOWELL MA	01854
00501	ILLUMINATED PRODUCTS INC	ANAHEIM CA	92803
00779	AMP INC	HARRISBURG PA	17105
00865	STETTNER-TRUSH INC	CAZENOVIA NY	13035
01121	ALLEN-BRADLEY CO	MILWAUKEE WI	53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75231
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE NJ	08876
02768	ILLINOIS TOOL WORKS INC FASTEX DIV	DES PLAINES IL	60016
03888	KDI PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
06915	RICHCO PLASTIC CO	CHICAGO IL	60646
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94040
07700	TECHNICAL WIRE PRODUCTS INC	CRANFORD NJ	07016
09353	C AND K COMPONENTS INC	WATERTOWN MA	02172
11815	CHERRY RIVET DIV TOWNSEND CO	SANTA ANA CA	92707
11882	TELONIC IND INC TELONIC ENGRG DIV	LAGUNA BEACH CA	92652
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW CA	94040
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	76067
2K497	CABLEWAVE SYSTEMS INC	NORTH HAVEN CT	06473
22753	U I D ELECTRONICS CORP	HOLLYWOOD FL	33021
24226	GOWANDA ELECTRONICS CORP	GOWANDA NY	14070
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
24931	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS IN	46227
26742	METHODE ELECTRONICS INC	CHICAGO IL	60656
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
3H768	SIEMENS CORP	ISELIN NJ	08830
30983	MEPCO/ELECTRA CORP	SAN DIEGO CA	92121
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	92507
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS MO	63017
71450	CTS CORP	ELKHART IN	46514
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE IL	60007
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC CT	06226
72982	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE PA	16512
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
73734	FEDERAL SCREW PRODUCTS CO	CHICAGO IL	60618
73743	FISCHER SPECIAL MFG CO	CINCINNATI OH	45236
73899	J F D ELECTRONICS CORP	BROOKLYN NY	11219
74163	PHELPS DODGE CORP	NEW YORK NY	10022
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTELFUSE INC	DES PLAINES IL	60016
76530	TRW ELEK CMPNT CINCH-MONADNOCK DIV	CITY OF INDUSTRY CA	91747
76854	OAK IND INC SW DIV	CRYSTAL LAKE IL	60014
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN IL	60126
78553	TINNERMAN PRODUCTS INC	CLEVELAND OH	44129
79727	C-W INDUSTRIES	WARMINSTER PA	18974
80486	ALL STAR PROD INC	DEFIANCE OH	43512
83330	SMITH HERMAN H INC	BROOKLYN NY	11207
90909	AMPHENOL SALES DIV OF BUNKER-RAMO	HAZELWOOD MO	63042
91637	DALE ELECTRONICS INC	COLUMBUS NE	68601
95121	QUALITY COMPONENTS INC	ST MARYS PA	15857
95987	WECKESSER CO INC	CHICAGO IL	60641
97464	INDUSTRIAL RETAINING RING CO	IRVINGTON NJ	07111
98291	SEALECTRO CORP	MAMARONECK NY	10544
99800	AMER PRCN IND INC DELEVAN DIV	AURORA NY	14052
99934	REMBRANDT INC	BOSTON MA	02118

BACK DATING MANUAL CHANGES

SECTION VII
MANUAL CHANGES

7-1. INTRODUCTION

7-2. This section normally contains information for adapting this manual to instruments for which the content does not apply directly. Since this manual does apply directly to instruments having serial numbers listed on the title page, no change information is given here. Refer to INSTRUMENTS COVERED BY MANUAL in Section I for additional important information about serial number coverage.

SERVICE INFO

SECTION VIII
SERVICE

8-1. INTRODUCTION

8-2. This section contains instructions for troubleshooting and repairing the Signal Generator.

8-3. Principles of operation and troubleshooting information are located opposite the schematics on the foldout Service Sheets. The last two foldouts in this manual have top and bottom internal views of the instrument showing the locations of the major assemblies and some of the chassis parts. Also included are top and bottom internal views with the covers removed from the castings; these views show the locations of the sub-assemblies, the adjustments, and most of the instrument's test points. The last foldout also shows a rear panel view of the instrument.

8-4. The rest of this section has general service information that should help you to quickly service and repair the Signal Generator.

8-5. PRINCIPLES OF OPERATION

8-6. Principles of operation appear on the foldout pages opposite the block diagrams and the schematics on the Service Sheets. Service Sheet 1 is an overall block diagram that briefly describes overall instrument operation. It is keyed, by the numbers in the lower right-hand corners of the blocks, to the detailed block diagrams. They provide an assembly-by-assembly description of instrument operation.

8-7. The detailed block diagrams, in turn, are keyed to the schematics on the Service Sheets that follow them. These Service Sheets provide a stage-by-stage description of the circuits on the schematics. The stages are keyed to the descriptions by the stage names that appear on the schematics.

NOTE

Table 8-4, Schematic Diagram Notes, explains any unusual symbols that appear on the schematics. The table also explains the switch-wafer numbering system.

8-8. TROUBLESHOOTING

8-9. This manual provides two methods to isolate a problem to a particular assembly. The first method is to use the results of the Basic Functional Checks and the performance tests (given in Section IV) and the table of Post-Repair Performance Tests and Adjustments, found in Section V. More information about this method is given in Section V.

8-10. **Overall Troubleshooting.** The second, and primary, troubleshooting method is to use the overall block diagram (found on Service Sheet 1) and the troubleshooting block diagrams that follow it to isolate a problem to a particular assembly or circuit. The troubleshooting information on Service Sheet 1 explains how to use the block diagrams.

8-11. **Circuit-Level Troubleshooting.** Once a problem has been isolated to a particular assembly or circuit, the text and a table opposite the service sheet that documents that circuit give detailed troubleshooting information for the circuit.

8-12. RECOMMENDED TEST EQUIPMENT

8-13. Test equipment and test equipment accessories required to maintain the Signal Generator are listed in Tables 1-2 and 1-3. Equipment other than that listed may be used if it meets the listed critical specifications.

8-14. SERVICE AIDS

8-15. **Pozidriv Screwdrivers.** Many screws in the instrument appear to be Phillips, but are not. To avoid damage to the screw slots, Pozidriv screwdrivers should be used.

8-16. **Service Kit.** The following parts can be ordered for use in a service kit for the generator. (Before ordering, check to ensure that they are not on hand; most of them are common to service kits for other Hewlett-Packard instruments.)

1	SMC Adapter	HP 1250-0827
2	Test Cables SMC to BNC	HP 11592-60001
1	Extender Board 30 pins	HP 08640-60036
1	Extender Board — 20 pins	HP 5060-0256
1	Extender Board — 12 pins	HP 5060-0257
2	Bumpers (for Board)	HP 0403-0115

SERVICE AIDS (Cont'd)

8-17. Hardware Kit. The HP 08640-60095 Hardware Kit contains miscellaneous mechanical spare parts for the generator — such things as nuts, bolts, screws and washers.

8-18. Extender Board. An extender board (HP 08640-60036) is available that can be used to extend all circuit boards (except the A10A2 RF Divider Assembly and the A12 Rectifier Assembly) that are not accessible by removing a casting cover. The RF Divider Assembly is self-extending — just remove the riser board and insert the RF Divider Assembly into the riser's slot. Figure 8-1 shows the extender board in use and the RF Divider Assembly extended.

8-19. Wrench. A wrench is supplied with the generator. One end fits 7/32-inch connectors while the other end fits 1/4-inch connectors. Both of these SMC RF connector sizes are used in the generator. (See Service Sheet H for location.)

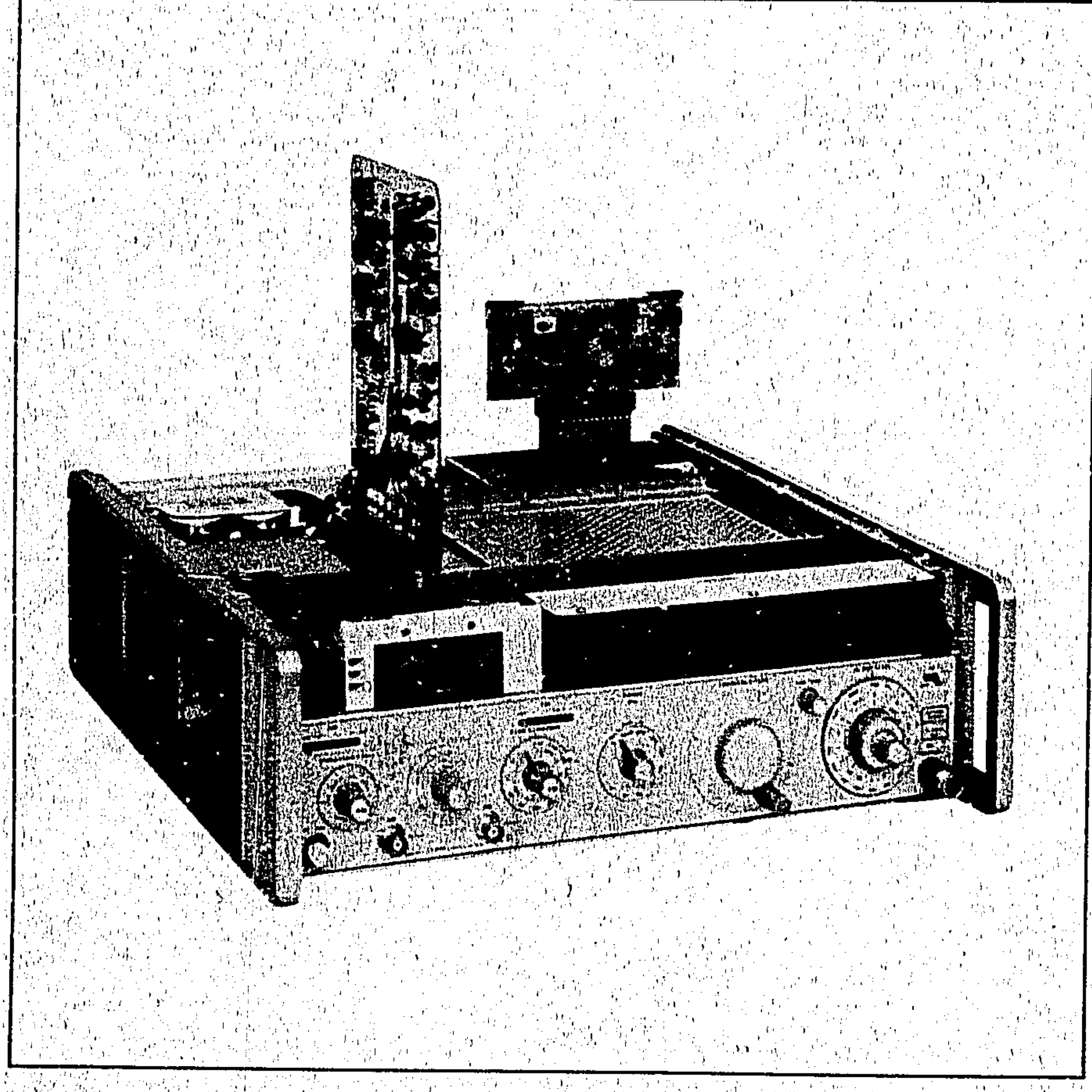


Figure 8-1. Signal Generator With Circuit Boards on Extenders

SERVICE AIDS (Cont'd)

8-20. **Part Location Aids.** The locations of some chassis-mounted parts and the major assemblies are shown on the last two foldouts in this manual. In addition, illustrated parts breakdowns located in Section VI and the alphabetical Service Sheets in Section VIII facilitate the identification of mechanical parts. The locations of individual components mounted on printed circuit boards or other assemblies are shown on the appropriate schematic diagram page or on the page opposite it. The part reference designator is the assembly designator plus the part designator (for example, A6R9 is R9 on the A6 assembly). For specific component description and ordering information refer to the parts list in Section VI.

8-21. **Servicing Aids on Printed Circuit Boards.** The servicing aids include test points, transistor and integrated circuit designations, adjustment callouts and assembly stock numbers.

8-22. REPAIR

8-23. Factory-Selected Components

8-24. Some component values are selected at the time of final checkout at the factory (see Table 5-1). Usually these values are not extremely critical; they are selected to provide optimum compatibility with associated components. These components are identified on individual schematics by an asterisk (*). The recommended procedure for replacing a factory-selected part is as follows:

a. Try the same value as the component just removed, then perform the calibration test specified for the circuit in the performance and adjustment sections of this manual.

b. If calibration cannot be accomplished, try the typical value shown in the parts list and repeat the test.

c. If the test results are still not satisfactory, substitute various values within the tolerances specified in Table 5-1, until the desired result is obtained.

8-25. Etched Circuits

8-26. The etched circuit boards in the Signal Generator are of the plated-through type consisting of metallic conductors bonded to both sides of insulating material. The metallic conductors are extended through the component mounting holes by a plating process. Soldering can be done from either side of the board with equally good results. Table 8-1 lists recommendations and precautions pertinent to etched circuit repair work.

a. Avoid unnecessary component substitution; it can result in damage to the circuit board and/or adjacent components.

b. Do not use a high-power soldering iron on etched circuit boards. Excessive heat may lift a conductor or damage the board.

c. Use a suction device (Table 8-1) or wooden toothpick to remove solder from component mounting holes. DO NOT USE A SHARP METAL OBJECT SUCH AS AN AWL OR TWIST DRILL FOR THIS PURPOSE. SHARP OBJECTS MAY DAMAGE THE PLATED-THROUGH CONDUCTOR.

d. After soldering, remove excess flux from the soldered areas and apply a protective coating to prevent contamination and corrosion. (Avoid getting flux remover on the printed circuit board extractors.) See Table 8-1 for recommendation.

8-27. Etched Conductor Repair

8-28. A broken or burned section of conductor can be repaired by bridging the damaged section with a length of tinned copper wire. Allow adequate overlay and remove any varnish from etched conductor before soldering wire into place.

8-29. Component Replacement

8-30. Remove defective component from board.

NOTE

Although not recommended on boards with high-frequency signals or where both sides of a board are accessible, axial lead components, such as resistors and tubular capacitors, can be replaced without unsoldering. Clip leads near body of defective component, remove component and straighten leads left in board. Wrap leads of replacement component one turn around original leads. Solder wrapped connection and clip off excess lead.

8-31. If component was unsoldered, remove solder from mounting holes, and position component as original was positioned. DO NOT FORCE LEADS INTO MOUNTING HOLES; sharp lead ends may damage plated-through conductor.

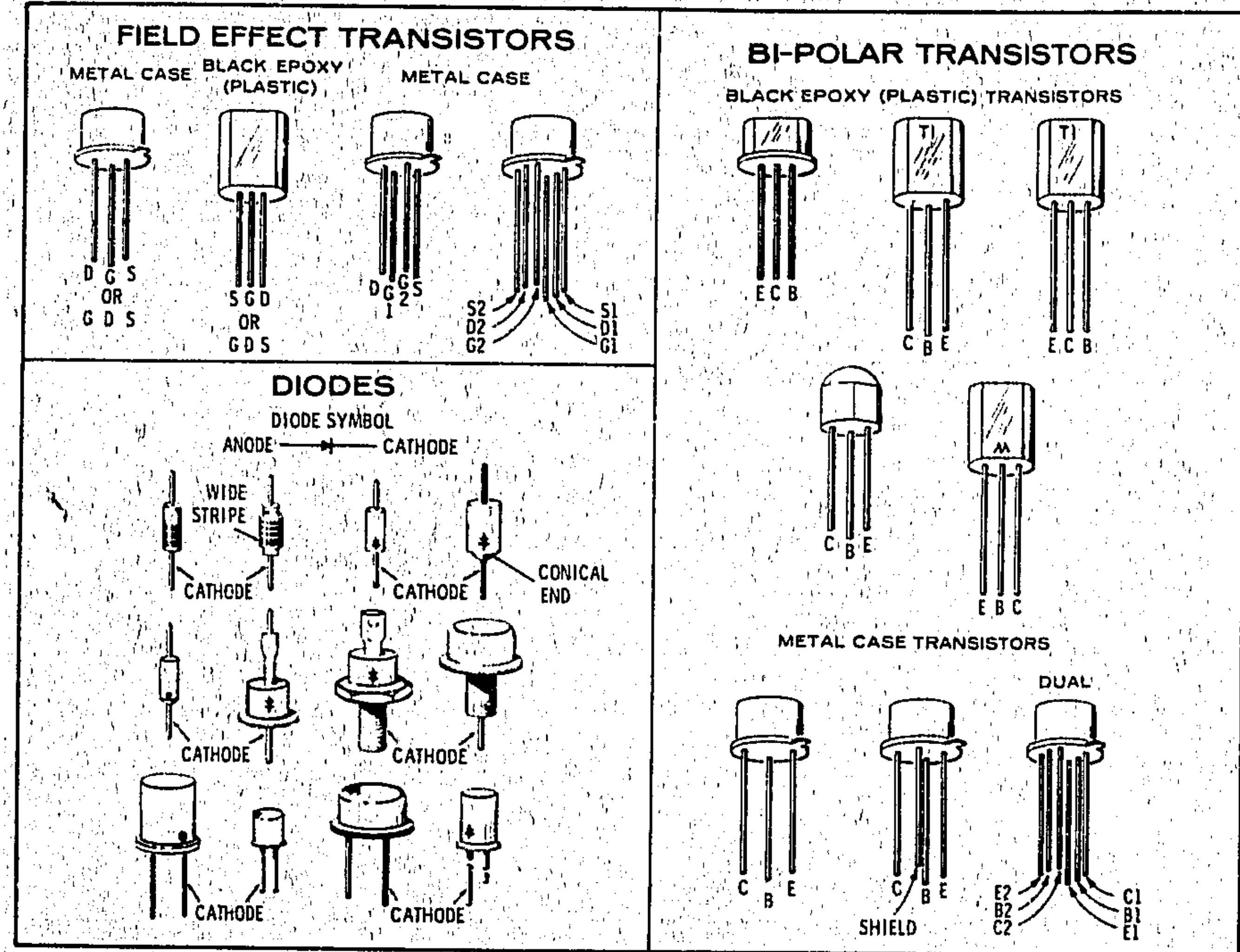


Figure 8-2. Examples of Diode and Transistor Marking Methods

Table 8-1. Etched Circuit Soldering Equipment

Item	Use	Specification	Item Recommended
Soldering tool	Soldering, unsoldering	Wattage range: 37-50; Tip Temp: 750-800°	Ungar #766 handle w/*Ungar #1237 heating unit
Soldering Tip	Soldering, unsoldering	*Shape: pointed	*Ungar #PL111
De-soldering Aid	To remove molten solder from connection	Suction device	Soldapullt by Edsyn Co., Arleta, California
Resin (flux) Solvent	Remove excess flux from soldered area before application of protective coating	Must not dissolve etched circuit base board	Freon; Acetone; Lacquer Thinner
Solder	Component replacement Circuit board repair Wiring	Resin (flux) core, high tin content (60/40 tin/lead), 18 gauge (SWG) preferred	— —
Protective	Contamination, corrosion protection	Good electrical insulation; corrosion-prevention properties	Silicone Resin such as GE DRI-FILM**88

* For working on circuit boards: for general purpose work, use Ungar No. 4037 Heating Unit (47½-56½W) tip temperature of 850-900 degrees) and Ungar No. PL113 1/8" chisel tip.

** General Electric Co., Silicone Products Dept., Waterford, New York, U.S.A.

8-32. Transistor Replacement. Transistors are packaged in many physical forms. This sometimes results in confusion as to which lead is the collector, which is the emitter, and which is the base. Figure 8-2 shows typical epoxy and metal case transistors and the means of identifying the leads.

8-33. To replace a transistor, proceed as follows:

a. Do not apply excessive heat; see Table 8-1 for recommended soldering tools.

b. If possible, use long-nose pliers between transistor and hot soldering tools.

c. When installing replacement transistor, ensure sufficient lead length to dissipate soldering heat by using about the same length of exposed lead as used for original transistor.

d. Integrated circuit replacement instructions are the same as those for transistors.

8-34. Some transistors are mounted on heat sinks for good heat dissipation. This requires good thermal contact with mounting surfaces. To assure good thermal contact for a replacement transistor, coat both sides of the insulator with Dow Corning No. 5 silicone compound or equivalent before fastening the transistor to the chassis. Dow Corning No. 5 compound is available in 8 oz. tubes from Hewlett-Packard; order HP 8500-0059.

8-35. Diode Replacement. Solid state diodes have many different physical forms. This sometimes results in confusion as to which lead is the anode (positive), since not all diodes are marked with the standard symbols. Figure 8-2 shows examples of some diode marking methods. If doubt exists as to polarity, an ohmmeter may be used to determine the proper connection. It is necessary to know the polarity of the ohms lead with respect to the common lead for the ohmmeter used. (For the HP Model 410B Vacuum Tube Voltmeter, the ohms lead is negative with respect to the common; for the HP Model 412A DC Vacuum Tube Voltmeter, the ohms lead is positive with respect to the common). When the ohmmeter indicates the least diode resistance, the cathode of the diode is connected to the ohmmeter lead which is negative with respect to the other lead.

NOTE

Replacement instructions are the same as those listed for transistor replacement.

8-36. Illustrated Parts Breakdowns

8-37. Illustrated parts breakdowns for the generator's major assemblies are given on Service Sheets A through H. They are keyed to disassembly and removal instructions (given on the alphabetical service sheets) and to the replaceable parts list given in Section VI. In addition, Section VI contains illustrated parts breakdowns for the N type output connector, the cabinet parts, and front panel mechanical parts.

8-38. BASIC CIRCUIT THEORY

8-39. Binary Circuits and Symbols

8-40. Introduction. The binary circuits and symbols used in this manual are as shown in Figure 8-3. This instrument uses three different families of logic circuits: TTL, ECL, and EECL. Most of the logic devices used in this instrument are TTL; there are notes on the Service Sheets that indicate what families the non-TTL devices belong to. Table 8-2 indicates the voltage levels that are associated with each family. The table also shows the effect that an open and a ground has on each family.

Table 8-2. Logic Levels

Logic Voltage Levels

LOGIC	TTL	ECL	EECL
High (1) Low (0)	≥2V ≤0.8V	≥−0.5V ≤−1.5V	≥−0.1V ≤−0.6V

Input Conditioning

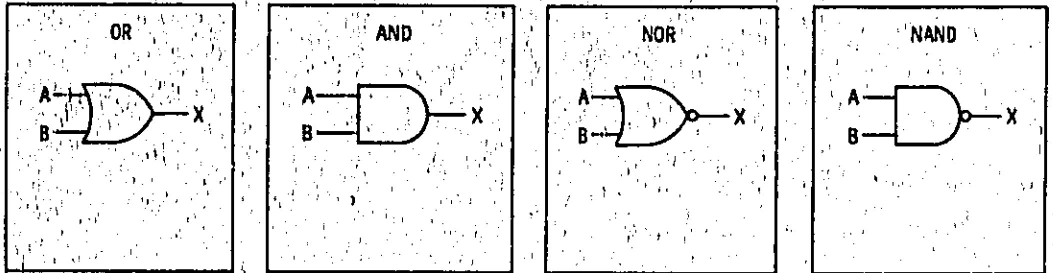
INPUT	TTL	ECL	EECL
Grounded Open	Low (0) High (1)	High (1) Low (0)	High (1) Low (0)

8-41. Symbols used to designate binary circuits in this manual should be interpreted according to the following general rules:

a. Signals that are active-low are indicated with an L in parenthesis (e.g., CLOCK (L) indicates a clock signal that is active low).

b. Signals that are active-high are indicated with an H in parenthesis.

BINARY SYMBOLS



OR

A	B	X
H	H	H
H	L	H
L	H	H
L	L	L

AND

A	B	X
H	H	H
H	L	L
L	H	L
L	L	L

NOR

A	B	X
H	H	L
H	L	L
L	H	L
L	L	H

NAND

A	B	X
H	H	L
H	L	H
L	H	H
L	L	H

Figure 8-3. Binary Symbols

Binary Circuits and Symbols (Cont'd)

c. A circle (○) at an input indicates that it is active low. A circle at an output indicates inversion or that the output is active-low.

d. A dynamic indicator symbol (▷) at an input indicates that the input triggers (is active) only on the leading or trailing edge of an input signal. If a circle is present at the same input, it is sensitive to the trailing edge. If no circle is present, the input triggers on the leading edge. Inputs that are not edge sensitive are referred to as level sensetive and are shown without the dynamic indicator symbol.

e. Complementary outputs are usually designated with a not-bar (e.g., the complement of the J/K flip-flop's Q output is its $\bar{Q}$ output). Both Q and $\bar{Q}$ may be simultaneously high in some instances (e.g., when both SET and CLEAR are low on some D flip-flops).

8-42. Trigger (T) inputs are usually high-going (edge sensitive) unless there is a circle at the input (which would make them low-going). All other inputs are usually level sensitive.

8-43. Open Collector TTL. Some TTL gates have open collector outputs. This feature is indicated by a note on the Service Sheet. In open collector logic the output stage is an NPN transistor with the emitter grounded and the collector connected directly to the output terminal (with no internal pull-up resistor or transistor) as shown in Figure 8-4. The output is low when the output transistor is saturated and is high when the transistor is off. (However, the output can only be high when the collector is connected to the positive supply through an external pull-up resistor). Open collector gates are often used to switch in non-TTL devices such as lamps, relays, and capacitors.

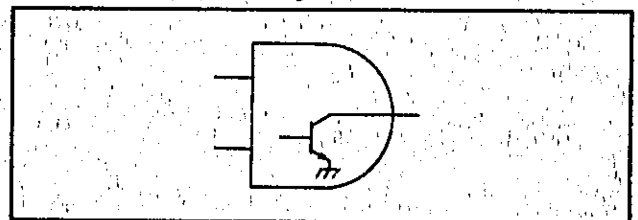


Figure 8-4. Open Collector Output Stage (AND Gate)

8-44. Triggered Flip-Flop. There are two kinds of triggered flip-flops. The bistable triggered flip-flop toggles (changes states) when triggered by a pulse at the T input (shown in Figure 8-5). This effectively divides the input by two, giving one output pulse at the Q output for every two input pulses.

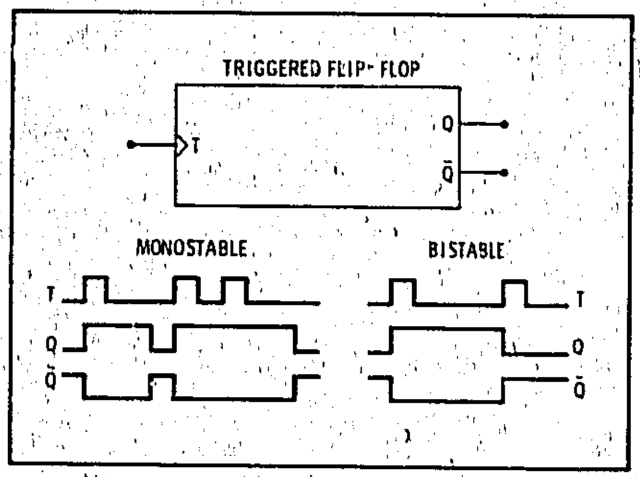


Figure 8-5. Triggered Flip-Flop

Binary Circuits and Symbols (Cont'd)

The monostable triggered flip-flop's Q output goes high when triggered at the T input. Unless disturbed by another input pulse, the Q output will automatically return to the original state after a set amount of time. This period of time is usually determined by external components. The monostable flip-flop (or one-shot) is often used for timing or pulse shaping.

8-45. Schmitt Trigger. A typical Schmitt Trigger is shown in Figure 8-6. Some Schmitt triggers have complementary outputs. The device initially triggers when the input signal passes a voltage reference called the upper trip point. It triggers back into its initial state when the input voltage passes a voltage reference called the lower trip point. One or both trip points may be indicated.

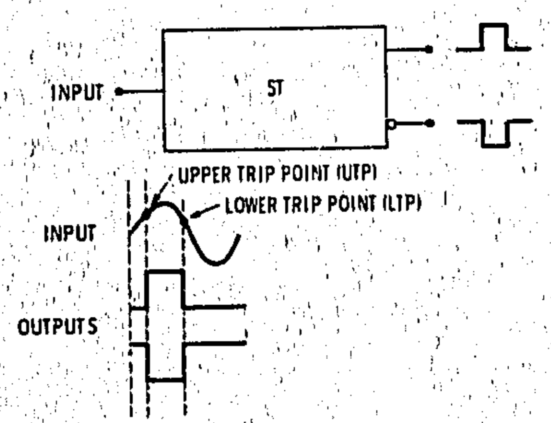


Figure 8-6. Schmitt Trigger

8-46. J/K Flip-Flop. Figure 8-7 shows a typical J/K flip-flop. The trigger (T) input is activated by a low-going signal as indicated by the circle on the symbol. Flip-flop response is determined by the values of the J and K inputs at the instant that a low-going signal is applied to the trigger input:

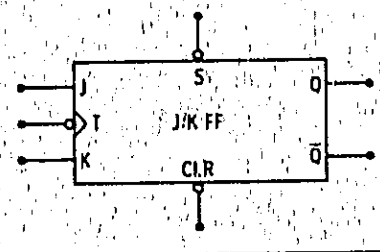
a. When J and K are low, the Q outputs will not change state.

b. When J is low and K is high, Q will go low (unless it is already low).

c. When J is high and K is low, Q will go high (unless it is already high).

d. When J and K are connected together and high, the Q output will change state with each trigger pulse. The result is a flip-flop which divides the trigger frequency by two.

J/K FLIP-FLOP



J	K	OUTPUT AFTER TRIGGER Q	$\overline{Q}$
0	0	NO CHANGE	
0	1	0	1
1	0	1	0
1	1	TOGGLES	

Figure 8-7. J/K Flip-Flop

8-47. The set (S) and clear (CLR) inputs override all other input conditions: when S is low, Q is forced high; when CLR is low, Q is forced low. Although normally the $\overline{Q}$ output is the compliment of the Q output, simultaneous low inputs at S and CLR will force both Q and $\overline{Q}$ high on some J/K flip-flops.

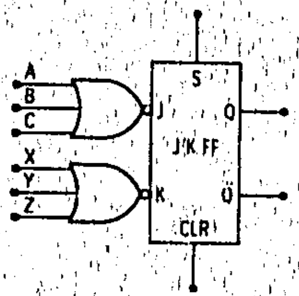
8-48. Multiple Input J/K Flip-Flop. A multiple input J/K flip-flop is shown in Figure 8-8. It behaves like a J/K flip-flop with NORed inputs: if A, B and C are low, J is high, if A, B or C is high, J is low. A J-related and a K-related input may be tied together to form a trigger input; in this case the trigger would be active-low (if all other inputs are low).

8-49. Linear Integrated Circuits

8-50. Operational Amplifier. Figure 8-9 shows a typical operational amplifier. Circuit A is a non-inverting buffer amplifier with a gain of 1. Circuit B is a non-inverting amplifier with gain determined by R1 and R2. Circuit C is an inverting amplifier with gain determined by R2 and R1. Circuit D shows typical circuit connections and parameters. It is assumed that the amplifier has high gain, low output impedance, and high input impedance.

Linear Integrated Circuits (Con't)

MULTIPLE INPUT J/K FLIP-FLOP



A	X	Q	$\bar{Q}$
0	0	TOGGLES	
0	1	1	0
1	0	0	1
1	1	NO CHANGE	
B, C, Y and Z = 0			

Figure 8-8. Multiple Input J/K Flip-Flop

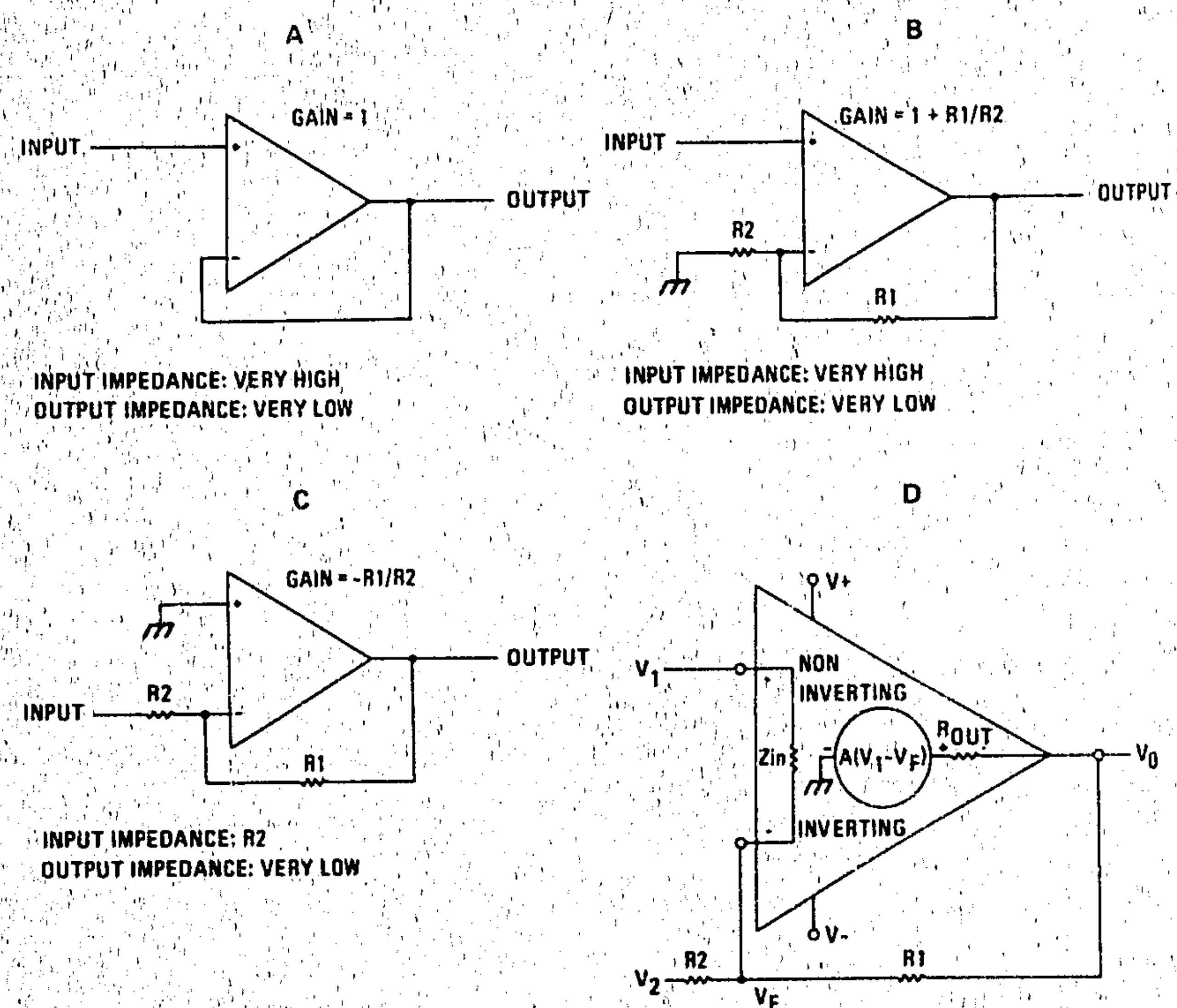
8-51. An operational amplifier can be characterized as an ideal voltage amplifier having low output impedance, high input impedance, and very high gain. Also the output voltage is proportional to the difference in the voltages applied to the two input terminals. In use, the amplifier output drives the input voltage difference close to zero through a negative feedback path.

8-52. When troubleshooting an operational amplifier, measure the voltages at the two inputs with no signal applied; the difference between these voltages should be less than 10 mV. A difference voltage much greater than 10 mV indicates trouble in the amplifier or its external circuitry. Usually this difference will be several volts and one of the inputs will be very close to an applied circuit operating voltage (for example, +20V, −12V).

8-53. Next, check the amplifier's output voltage. It will probably also be close to one of the applied circuit potentials: ground, +20V, −12V, etc. Check to see that the output conforms to the inputs. For example, if the inverting input is positive, the output should be negative; if the non-inverting input is positive, the output should be positive. If the output conforms to the inputs, check the amplifier's external circuitry. If the amplifier's output does not conform to its inputs, it is probably defective.

8-54. **Comparator.** Comparators are used as sense amplifiers, pulse height discriminators, and voltage comparators. A voltage reference is connected to one of the amplifier's inputs as shown in Figure 8-10. When the input signal voltage crosses the reference, the output goes positive; the output remains positive until the signal re-crosses the reference.

OPERATIONAL AMPLIFIER



IF "A" IS LARGE, $V_F = V_1$

(1) $\boxed{V_0 = V_1\left(1 + \frac{R1}{R2}\right) - V_2\left(\frac{R1}{R2}\right)}$

(2) IF $V_2 = 0$ (⏚), THEN $\boxed{V_0 = V_1\left(1 + \frac{R1}{R2}\right)}$

(3) IF $V_1 = 0$ (⏚), THEN $\boxed{V_0 = -V_2\left(\frac{R1}{R2}\right)}$

Figure 8-9. Operational Amplifier

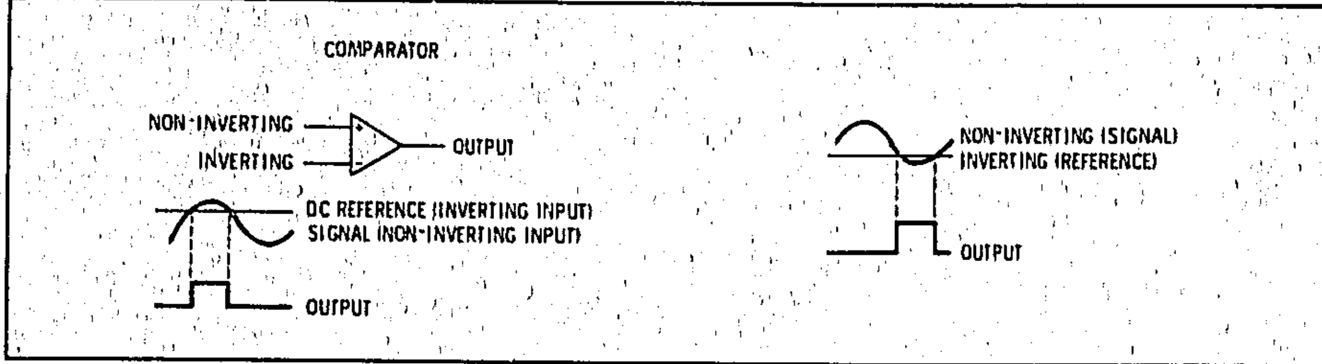


Figure 8-10. Comparator

Table 8-3. Assembly Information Index

Assembly[1]	Service Sheet Number	
	Schematic[2]	Illustrated Parts Breakdown[3]
A1 Output Level Assembly	13, 13A, 13B, 16	A
A2 Meter Switch and Drive Assembly	17	
A3 RF Oscillator Assembly	5, 6	B
A5 FM Amplifier Assembly	6	
A6 Annunciator Assembly	8, 17	
A7 FM Shaping Assembly	7, 8	
A8 Mechanical Dial Assembly		C
A9 Peak Deviation and Range Switch Assembly	6, 7, 8, 15	D
A10 Divider/Filter Assembly	10, 11	E
A11 Fixed-Frequency Modulation Oscillator Assembly (Standard)	9	
A11 Variable-Frequency Modulation Oscillator Assembly (Option 001)	9A	E
A12 Rectifier Assembly	22	
A13 Modulation/Metering Motherboard Assembly	6, 9, 9A, 14, 25	
A14 Line Power Assembly	22	
A15 Riser Assembly	14, 15, 16	
A16 Fan Motor Assembly	23	
A17 Power Supply MotherBoard	24	
A18 −5.2V Regulator and Fan Driver Assembly	23	
A20 +5.2V and +44.6V Regulator Assembly	22	
A21 Reverse Power Protection Assembly (Option 003)	13B	
A22 +20V and −20V Regulator Assembly	22	
A24 Series Regulator Socket Assembly	22	
A26 AM/AGC and RF Amplifier Assembly	12, 13, 14, 15, 16	F
A26 AM/AGC and RF Amplifier Assembly (Option 002)	12A, 13A, 14, 15, 16	F

[1]Odd numbered assemblies and their subassemblies are accessible from bottom of instrument. Even numbered assemblies and their subassemblies are accessible from top of instrument. See Service Sheets G and H for top and bottom internal views of instrument.

[2]Assembly principles of operation, troubleshooting, and component location photographs are given on the service sheet with the schematic.

[3]Assembly removal and disassembly procedures are given on the service sheet with the illustrated parts breakdown.

Table 8-4. Schematic Diagram Notes (1 of 3)

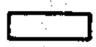
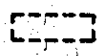
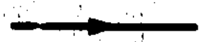
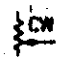
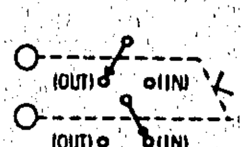
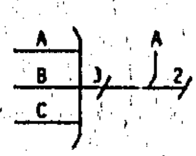
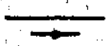
	Resistance in ohms, capacitance in picofarads, inductance in microhenries unless otherwise noted. Binary symbols explained beginning with paragraph 8-39.
	Tool-aided adjustment.
	Manual control.
	Enclosed front-panel designation.
	Encloses rear-panel designation.
	Circuit assembly borderline.
	Other assembly borderline. Also used to indicate mechanical interconnection (ganging) and RF shielding.
	Heavy line with arrows indicates path and direction of main signal.
	Heavy dashed line with arrows indicates path and direction of main feedback.
	Wiper moves toward cw with clockwise rotation of control (as viewed from shaft or knob).
	A direct conducting connection to the earth, or a conducting connection to a structure that has a similar function (e.g., the frame of an air, sea, or land vehicle).
	Relay contact moves in direction of arrow when energized.
	Indicates interconnected pushbutton switches. Pushing one switch in (IN) releases the other.
	Indicates multiple paths represented by only one line. Letters or names identify individual paths. Numbers indicate number of paths represented by the line.
	Coaxial or shielded cable.

Table 8-4. Schematic Diagram Notes (2 of 3)

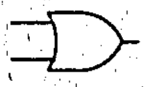

Stripline (i.e., RF transmission line above ground)

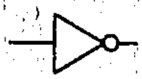
RF coupling by magnetic (H) field.

Indicates twisted wire pair. (T indicates twisted wire triplet.)

BINARY CIRCUIT SYMBOLS


AND Gate


OR Gate


Inverter

Active-low input/output

High-going edge sensitive trigger

Low-going edge sensitive trigger

EXAMPLE: A3S1AR(2-1/2)

A3S1 – SWITCH S1 WITHIN ASSEMBLY A3

A – 1st WAFER FROM FRONT (A – 1st, ETC)

R – REAR OF WAFER (F – FRONT)

(2-1/2) – TERMINAL LOCATION (2-1/2) (VIEWED FROM FRONT)

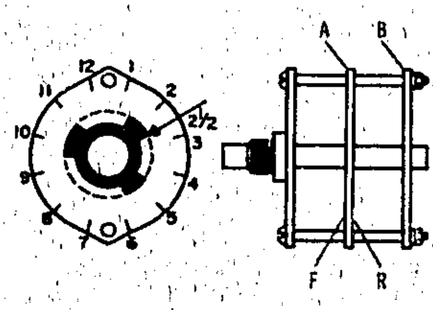
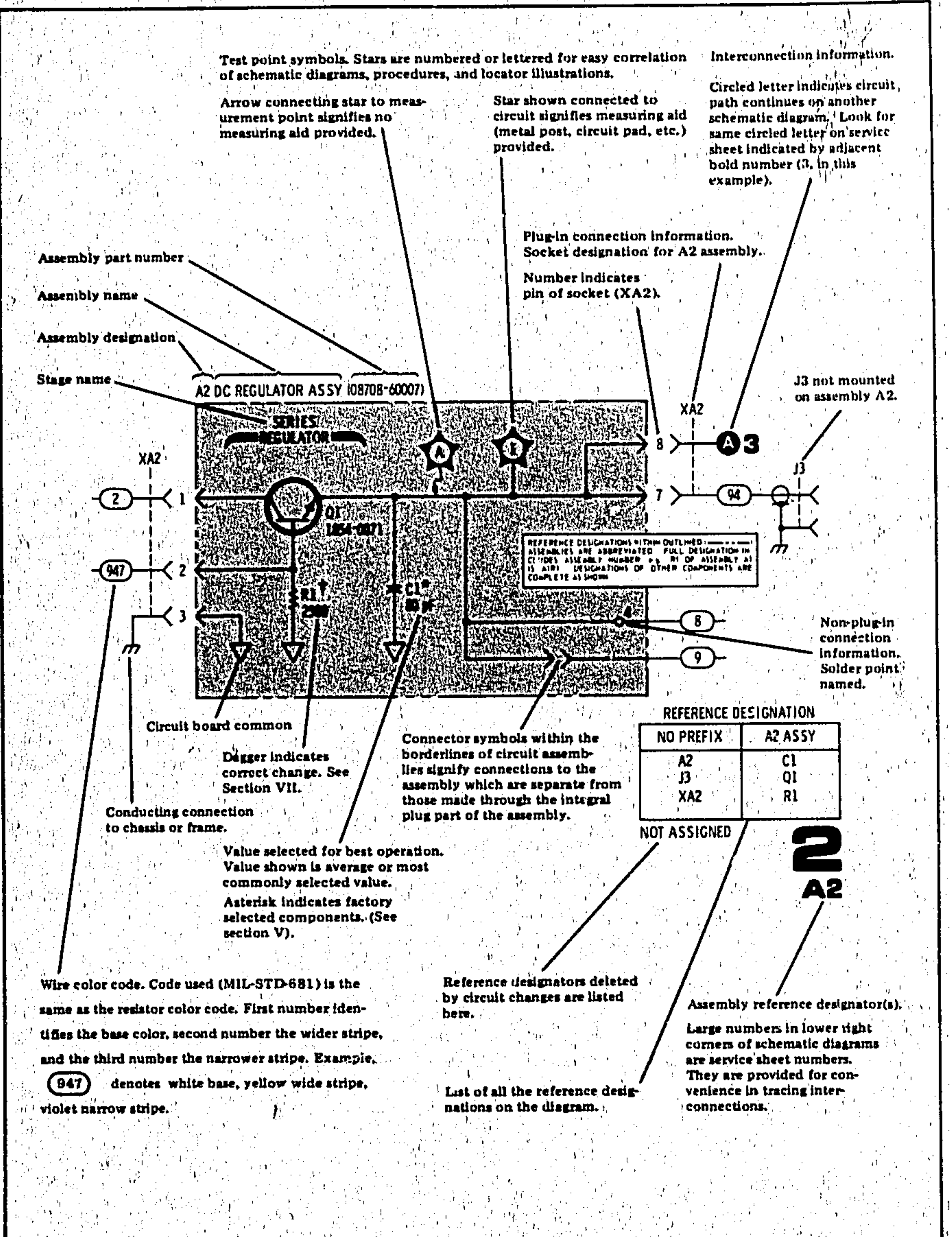


Table 8-4. Schematic Diagram Notes (3 of 3)



SERVICE SHEET 1

PRINCIPLES OF OPERATION

General

The Hewlett-Packard Model 8640A Signal Generator is a mechanically-tuned, solid-state RF source producing signals from 0.5 to 512 MHz. The RF oscillator produces a basic frequency range of 256 to 512 MHz. Nine lower ranges (0.5 to 256 MHz) are obtained by dividing down this range, and one higher range (512 to 1024 MHz, Option 002) is obtained by frequency doubling. The leveled output may be continuously varied over an 18 dB range or attenuated in 10 dB steps from +19 to −145 dBm (+13 to −145 dBm in the 512 to 1024 range). Calibrated AM and FM (either internal or external) and external pulse modulation are provided. The RF output frequency is read on a mechanical dial.

FM Circuits and RF Oscillator

The RF source is a 256 to 512 MHz cavity-tuned oscillator that is mechanically tuned by the FREQUENCY TUNE and FINE TUNE controls. The oscillator can also be electrically tuned over a smaller range by the FM circuits. The FM circuits amplify and shape the modulation input to provide linear, calibrated frequency modulation. FM inputs can be either external (ac or dc coupled) internal from the modulation oscillator, or an accurate 1 Vdc useful for FM calibration.

AM/AGC Circuit and Output Amplifier

The RF oscillator drives the RF dividers (a chain of binary dividers) which yield the RF for the lower nine frequency ranges. The RF filters remove the harmonics from the RF signal.

The AM/AGC circuits form a feedback system to control the amplitude of the output and to provide AM or pulse modulation. The detector senses the level of the RF signal from the RF output amplifier. A summing amplifier compares the detector output against an input reference and drives the modulator. The modulator acts as a current-controlled attenuator to control the RF level.

The reference to the summing amplifier consists of the level reference, which comes from the output level vernier, and the modulation signal, if present. The modulation signal can be either external (ac or dc coupled) or internal (from the modulation oscillator). In the pulse modulation mode, external modulation pulses switch the modulator off and on. Amplitude leveling is maintained in this mode by storing the detector output between pulses.

The 10 dB RF step attenuator further controls the output level. The meter circuits monitor either the detector output (and hence the output level), the positive peak of the AM modulating signal (calibrated to give % AM), or the positive peak of the FM modulating signal (calibrated to give peak deviation).

Internal Doubler (Option 002)

If the 512–1024 MHz range is selected, a frequency doubler circuit is switched in at the output of the output amplifier. The doubler is a full-wave rectifier followed by a high frequency amplifier. On this range a separate detector is used.

Reverse Power Protection (Option 003)

Reverse power protection consists of a power level sensor, limiter, and RF relay which opens the RF path to the output connector when excessive RF power is sensed.

TROUBLESHOOTING

Use the overall block diagram to isolate the trouble to a specific section of the instrument. Then turn to the troubleshooting block diagram that covers that section of the instrument and use the information on the diagram to isolate the trouble to the defective assembly. Next, turn to the Service Sheet that covers that assembly and isolate the trouble to the defective component or replace the assembly.

For example, suppose the AM functions are out of specification. The block diagram on Service Sheet 1 is keyed to the troubleshooting block diagrams that follow it — in this case, Service Sheet 3. Service Sheet 3 gives a list of generator control settings (the list is located in the box on the right-hand side of the sheet) and the voltages and waveforms that should be found at the test points and along the signal paths. To check a voltage at a test point, change the control settings as specified in the box associated with that test point, check the voltage, then reset the controls to the settings specified in the box on the right-hand side.

NOTE

The last two foldouts in this manual have top and bottom internal views

SERVICE SHEET 1 (Cont'd)

of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).

The blocks on Service Sheet 3 are keyed, by the numbers located in their lower right-hand corners, to the Service Sheets that have the circuit schematics. In our example, suppose the signals to the A26A3 Assembly are correct and the signals from A26A3 are incorrect. Turn to Service Sheet 12 (or 12A for Option 002) and isolate the trouble to a component or replace A26A3.

NOTE

After repairs are complete, see Table 5-2 for appropriate post-repair tests and adjustments.

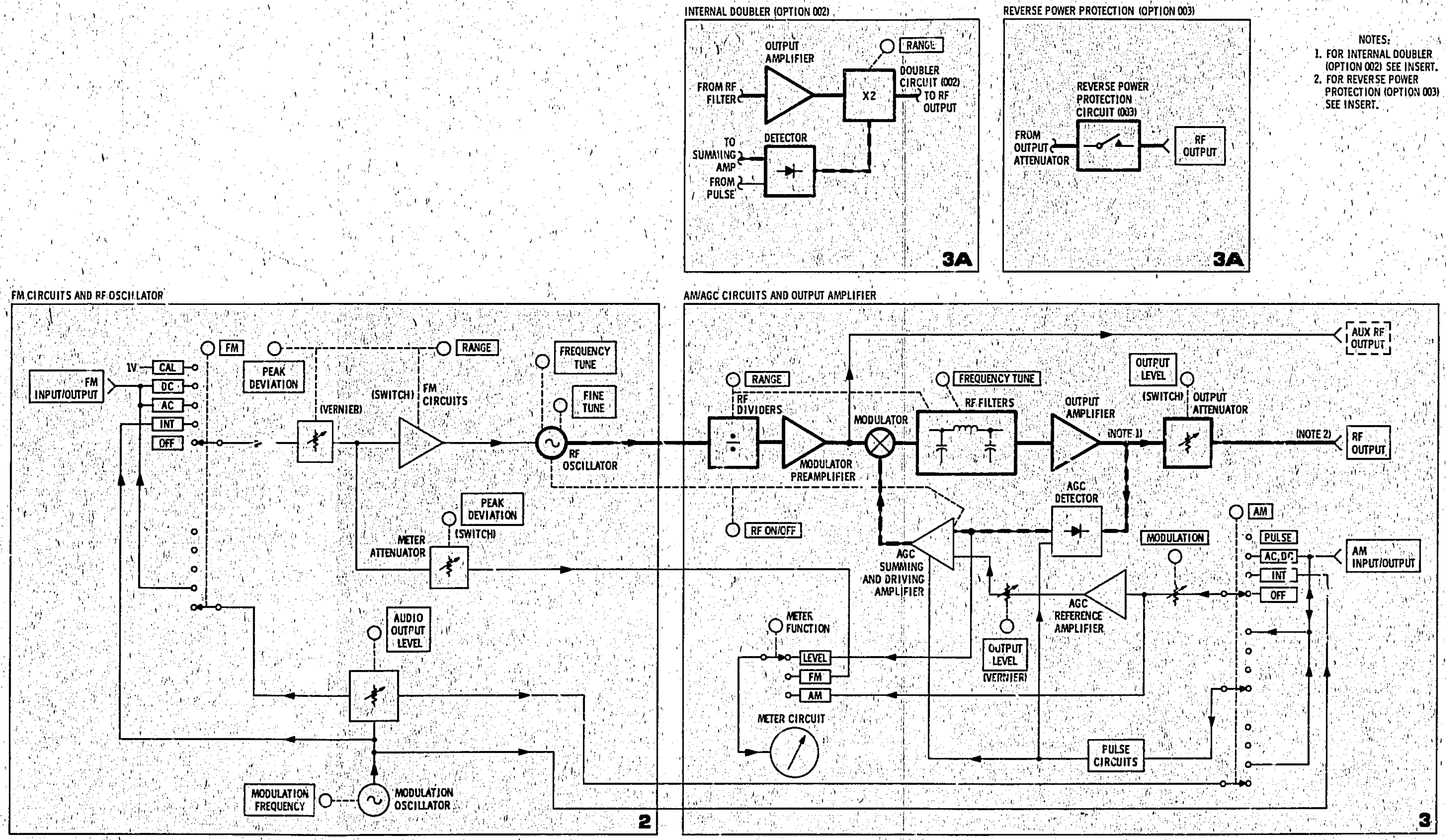
WARNINGS

The opening of covers or removal of parts, except those to which access can be gained by hand, is likely to expose live parts, and also accessible terminals may be live. Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuse-holders must be avoided.

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



1

Figure 8-11. Overall Block Diagram

SERVICE SHEET 2

PRINCIPLES OF OPERATION

RF Oscillator

The full frequency range of the RF Oscillator is 230 to 550 MHz (nominally 256—512 MHz). The oscillator uses a single high-frequency transistor in a foreshortened cavity. Frequency is controlled by varying the capacitive loading of the cavity. The oscillator is buffered by an output amplifier. The Divider/Filter Buffer Amplifier drives the RF dividers which drive the amplitude modulating and leveling circuits. The oscillator's cavity has two varactor diodes that allow the capacitive loading to be varied by a voltage at the cathode to provide FM.

FM Circuits

The RF oscillator's varactor cathode is driven by the FM Amplifier which provides accurate amplification or attenuation of the modulation signal and shapes the signal to compensate for the non-linear characteristics of the varactor diodes. Separate shaping circuits are used for positive and negative voltage excursions. The PEAK DEVIATION switch, which controls basic FM amplifier gain, is mechanically linked to the RANGE switch since, for a given amount of peak deviation, the percent deviation (i.e., the amount of deviation relative to the carrier frequency) changes as the frequency range is changed. Also, as the frequency is tuned, the FM deviation changes. An FM Gain Compensation circuit with a potentiometer, which is geared to the FREQUENCY TUNE control, adjusts for the change in FM sensitivity with tuning.

Inputs to the FM circuits are routed through the FM switch. In the CAL position, an accurate 1 Vdc is applied to the FM input. External inputs are applied in AC and DC, and an internal modulation signal in INT. The PEAK DEVIATION vernier adjusts the input level into a unity gain Buffer Amplifier. In addition to driving the FM amplifier, the Buffer Amplifier drives the Over-Deviation Detector and the Meter Attenuator. In the event that the input signal exceeds ±1.1V, the Over-Deviation Detector turns on the REDUCE FM VERNIER lamp. The Meter Attenuator scales the input signal to the meter circuits in such a way that a 1 Vpk input corresponds to the deviation selected when read on the meter.

Modulation Oscillator

Internal AM and FM is provided by the Modulation Oscillator. The oscillator drives either the AM modulation circuits and AM OUTPUT jack or the FM modulation circuits and FM OUTPUT jack or all four. The oscillator is enabled whenever either the AM or FM switch is in INT.

The standard modulation oscillator has two fixed frequencies — 400 Hz and 1 kHz. The oscillator supplied with Option 001 has, in addition, five variable frequency ranges covering from 20 Hz to 600 kHz.

Power Supplies and Fan

The instrument has five regulated supply voltages, +44.6V, +20V, −20V, +5.2V, −5.2V. All supplies are protected against overloading, over voltage, and reverse voltage. An LED annunciator on each supply indicates proper operation when on. The cooling fan is driven by a dc brushless motor controlled by the Fan Driver circuits.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the FM circuits and RF oscillator as a result of using the overall block diagram. Troubleshoot by using the test equipment and procedures specified below.

Test Equipment

Digital Voltmeter . . . . HP 3490A
Oscilloscope . . . . HP 180C/1801A/1820C

Initial Test Conditions

Top and bottom covers removed (see Service Sheet G).

Procedure

Set the generator's controls as listed in the box at the right-hand side of the diagram. To check a voltage at a test point, change the control settings as specified in the box associated with that test

SERVICE SHEET 2 (Cont'd)

point, check the voltage, then reset the controls to the settings specified in the box at the right-hand side.

The blocks are keyed (to the Service Sheets that have the circuit schematics) by the numbers located in their lower right-hand corners.

NOTES

The last two foldouts in this manual have top and bottom internal views of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).

After repairs are complete, see Table 5-2 for appropriate post-repair tests and adjustments.

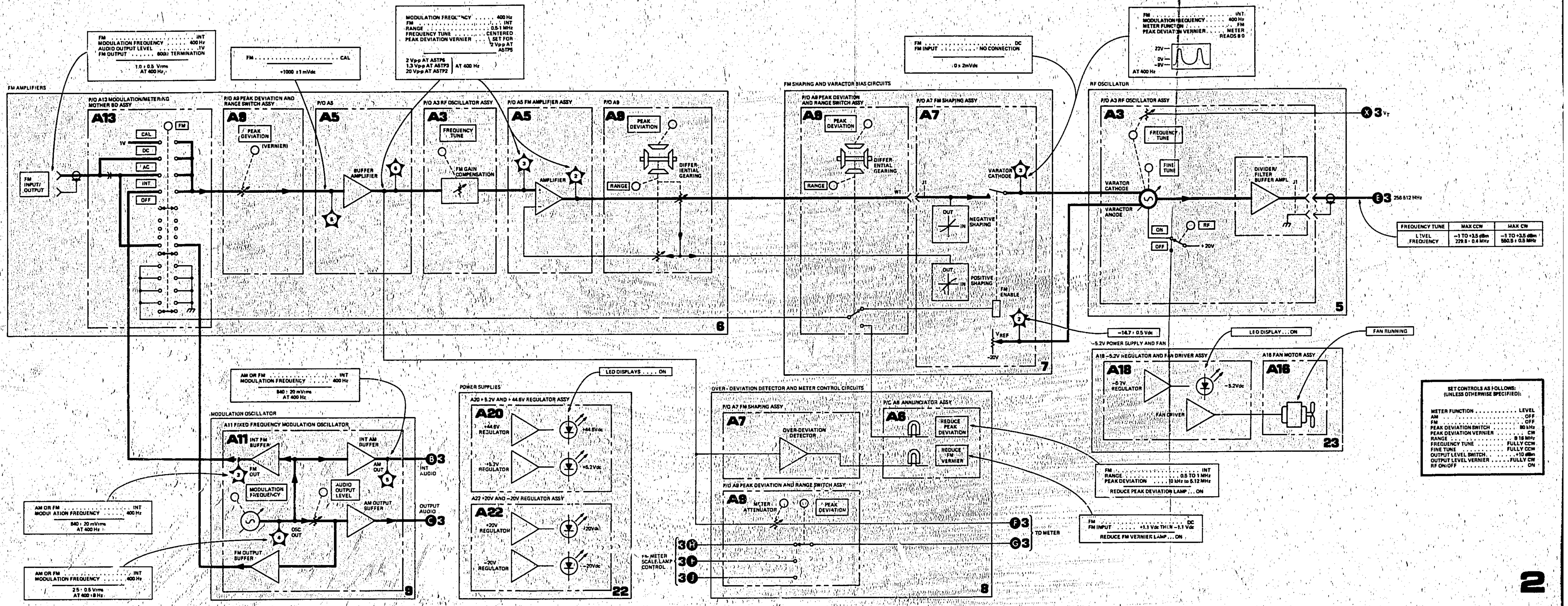


Figure 8-12. FM Circuits and RF Oscillator Block Diagram

SERVICE SHEET 3

PRINCIPLES OF OPERATION

Divider/Filters

Except for the 256—512 MHz and 512—1024 MHz frequency ranges, the RF signal from the Divider/Filter Buffer Amplifier (Service Sheet 2) is routed through a series of binary frequency dividers (i.e., ÷2) by slide switches on the filter section of the A10 Divider/Filter Assembly. The RF signal is divided to the selected range. This is also illustrated in the simplified logic diagram, Figure 8-35.

The divided signal passes through the Modulator Preamplifier, the Modulator, and then to the RF Filters. The filters remove unwanted harmonics from the signal (which is approximately a square wave after being divided). The upper frequency ranges have two filters per range—one for the lower half (Low Band Filters) and one for the upper half (High Band Filters) of the range. This is necessary to effectively remove the second harmonic on the lower half of the range. The midpoint of the range is sensed by a Schmitt Trigger which compares a reference voltage to a voltage proportional to the frequency tuning. On the four lowest frequency ranges the RF signal has little second harmonic content because of good waveform symmetry; therefore, each range has only one filter.

AM/AGC Circuits

The output of the RF Filters is amplified by the Output Amplifier located in the AM/AGC Assembly.

The amplified output is peak-detected and buffered by the Detector Buffer Amplifier. The detected voltage, which is negative, is summed (in the Summing Amplifier) with a positive AGC reference voltage from the OUTPUT LEVEL vernier. The AGC reference may also have the amplitude modulation voltage superimposed on it. The sum of the detector and reference voltages is amplified by the Summing and Modulator Driver Amplifiers. The Modulator Driver Amplifier supplies control current to the Modulator which adjusts the RF output level.

In the pulse modulation mode, the Modulator Driver Amplifier is switched on and off by input pulses from the Schmitt Trigger. To maintain a constant detector voltage into the summing amplifier, the detected output voltage is sampled during the RF-on period and then stored in the Sample-And-Hold section of the Detector Buffer Amplifer when the RF is off. The Pulse Overload Detector senses any large errors in the leveling circuit which may occur when the OUTPUT LEVEL vernier is reduced. In case of large errors, the Hold function is defeated until equilibrium occurs.

FM Circuits and RF Oscillator Block Diagram
◀ SERVICE SHEET 2

SERVICE SHEET 3 (Cont'd)

The Rate Detector senses pulses of low repetition rate and turns off the meter circuit when the rate is so low that the meter is no longer accurate.

The Modulation Overload Detector senses when the AGC reference, the AM signal, or a combination of the two is beyond the Modulator's capability to deliver power. The REDUCE PEAK POWER lamp is then turned on. The Meter Amplifier produces an output voltage proportional to the detected output voltage (and hence the output level) to drive the meter circuits. The AGC reference voltage originates in the AM Offset Amplifier where it is summed with any AM input signal. The voltage out of the amplifier then passes through the OUTPUT LEVEL vernier to the modulation Summing Amplifier. The Modulator can be disabled (i.e., maximum modulator attenuation) by the RF ON/OFF switch.

Meter Circuits

The meter can be set to measure either percent AM, peak frequency deviation (FM), or output level. In measuring AM and FM, the modulation signal is peak-detected by the Positive Peak Detector and amplified. For output level, the output of the Meter Amplifier, which is proportional to the detector output, is amplified by the Meter Drive Amplifier.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the AM/AGC circuits and output amplifier as a result of using the overall block diagram. Troubleshoot by using the test equipment and procedures specified below.

Test Equipment

Digital Voltmeter . . . . HP 3490A
Oscilloscope . . . . .HP 180C/1801A/1820C
Power Meter and Sensor . . . . HP 435A/8482A
Frequency Counter . . . . .HP 5327C

Initial Test Conditions

Top and bottom covers removed (see Service Sheet G).

Procedure

Set the generator's controls as specified in the box at the right-hand side of the diagram. To check a voltage at a test point, change the control setting as specified in the box associated with that test point, check the voltage, then reset the controls to the settings specified in the box at the right-hand side.

The blocks are keyed, by the numbers located in their lower right-hand corners, to the Service Sheets that have the circuit schematics.

NOTES

The last two foldouts in this manual have top and bottom internal views of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).

After repairs are complete, see Table 5-2 for appropriate post-repair tests and adjustments.

SERVICE INFO

CON'T

Figure 8-13. AM/AGC Circuits and Output Amplifier Block Diagram

SERVICE SHEET 3A

PRINCIPLES OF OPERATION

Internal Doubler Circuits (Option 002)

On the 0.5 to 512 MHz ranges the RF signal from the Output Amplifier is fed un-doubled to the output jack. On the 512—1024 MHz range a frequency doubler and Doubler Amplifier are inserted into the RF path. The RF doubler is a passive full-wave rectifier. If the input signal is sinusoidal and the rectifier is well balanced, the output from the doubler will contain even harmonics of the input signal (the second harmonic being the strongest). This doubled signal is amplified by the Doubler Amplifier. The 1120 MHz Low-Pass Filter filters out the high frequency harmonics of the doubled signal which are not otherwise effectively attenuated by the Step Attenuator. A Doubler Detector is switched in at the output of the Doubler Amplifier to include it in the AGC loop.

Reverse Power Protection Circuit (Option 003)

If high level reverse power is applied into the RF OUTPUT jack, this level is sensed by a Comparator which drives an RF relay and opens the RF path. The Limiter protects the generator's output circuits during the time that elapses while the relay is de-energizing. The relay contacts are open when the generator is off.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the AM/AGC circuits and output amplifier as a result of using the overall block diagram. Troubleshoot by using the test equipment and procedures specified below.

Test Equipment

Digital Voltmeter . . . . HP 3490A
Oscilloscope . . . . .HP 180C/1801A/1820C
Power Meter and Sensor . . . . HP 435A/8482A
Frequency Counter. . . . . .HP 5327C

Initial Test Conditions

Top and bottom covers removed (see Service Sheet G).

Procedure

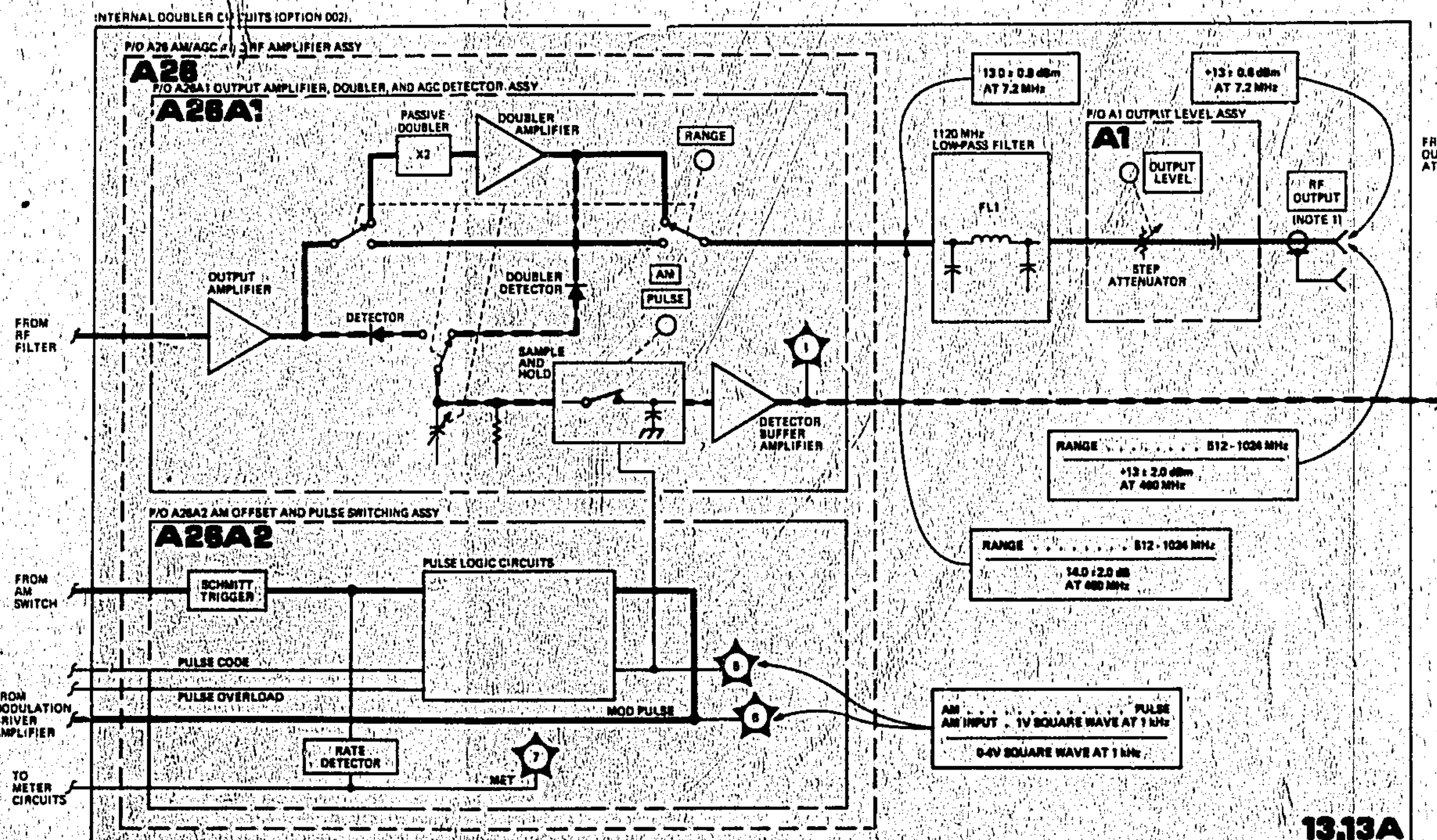
Set the generator's controls as specified in the box at the right-hand side of the diagram. To check a voltage at a test point, change the control setting as specified in the box associated with that test point, check the voltage, then reset the controls to the settings specified in the box at the right-hand side.

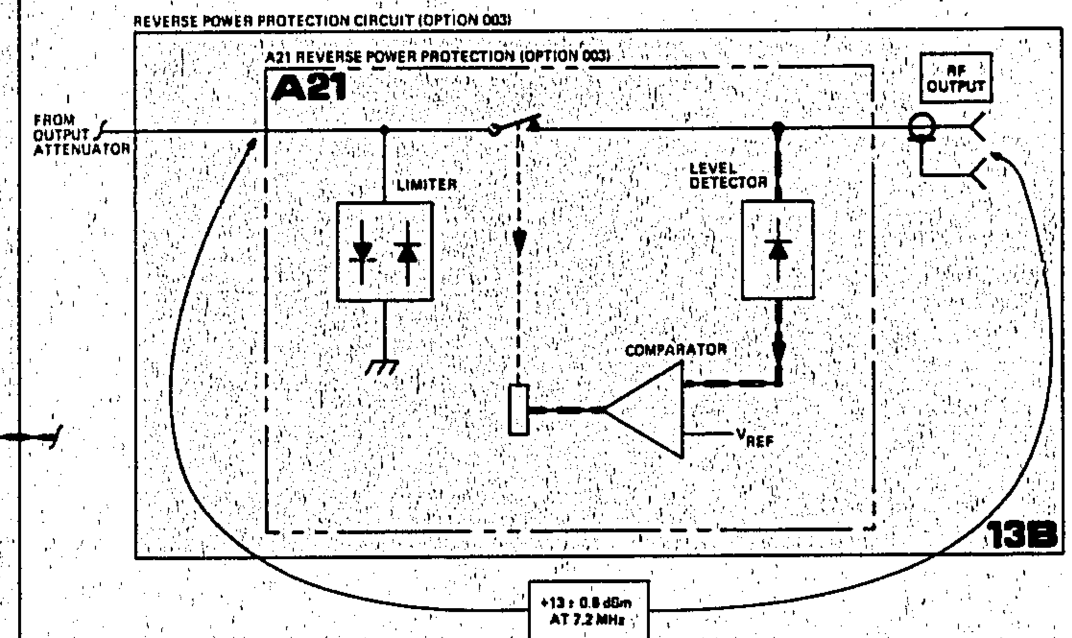
The blocks are keyed, by the numbers located in their lower right-hand corners, to the Service Sheets that have the circuit schematics.

NOTES

The last two foldouts in this manual have top and bottom internal views of the instrument that show the locations of the test points, assemblies, and cables (all RF cables are accessible from the bottom of the instrument).

After repairs are complete, see Table 5-2 for appropriate post-repair tests and adjustments.





SET CONTROLS AS FOLLOWS:
(UNLESS OTHERWISE SPECIFIED)

METER FUNCTION . . . . LEVEL
AM . . . . OFF
FM . . . . OFF
RANGE . . . . 8-16 MHz
FINE TUNE . . . . CCW
OUTPUT LEVEL SWITCH . . . . +10 dBm
OUTPUT LEVEL VERNIER . . . . FULLY CW
RF ON/OFF . . . . ON

NOTES:

1. SEE RIGHT HAND BLOCK IF OPTION 003 IS INSTALLED.

3A

Figure 8-14. Internal Doubler (Option 002) and Reverse Power Protection (Option 003) Block Diagrams

SERVICE SHEET 5

PRINCIPLES OF OPERATION

General

The A3 RF Oscillator Assembly contains the main RF Oscillator, a varactor assembly, and a buffer amplifier. The output of the RF oscillator is applied to the RF OUTPUT jack through the A10 Divider/Filter Assembly, the A26 AM/AGC and RF Amplifier Assembly, and the A1 Output Attenuator (see block diagrams for schematic locations).

RF Oscillator

The 230 to 550 MHz RF Oscillator is a single transistor, cavity-tuned oscillator. Integral with the oscillator assembly is a Varactor Head Assembly which provides electrical tuning for FM and phase lock. The Varactor Head Filter Assembly prevents RF from leaking back into the FM circuits. The high-frequency transistor is in a common-base configuration. The emitter and collector loops couple into the cavity and to each other to provide the positive feedback necessary for oscillation.

The cavity is a foreshortened type which is essentially a length of coaxial transmission line with a short at one end and a capacitive load at the other. The shorted transmission line is less than 1/4 wavelength long at the frequency of oscillation and its impedance is inductive. The cavity resonates at the frequency at which the inductive reactance of the transmission line equals the capacitive reactance of the load capacitor. The resonant frequency is varied by changing the length of the cavity (a secondary effect) and by changing the load capacitance. The varactor diodes are in parallel with the main load capacitance. The cavity is mechanically fine tuned by rotating a small vane in the cavity. Signal is coupled out of the cavity into a buffer amplifier by a loop which protrudes into the cavity.

Divider/Filter Buffer Amplifier A3A1A2

The Divider/Filter Buffer Amplifier A3A1A2 amplifies the signal from the RF oscillator to drive the Modulator Preamplifier; its main function, however, is to isolate the RF Oscillator from external circuits. Transistors Q1 and Q2 are two common-emitter amplifier stages. The base of Q1 is dc grounded through the coupling loop T1. Emitter current is established by resistors R3 and R4; capacitor C2 ac bypasses R4. The gain of Q1 is set by R1, R2, R3, and C8. The collector of Q1 is ac coupled to the base of Q2 by capacitor C4. Operation of transistor Q2 is similar to Q1. The amplifier board is secured through slotted holes by two screws. By loosening the screws and sliding the board, the amount of coupling loop protruding into the cavity can be altered and the amplifier output level varied.

Internal Doubler (Option 002) and
Reverse Power Protection (Option 003)
Block Diagrams
◀SERVICE SHEET 3A

SERVICE SHEET 5 (Cont'd)

TROUBLESHOOTING

General

The oscillator transistor, buffer amplifier, and external circuits of the A3 RF Oscillator Assembly may be repaired to the component level. However, if a problem has been isolated to components in the RF Oscillator cavity, the oscillator assembly should be returned to Hewlett-Packard for repair. Do not attempt to disassemble it because proper reassembly depends upon specialized skills and procedures.

Divider/Filter Buffer Amplifier

Refer to Service Sheet B for access to the Divider/Buffer Amplifier assembly. Check dc bias voltages to reveal a faulty component. See Section V for adjustment.

RF ON/OFF Switch Modification

The RF ON/OFF Switch function may be wired to:

a. switch off both the RF Oscillator and Modulator leaving the RF output completely off but requiring a stabilization period after turn on; or

b. switch off only the Modulator leaving the RF Oscillator on and warmed up and the Auxiliary RF Output on. In this case, however, the RF is not truly "off" but is reduced by an amount equal to the pulse on/off ratio (at least 40 dB down and dependent on OUTPUT LEVEL vernier setting).

Either configuration can be easily altered to the other as follows:

a. Remove bottom cover (see Service Sheet G).

b. Remove two nuts that secure A3A4 Connector Board Assembly, and remove board. The board is located directly behind the Divider/Filter cam housing.

c. To modify the circuitry to leave the RF Oscillator on at all times, add jumper wire between the two holes labeled "RF OSC ON/OFF INHIBIT" as shown in Figure 8-16. To modify the circuitry so the RF Oscillator is switched off, remove the existing jumper wire.

d. Reinstall board and bottom cover.

e. Check RF ON/OFF operation by observing Auxiliary RF Output signal.

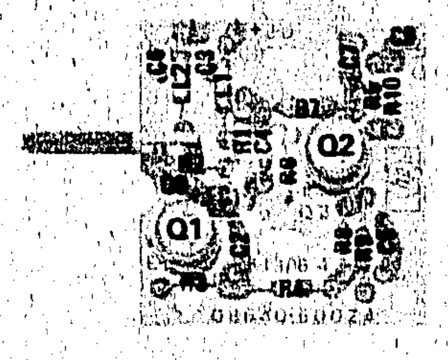


Figure 8-15. A3A1A2 Buffer Amplifier Assembly Component Locations

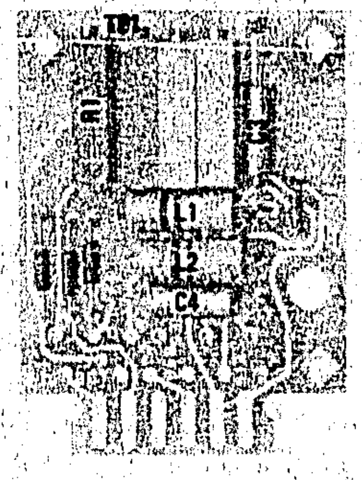
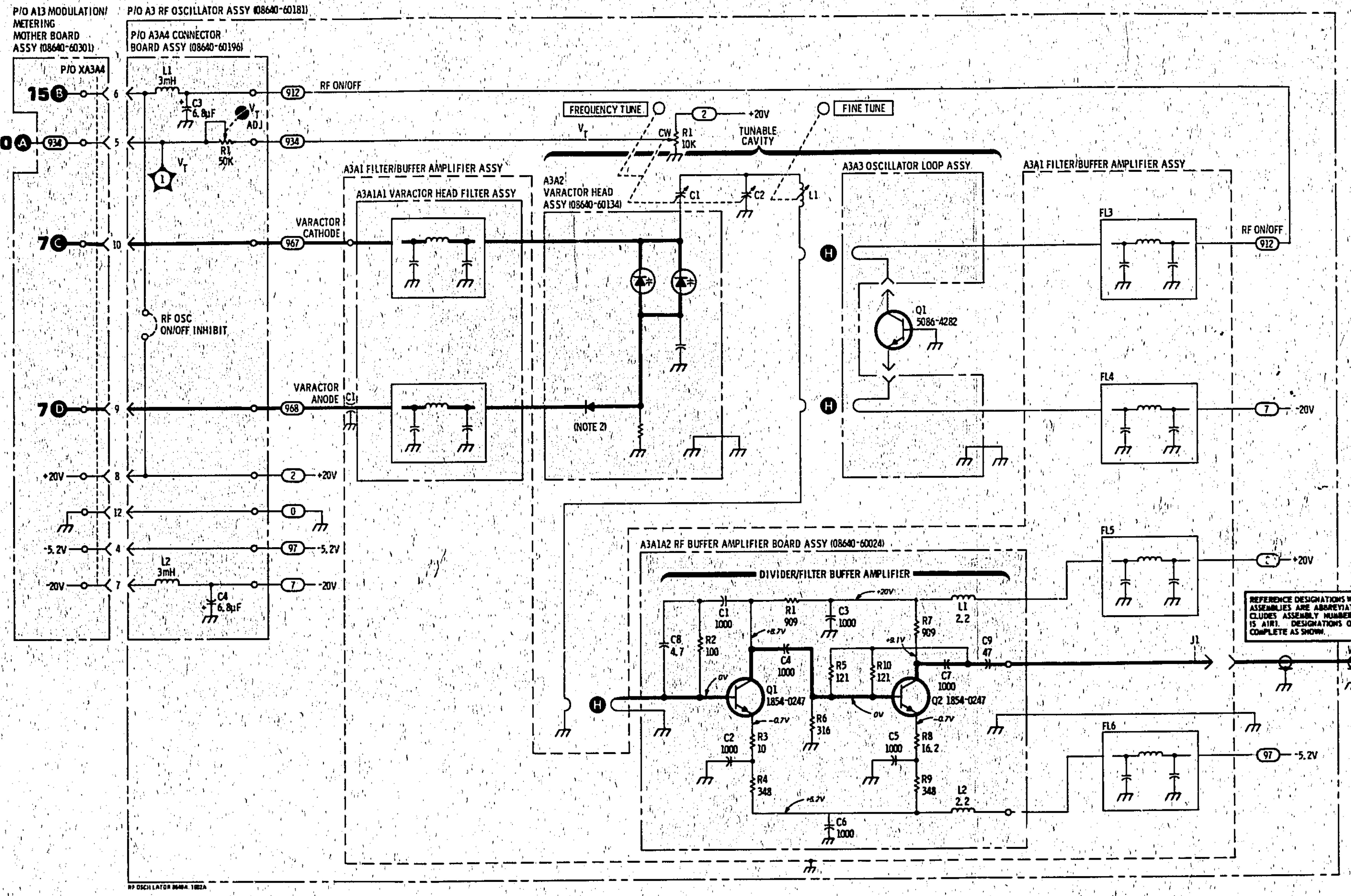


Figure 8-16. P/O A3A4 Connector Board Assembly Component Locations



NOTES

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.
2. FOR TROUBLESHOOTING MEASURED RESISTANCE OF VARACTOR ANODE TO GROUND IS APPROXIMATELY 61.9KΩ.

REFERENCE DESIGNATIONS

NO PREFIX	A3A1A2 ASSY
P/O W3	C1-9 L1,2 Q1,2 R1-10 T1
A3 ASSY	
C1,2 L1 Q1 R1	A3A4 ASSY
	C3,4 L1,2 R1 TP1
A3A1 ASSY	
C1 FL1-6 J1	A13 ASSY
	P/O XA3A4

5
A3

Figure 8-17. RF Oscillator Simplified Diagram

SERVICE SHEET 6

PRINCIPLES OF OPERATION

General

The A5 FM Amplifier Assembly, in conjunction with the A9 Peak Deviation and Range Switch and the A7 Shaping Assembly, conditions the modulation signal to drive the varactor diodes which frequency modulate the RF oscillator. Modulation signals may be dc or ac coupled.

Input and Buffer Circuits (A5)

The FM modulating signal is applied to the PEAK DEVIATION vernier. Buffer Amplifier U1 is internally connected as a voltage follower. The output of U1 drives the Meter Attenuator (Service Sheet 8), the Over-Deviation Detector (Service Sheet 8), and the FM Gain Compensation circuit through relay K1. When the FM switch is OFF, or if the PEAK DEVIATION switch is set to an unallowable position, the relay is de-energized and the signal path to the FM and meter circuits is opened. FM gain compensation potentiometer A3R2 is geared to the FREQUENCY TUNE control and adjusts the gain of the circuit. FM sensitivity is higher for higher RF oscillator frequencies and the FM Gain Compensation circuit reduces the modulation circuit drive at higher frequencies. The gain compensation adjustment potentiometers (A3A4R2, R3, and R4) set the FM sensitivity at the frequency mid-point and extremes. The output of the FM Gain Compensation circuit drives the FM Amplifier input.

Amplifier (A5)

The FM Amplifier is a non-linear, feedback amplifier which drives the varactor diodes in the RF Oscillator. The amplifier and shaping circuits compensate for the non-linear tuning sensitivity of the varactor diodes in the RF Oscillator. The correction for the negative excursions of the modulation signal is provided by the negative shaping circuit (Service Sheet 7) which follows the amplifier output. Correction for positive excursions is provided by the positive shaping circuit (Service Sheet 7) which is part of the amplifier feedback path.

Transistors Q1 through Q4 form a two-stage differential input amplifier. The dual transistors Q1 and Q2 are connected in a Darlington configuration to provide matched, high impedance inputs. Amplifier offset adjustment, R8 adjusts the dc offset. The gain of the first stage is approximately one-half the ratio R4/R3; gain for the second stage is approximately one-half the ratio R5/R6.

Transistors Q5 through Q8 form an intermediate driver stage. The voltage gain of the stage is approximately twice the ratio of the impedance across R27 to that of R17.

The shaping circuits require more gain for large positive voltage excursions. For low positive voltages, the resistor network R29 to R34 is in parallel with R27. As the voltage increases, diodes CR10, 11, and 12 respectively switch off and increase the impedance across R27 and thereby increase the amplifier's gain.

Transistors Q9 through Q12 form the amplifier output stage. Transistors Q9 and Q10 are in a Darlington configuration and supply current to the load during positive excursions. Transistors Q11 and Q12 are in an inverted Darlington configuration and sink load current during negative excursions.

SERVICE SHEET 6 (Cont'd)

Amplifier Configurations

The FM Amplifier is switched by the A9 Peak Deviation and Range Switch into three different configurations depending on the gain needed. For gains less than 0 dB, the amplifier is in a unity gain configuration followed by the positive shaping network (Service Sheet 7) which has little effect, an attenuator which determines the overall gain, and the negative shaping network (Service Sheet 7) which has only a small effect. The effect of the shaping networks is small because voltage swings are small and the tuning characteristic of the varactor diodes is fairly linear over the narrow range of operation. For 0 dB gain, the amplifier is in a unity gain configuration, the positive shaping network and attenuator have no effect, and the negative shaping network has a small effect. For gains greater than 0 dB, the attenuator is in the feedback path and the gain is inversely proportional to the feedback attenuation. The positive shaping network is also in the feedback path and for large positive voltage excursions it increases the feedback attenuation and hence increases the amplifier gain. The negative shaping network is in the output path, and for large negative voltage excursions, the output attenuation is increased and the overall amplifier gain decreases.

Attenuator (A9)

Before entering the feedback path, the FM Amplifier output passes through an attenuator formed by resistors R4 through R7 which reduces the open-loop gain of the amplifier when only small closed loop gain is needed. The gain control attenuator used in the feedback or output of the amplifier is formed by resistors R12 through R22.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the FM amplifier circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter . . . . HP 3490A
Oscilloscope . . . . HP 180C/1801A/1820C

NOTE

Use a 10 kΩ resistor, in series with the DVM probe tip, to reduce spurious oscillations in the amplifier circuitry while making dc measurements.

Initial Test Conditions

Bottom cover removed (see Service Sheet G for removal procedure). Extend A5 FM Amplifier Assembly on extender board. Remove A7 FM Shaping Assembly from chassis and disconnect cable A9W1 from A7J1.

SERVICE SHEET 6 (Cont'd)

Initial Control Settings

MODULATION FREQUENCY . . . . 400 Hz
FM . . . . INT
PEAK DEVIATION . . . . 5 kHz
PEAK DEVIATION Vernier . . . . Fully cw
RANGE . . . . 0.5–1 MHz
FREQUENCY TUNE . . . . Centered
(Four turns from stop)
RF ON/OFF . . . . ON

FM Amplifier Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
Buffer Amplifier (A5)	Initial conditions and settings. Adjust PEAK DEVIATION vernier for 2 Vp-p at TP5 (BUFFER IN).	2 Vp-p at TP6 (BUFFER OUT)	Check U1 and associated circuitry
FM Amplifier (A5)	Initial conditions and settings. Adjust PEAK DEVIATION vernier for 2 Vp-p at TP5 (BUFFER IN).	Peak-to-peak voltages at TP3 (+ INPUT) and TP4 (− INPUT) are the same	Set FM to OFF and use DVM to check dc voltages shown on schematic
	Switch RANGE through all ranges and check gain.	Gain in accordance with FM system gain table on schematic	Check switching of A9

RF Oscillator Simplified Diagram (A3)
SERVICE SHEET 5

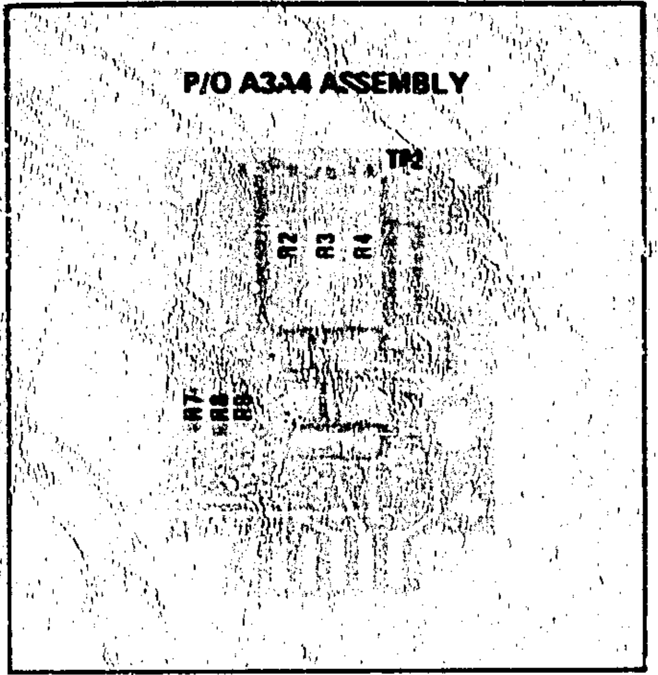


Figure 8-18. P/O A3A4 Connector Board Assembly Component Locations

A13

Component Locations for A13 Assembly are on Service Sheet 25.

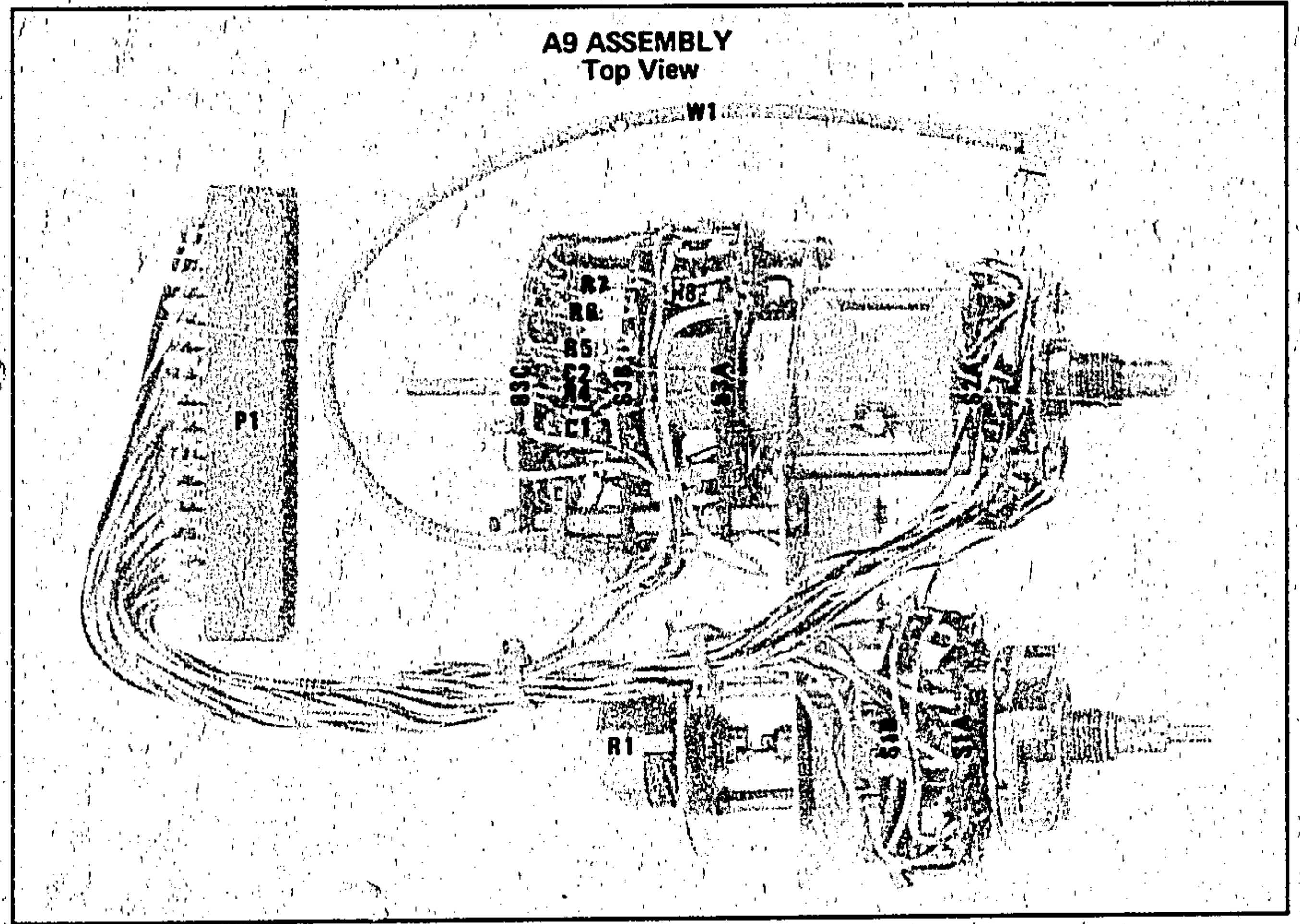


Figure 8-19. P/O A9 Peak Deviation and Range Switch Assembly Component Locations (1 of 2)

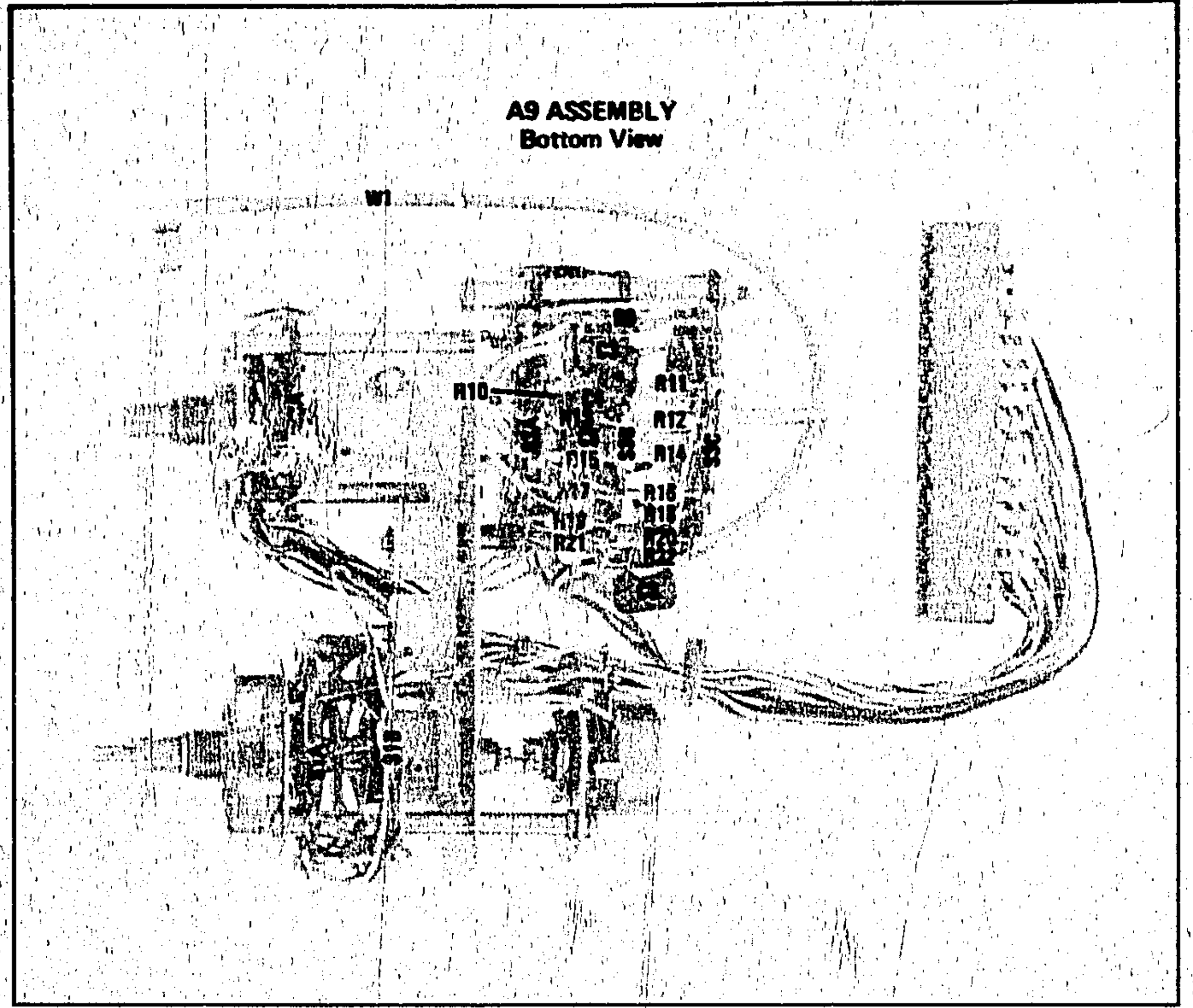


Figure 8-19. P/O A9 Peak Deviation and Range Switch Assembly Component Locations (2 of 2)

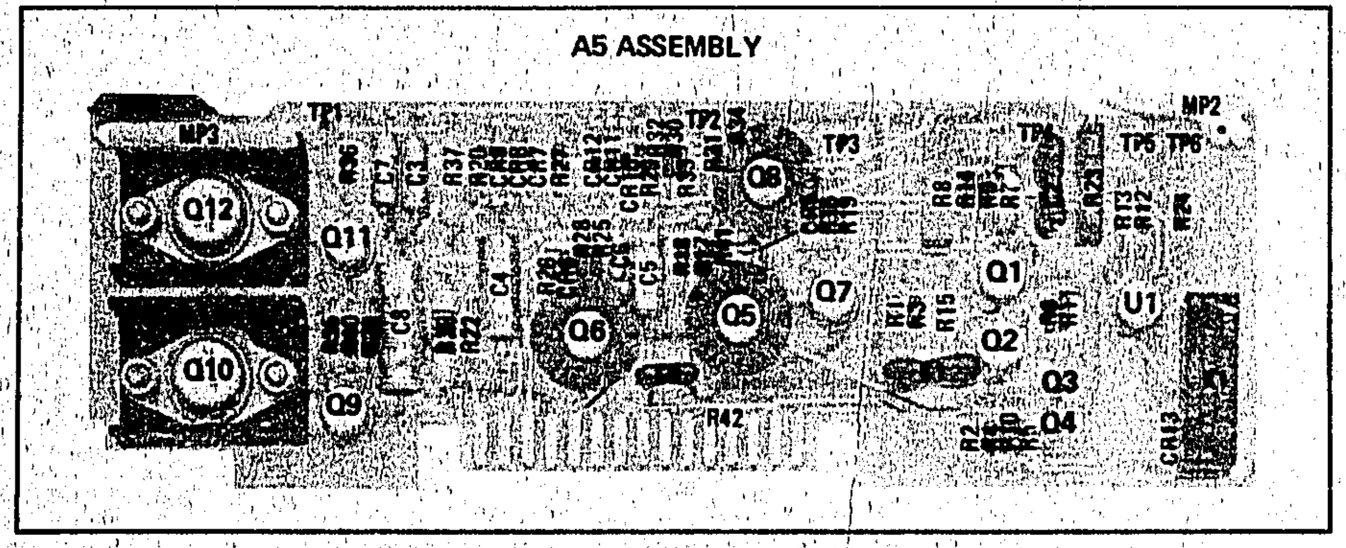
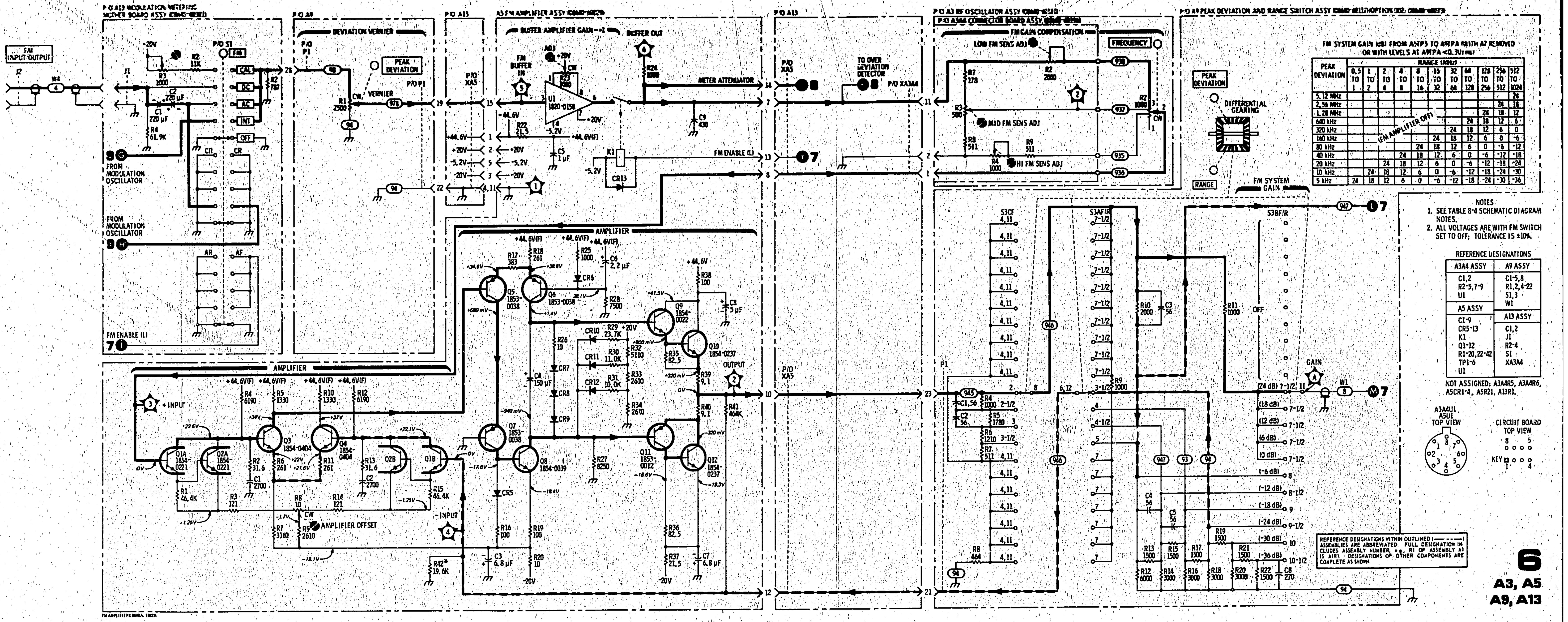


Figure 8-20. A5 FM Amplifier Assembly Component Locations



FM SYSTEM GAIN (dB) FROM A5TP3 TO A9TPA (WITH A7 REMOVED OR WITH LEVELS AT A9TPA <0.3Vrms)

PEAK DEVIATION	RANGE (MHz) 0.5 TO 1	1 TO 2	2 TO 4	4 TO 8	8 TO 16	16 TO 32	32 TO 64	64 TO 128	128 TO 256	256 TO 512	512 TO 1024
5.12 MHz											24
2.56 MHz										24	18
1.28 MHz									24	18	12
640 kHz								24	18	12	6
320 kHz							24	18	12	6	0
160 kHz						24	18	12	6	0	-6
80 kHz					24	18	12	6	0	-6	-12
40 kHz				24	18	12	6	0	-6	-12	-18
20 kHz			24	18	12	6	0	-6	-12	-18	-24
10 kHz		24	18	12	6	0	-6	-12	-18	-24	-30
5 kHz	24	18	12	6	0	-6	-12	-18	-24	-30	-36

(FM AMPLIFIER OFF)

NOTES
1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.
2. ALL VOLTAGES ARE WITH FM SWITCH SET TO OFF; TOLERANCE IS ±10%.

REFERENCE DESIGNATIONS

A3A4 ASSY	A9 ASSY
C1,2 R2-5,7-9 U1	C1-5,8 R1,2,4-22 S1,3 W1
A5 ASSY	**A13 ASSY**
C1-9 CR5-13 K1 Q1-12 R1-20,22-42 TP1-6 U1	C1,2 J1 R2-4 S1 XA3A4

NOT ASSIGNED: A3A4R5, A3A4R6, A5CR1-4, A5R21, A13R1.

A3A4U1, A5U1 TOP VIEW

CIRCUIT BOARD TOP VIEW

6
A3, A5
A9, A13

Figure 8-21. FM Amplifier Schematic Diagram

SERVICE SHEET 7

PRINCIPLES OF OPERATION

General

The FM shaping networks, in conjunction with the FM amplifier and the peak deviation attenuator (Service Sheet 6), condition the modulation signal to drive the RF Oscillator's varactor diodes which electrically tune the oscillator. The tuning sensitivity of the oscillator with respect to the modulation input decreases as the tuning voltage becomes more positive. The shaping networks compensate for this non-linear tuning characteristic.

FM Enable (A7)

The varactor diode cathodes are switched by FM Enable reed relay K1 either to R39 when the FM is disabled or to the amplifier output when the FM is enabled. The relay is energized only when the FM switch is not OFF and when the PEAK DEVIATION and RANGE switches are set to an allowable combination. The maximum peak FM deviation possible is 1% of the output frequency at the low end of a range (e.g., 2.56 MHz deviation on the 256 - 512 MHz range). The PEAK DEVIATION and RANGE switches, however, can be set to combinations that exceed this deviation (e.g., 2.56 MHz deviation on the 2—4 MHz range). For such unallowable combinations, the FM amplifier is disabled (by A5K1 on Service Sheet 6), the varactor diode cathodes are grounded (by A7K1), the meter input is opened (by A5K1), and the REDUCE PEAK DEVIATION annunciator lamp A6DS2 is turned on (see Service Sheet 8). The interaction of the PEAK DEVIATION switch and the RANGE switch is accomplished by differential gearing between the two switches.

Positive and Negative Shaping (A7)

The Positive Shaping network presents an increasingly lower impedance to the input as the input voltage increases. Resistors R11, R12, and R13 set the base voltage of transistor Q5, and Q5 sets the voltage supply to the resistor-diode ladder. Transistor Q6 supplies most of the current. Capacitor C5 keeps the base of Q5 at an ac ground potential. Diode CR9 protects Q6 in the event of a shorted +20V supply. The base-emitter junction of Q5 temperature-compensates the diodes of the ladder near it.

Transistor Q7 sets the voltage at the other end of the resistor-diode ladder at one diode junction drop below ground; it also temperature-compensates the diodes of the ladder near it. Transistor Q8 is a current sink. Capacitor C6 frequency-stabilizes Q7 and Q8. The diode cathodes in the ladder between Q7 and Q5 are at increasingly higher potentials. As the voltage at the input to the ladder increases, the diodes turn on consecutively and the

FM Amplifier
(A3A4, A9, A5)
SERVICE SHEET 6

SERVICE SHEET 7 (Cont'd)

impedance at the input lowers. The Negative Shaping network is analogous to the Positive Shaping network except the polarity of all voltages is reversed, the diodes are reversed, all transistors are complemented, and the shaping characteristic is modified.

Varactor Bias (A7)

Resistances R18, R19, and R20 form a voltage divider for the varactor anode bias. Potentiometer R19 is adjusted for the voltage indicated on the schematic.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the FM shaping circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter . . . . HP 3490A

Initial Test Conditions

Bottom cover removed (see Service Sheet G for removal procedure). Extend A7 FM Shaping Assembly on extender board.

Positive and Negative Shaping

A trouble in one of the shaping circuits will usually cause FM sensitivity, distortion, and meter accuracy to be out of specification and will also prevent FM linearity from being correctly adjusted. The quickest way to troubleshoot the shaping circuits is to use the ohms function of the DVM to check the components.

FM Shaping Circuits and Varactor Bias Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
POSITIVE and NEGATIVE SHAPING (A7)	Remove A7 Assembly from chassis. Check component resistances with DVM.	Components check good	Replace faulty component
VARACTOR BIAS (A7)	Initial conditions and settings. Check voltages shown on schematic.	Voltages check good	Remove A7 Assembly from chassis. Check component resistances with DVM. Replace faulty component.

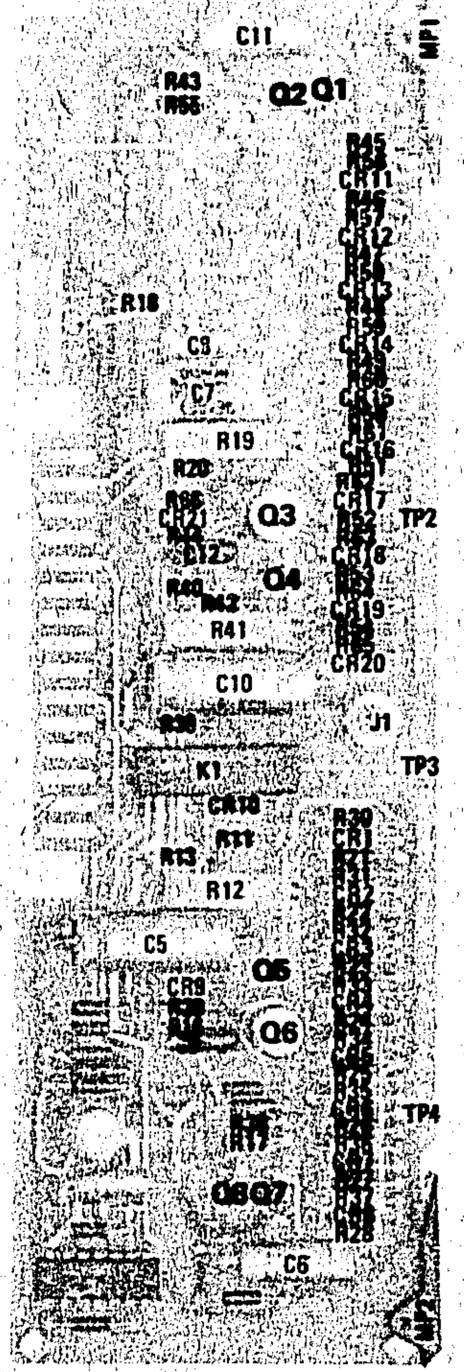
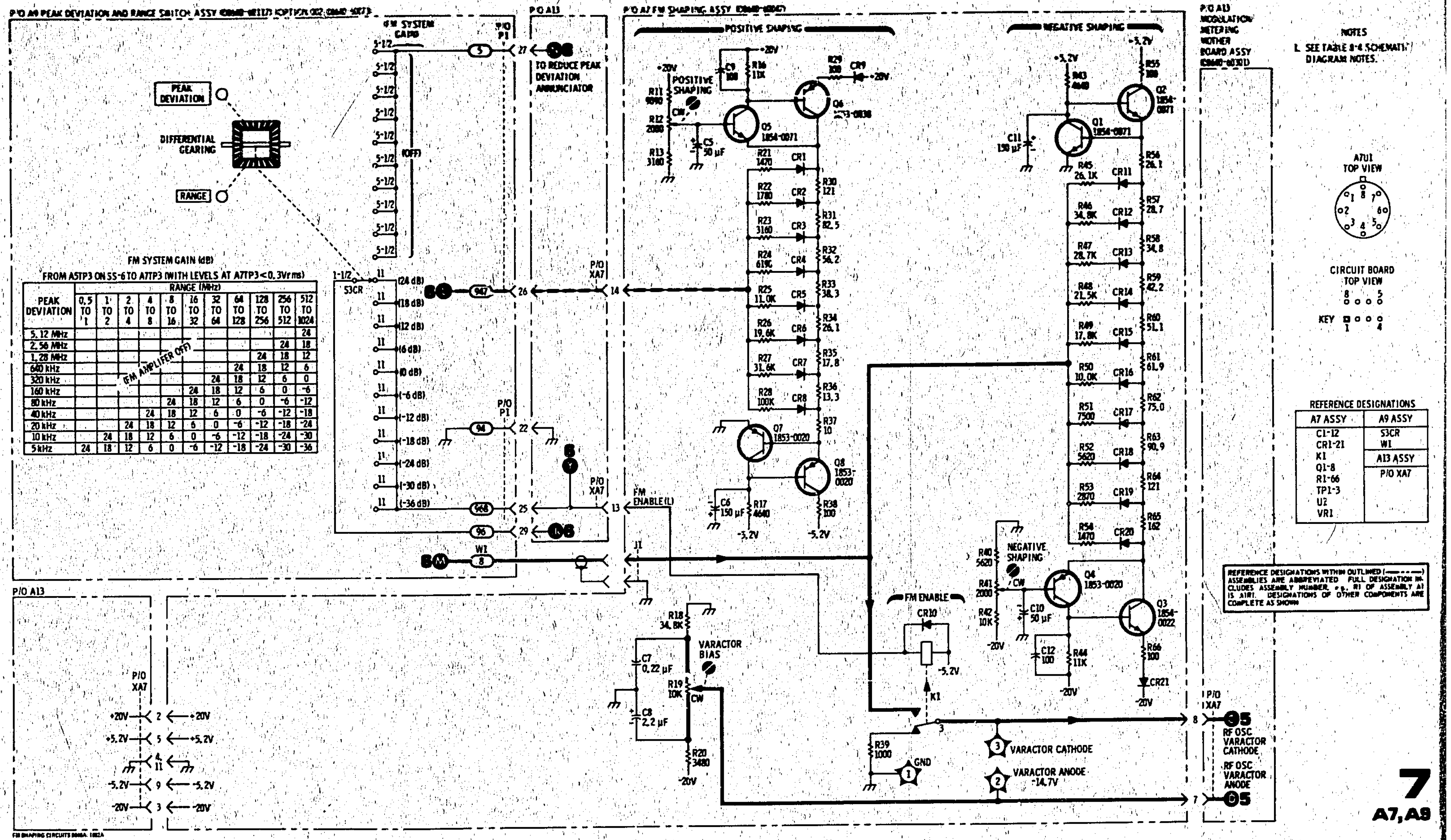


Figure 8-22. P/O A7 FM Shaping Assembly Component Locations



FM SYSTEM GAIN (dB)
FROM A5TP3 ON S5-6 TO A7TP3 (WITH LEVELS AT A7TP3 < 0.3Vrms)

PEAK DEVIATION	RANGE (MHz) 0.5 TO 1	1 TO 2	2 TO 4	4 TO 8	8 TO 16	16 TO 32	32 TO 64	64 TO 128	128 TO 256	256 TO 512	512 TO 1024
5.12 MHz											24
2.56 MHz										24	18
1.28 MHz									24	18	12
640 kHz								24	18	12	6
320 kHz							24	18	12	6	0
160 kHz						24	18	12	6	0	-6
80 kHz					24	18	12	6	0	-6	-12
40 kHz				24	18	12	6	0	-6	-12	-18
20 kHz			24	18	12	6	0	-6	-12	-18	-24
10 kHz		24	18	12	6	0	-6	-12	-18	-24	-30
5 kHz	24	18	12	6	0	-6	-12	-18	-24	-30	-36

(FM AMPLIFIER OFF)

NOTES
1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.

REFERENCE DESIGNATIONS

A7 ASSY	A9 ASSY
C1-12 CR1-21 K1 Q1-8 R1-66 TP1-3 U2 VR1	S3CR W1 **A13 ASSY** P/O XA7

REFERENCE DESIGNATIONS WITHIN OUTLINED (— - - —) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER, e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

Figure 8-23. FM Shaping Circuits and Varactor Bias Schematic Diagram

SERVICE SHEET 8

PRINCIPLES OF OPERATION

Over-Deviation Detector (A7)

If the FM input signal is too large for the FM circuits to operate properly, the Over-Deviation Detector lights the REDUCE FM VERNIER annunciator lamp A6DS1. Integrated circuit U2 is a dual comparator amplifier with wired-OR outputs. Pin 7 of U2B is at 1.1 Vdc; pin 4 of U2A is at −1.1 Vdc; these two voltages are the high and low reference voltages. Pins 6 and 3 of U2 are the common inputs. If the input, which comes from the FM buffer amplifier, is not between +1.1 and −1.1V, the outputs go high (> 1V). Integrated circuit U3 is a hex inverter with open collector outputs. U3A inverts the comparator output. When U3A goes low, capacitor C13 is discharged; when U3A goes high again, C13 slowly charges through R76. This effectively increases the duration of the comparator output when overloading occurs only for short periods. U3B inverts the output of U3A and drives four parallel inverters U3C to U3F. When the outputs of the four parallel inverters are low, the display lamp turns on, which occurs whenever the input to U3B is low.

Peak Deviation Switch (A9)

The Meter Attenuator scales the FM input signal to give the correct reading on the meter. The Scale/Annunciator Lamp Control section of the switch lights the proper scale annunciator lamp (on A6) for a given peak deviation range when the meter mode selected is FM.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the over-deviation detector, meter attenuator, or scale/annunciator lamp control circuits as a result of using the troubleshooting block diagrams.

Test Equipment

Digital Voltmeter .... HP 3490A
Oscilloscope .... HP 180C/1801A/1820C

Initial Test Conditions

Bottom cover removed (see Service Sheet G for removal procedure). Extend A7 FM Shaping Assembly on extender Board. Connect AM OUTPUT to FM INPUT.

Initial Control Settings

AM .... INT
AUDIO OUTPUT LEVEL .... cw
MODULATION .... ccw
MODULATION FREQUENCY .... 400 Hz (Fixed)
FM .... AC
PEAK DEVIATION .... 5 kHz
PEAK DEVIATION Vernier .... ccw
RANGE .... 0.5–1 MHz

SERVICE SHEET 8 (Cont'd)

Over-Deviation and Meter Control Circuits Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
OVER-DEVIATION DETECTOR (A7)	Initial conditions and settings. Adjust PEAK DEVIATION vernier for 1.8 Vp-p at U2 pins 3 and 6.	REDUCE FM VERNIER lamp unlit and 1. pins 6, 8, 10, 12 high 2. U3B pin 4 low 3. U3A pin 2 high 4. TP4 (FM OVERLOAD) low	Replace faulty component
	Adjust PEAK DEVIATION vernier for 2.4 V p-p at U2 pins 3 and 6	REDUCE FM VERNIER lamp lit and 1. pins 6, 8, 10, 12 low 2. U3B pin 4 high 3. U3A pin 2 low 4. TP4 (FM OVERLOAD) >2 Vp-p	Replace faulty component
SCALE/ ANNUNCIATOR LAMP CONTROL (A9)	Initial conditions and settings. Set Meter Function to FM and set PEAK DEVIATION as follows: 5 kHz 10 kHz 20 kHz 40 kHz 80 kHz 160 kHz 320 kHz 640 kHz 1.28 MHz 2.56 MHz 5.12 MHz	SCALE lamps light as follows: 5 10 3 5 10 3 3 10 3 3 5	Check scale lamps (A6) and switches (A9)

FM Shaping Circuits and Varactor Bias (A7)
SERVICE SHEET 7

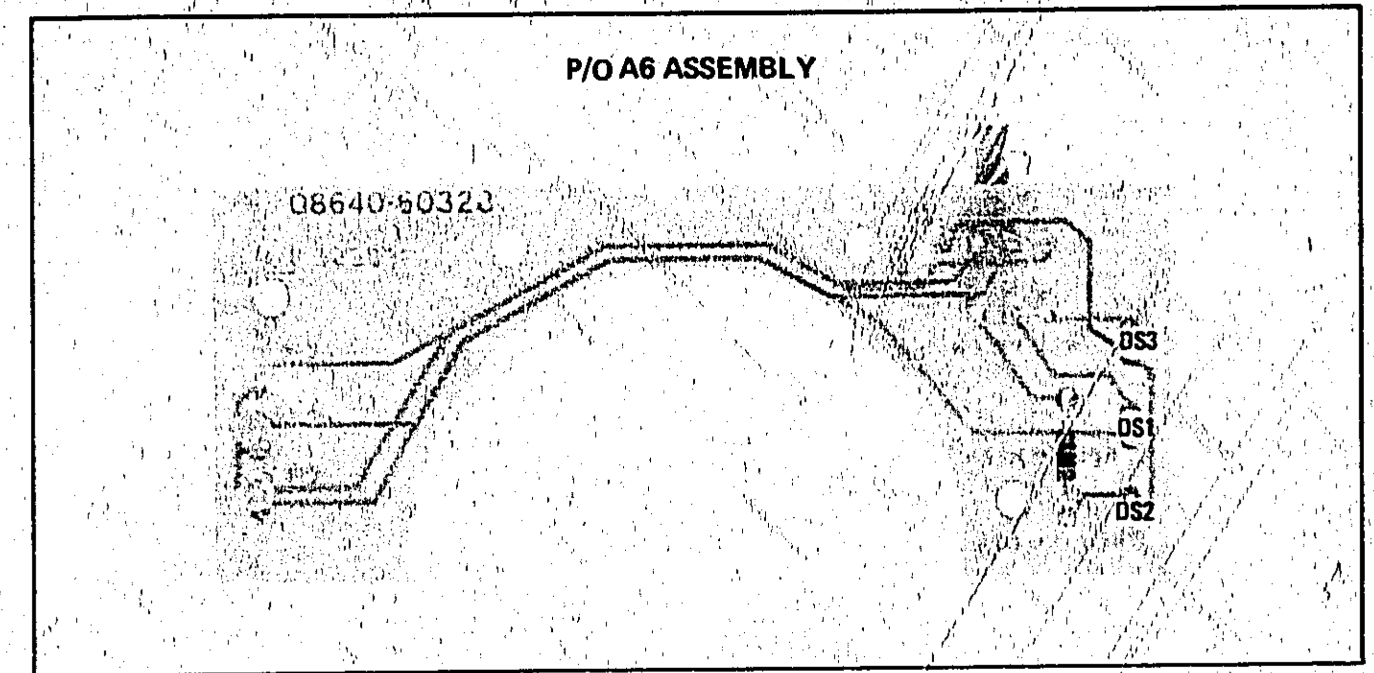


Figure 8-24. P/O A6 Annunciator Assembly Component Locations

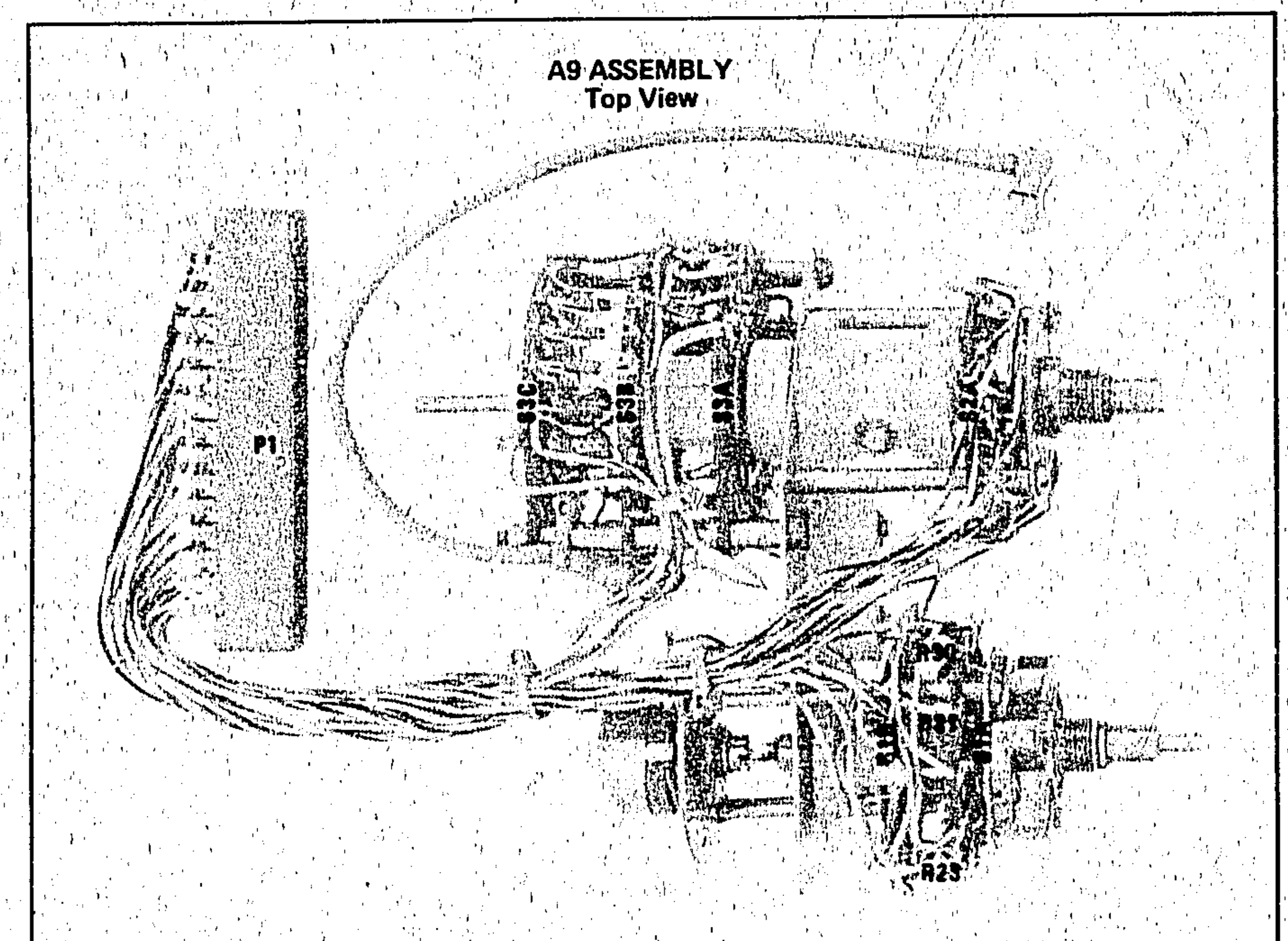


Figure 8-25. P/O A9 Peak Deviation and Range Switch Assembly Component Locations (1 of 2)

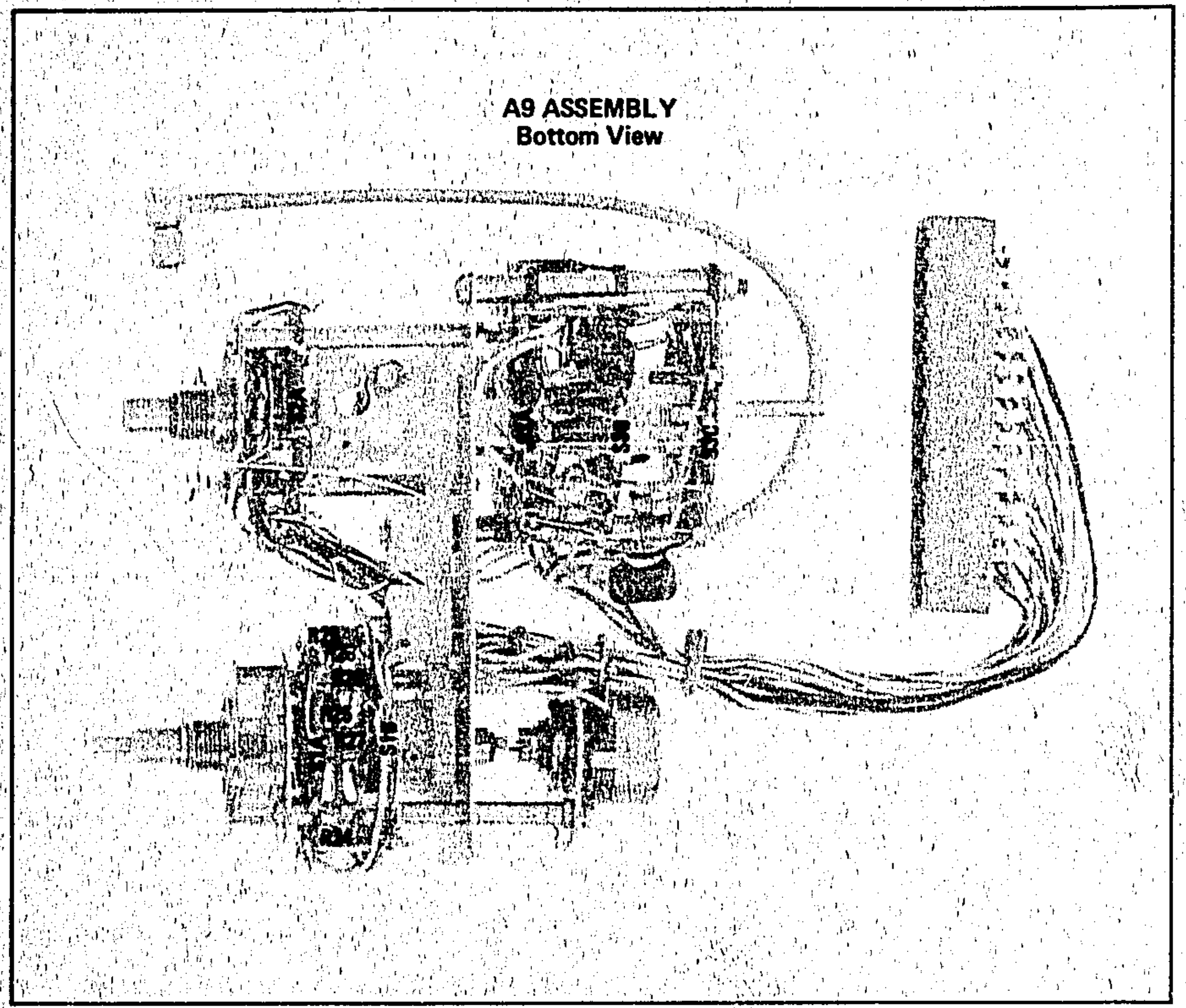


Figure 8-25. P/O A9 Peak Deviation and Range Switch Assembly Component Locations (2 of 2)

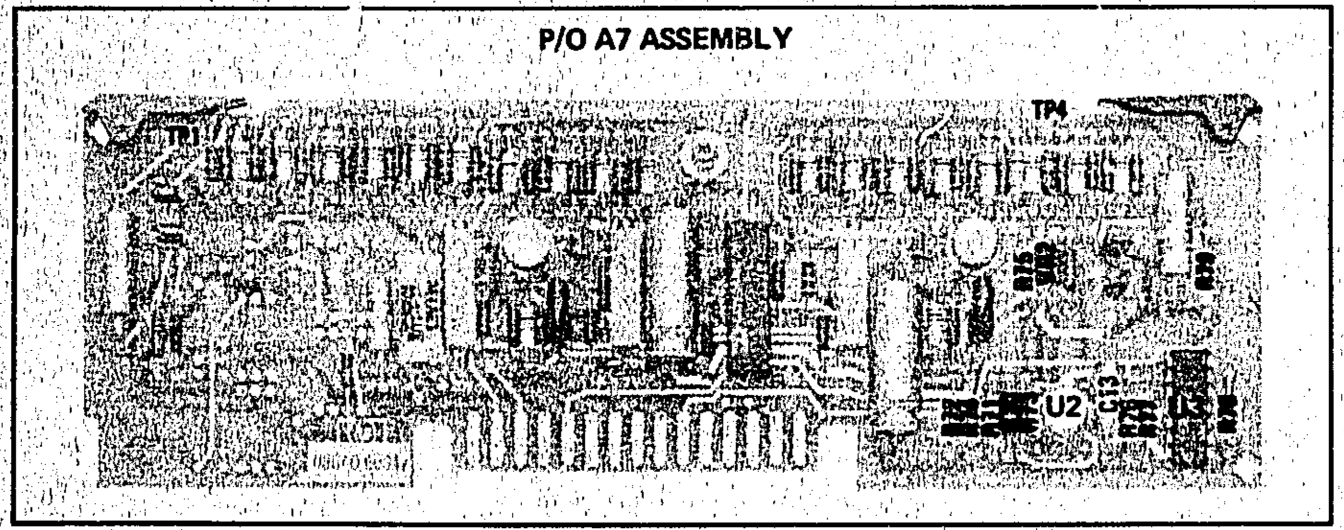


Figure 8-26. P/O A7 FM Shaping Assembly Component Locations

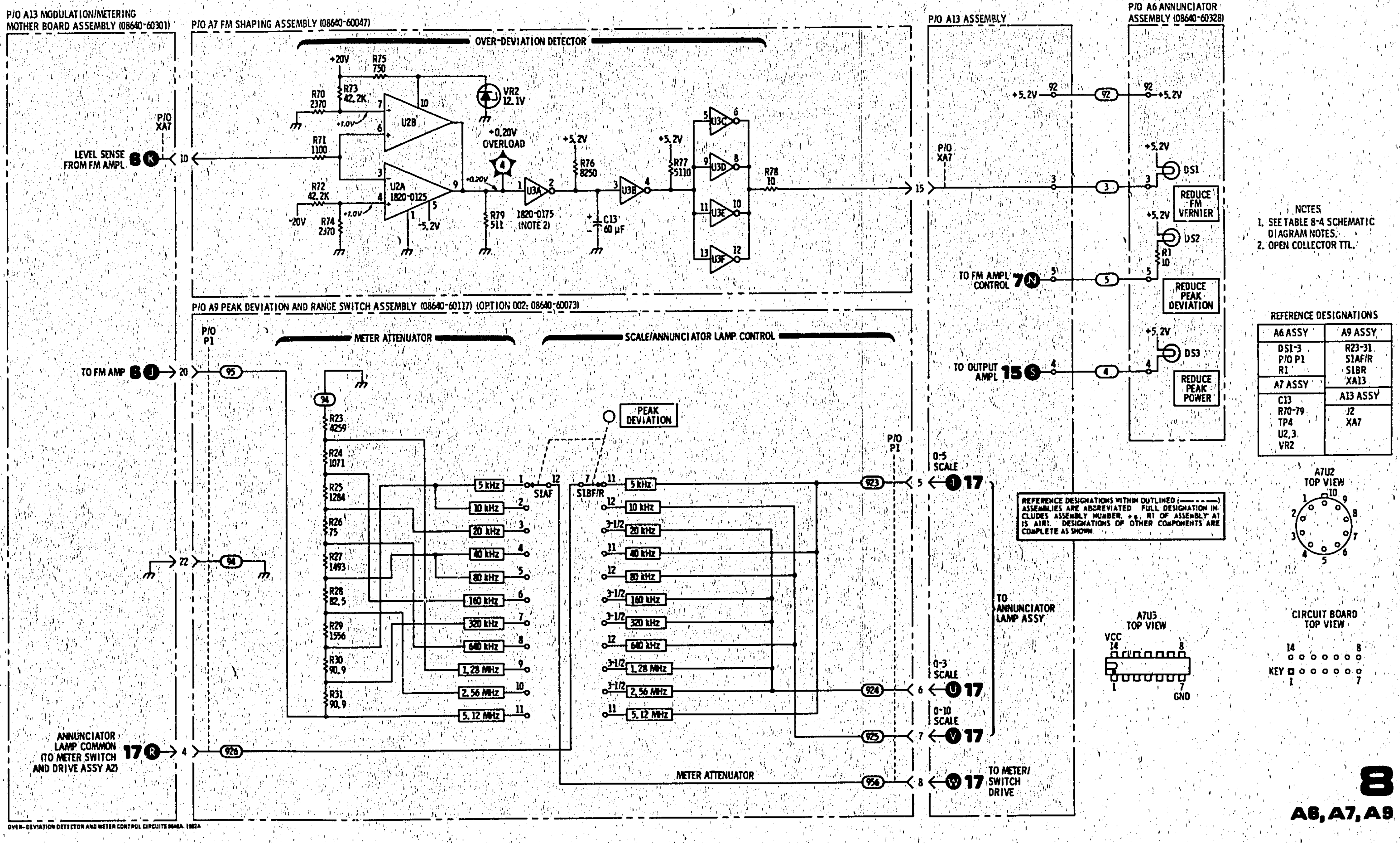


Figure 8-27. Over-Deviation Detector and Meter Control Circuits Schematic Diagram

SERVICE SHEET 9

PRINCIPLES OF OPERATION

General

This Service Sheet documents instruments with the fixed-frequency modulation oscillator (standard). When either the AM or FM modulation select switch is set to INT, the Modulation Oscillator is enabled. The oscillator feeds a 1000 or 400 Hz signal (selected by the MODULATION FREQUENCY switch) into the AM or FM modulator circuits and to the AM or FM front panel OUTPUT jacks.

Modulation Oscillator (A11)

Amplifier U1 is the gain block. A frequency-selective bridged-tee network forms a negative feedback path for U1. (This network is a notch filter with zero phase shift at the minimum of the notch.) The frequency of oscillation is determined by the network: C1, C2, and either A11A1R1 and R2 or R3 and R4. The positive-feedback path is a voltage divider in which the amount of feedback is determined by the output of a peak detector. (The amount of feedback automatically adjusts to maintain oscillation at a constant amplitude.) The voltage divider consists of A11R4, R3, CR1, and CR2. Diodes CR1 and CR2 are in ac parallel and dc series. The ac resistance is determined by the dc voltage across capacitor C5. At the peak of each output cycle VR2 and CR3 conduct and replenish the charge lost from C5. The ac voltage at the output of U1 is about 14.4 Vp-p (≈5.1 Vrms).

Buffer Amplifiers (A11)

Resistors R5, R6, and R7 lower the oscillator output voltage to 2.3 Vrms at TP5. Resistors R13 and R14 lower the voltage to about 0.84 Vrms at TP3 and TP4. Transistor Q5 drives the FM PEAK DEVIATION vernier potentiometer; Q4 drives the AM MODULATION potentiometer; Q1 drives the AM OUTPUT jack; and Q2 drives the FM OUTPUT jack. Signal levels at the two jacks are approximately 1 Vrms into 600Ω.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the fixed-frequency modulation oscillator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter . . . . HP 3490A
Oscilloscope . . . . HP 180C/1801A/1820C

Initial Test Conditions

Top and bottom covers removed (see Service Sheet G for removal procedure). Extend A11 Fixed-Frequency Modulation Oscillator Assembly on extender board (see Service Sheet E for removal procedure).

Initial Control Settings

AM . . . . INT
AUDIO OUTPUT LEVEL . . . . cw
MODULATION FREQUENCY . . . . . 400 Hz

Fine Frequency Adjustment

The oscillator's frequency can be lowered slightly by twisting the orange (3), yellow (4), and green (5) wires together. The wires connect MODULATION FREQUENCY switch A11A1S1 to the A11 circuit board.

Fixed-Frequency Modulation Oscillator Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
MODULATION OSCILLATOR ASSY (A11)	Initial conditions and settings. Then set MODULATION FREQUENCY to 1000 Hz.	Peak-to-peak voltages are as shown on schematic	Check appropriate circuit and replace faulty component
	Set AM to OFF. Use DVM to check dc voltages.	DC voltages check good	Replace faulty component

A11 ASSEMBLY

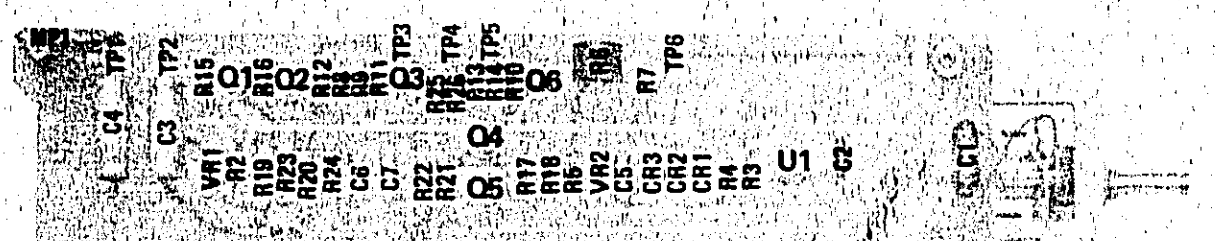
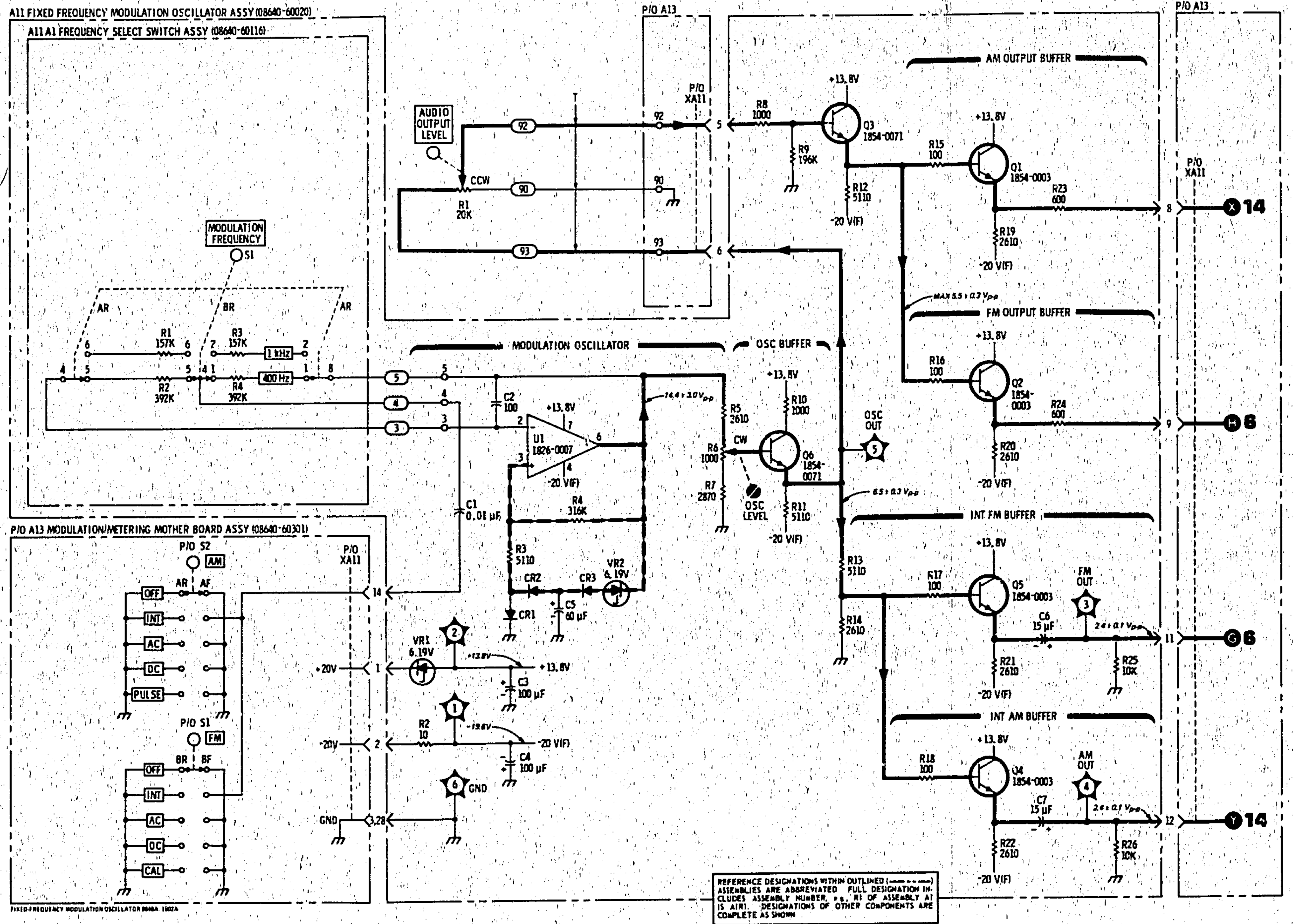


Figure 8-28. A11 Fixed-Frequency Modulation Oscillator Component Locations

A13

Component Locations for A13 Assembly are on Service Sheet 25.



NOTES

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.

REFERENCE DESIGNATIONS

NO PREFIX	A11A1 ASSY
R1	R1-4 S1
A11 ASSY	A13 ASSY
C1-7 CR1-3 Q1-6 R2-26 TP1-6 U1 VR1,2	P/O S1, S2 XA11

NOT ASSIGNED: A11R1

9

A11, A13

Figure 8-29. Fixed-Frequency Modulation Oscillator Schematic Diagram

SERVICE SHEET 9A (Option 001)

PRINCIPLES OF OPERATION

General

This Service Sheet documents instruments with the variable-frequency modulation oscillator (Option 001). When either the AM or FM modulation select switch is set to INT, the Modulation Oscillator is enabled. The oscillator feeds a signal with a frequency selected by the MODULATION FREQUENCY switch into the AM or FM modulator circuits and to the AM or FM front panel OUTPUT jacks.

Modulation Oscillator (A11)

The Modulation Oscillator is a Wein-bridge type. Transistors Q7 to Q12 form a differential amplifier. The gate of FET Q11 is a high impedance non-inverting input of the amplifier. Transistor Q12 is an emitter-follower buffer amplifier. Trimmer capacitor C9 compensates for the high-frequency phase shift of the amplifier. Transistors Q9 and Q10 provide voltage gain and drive the complementary symmetry output transistors Q7 and Q8. The inverting input to the amplifier is the emitter of Q9. Diodes CR2 to CR4 bias and thermally compensate Q7 and Q8. Components R19, C11, and C12 frequency compensate the amplifier. Resistor R26 provides negative dc feedback.

A frequency-selective Wein ladder forms a positive feedback path. This network is a band-pass filter with zero phase shift at the maximum of the pass band. The frequency of oscillation is determined by the resistors and capacitors of the ladder. In the FIXED FREQ range, C6 and C7 are the ladder capacitors and either R2 and R6 or R3 and R5 in parallel with R6 are the resistors. In the variable frequency ranges, C1A and C1B are the variable ladder capacitors and R1 and R4 (each in parallel with one or none of the resistors on the A11A1 Frequency Select Switch) are the resistors. Capacitors C2, C3, C4, and C5 set the frequency end points and maximize flatness for a given frequency range. The negative feedback path is a voltage divider in which the amount of feedback is determined by the output signal level. The amount of feedback adjusts to maintain oscillation at a constant amplitude. The voltage divider consists of R28 and RT1, a thermistor assembly. Diodes VR1, VR2, CR5, and CR6 add a small amount of odd-harmonic distortion to stabilize the amplitude characteristic of the oscillator.

Buffer Amplifiers (A11)

Transistors Q1 to Q4 form the AM/FM Output Buffer Amplifier which is similar in operation to the oscillator output amplifier. Gain of the amplifier is adjusted by R40. The outputs drive the external AM or FM jacks. Resistors R34, R35, and R36 attenuate the oscillator output to a level of

SERVICE SHEET 9A (Cont'd)

0.84 Vrms. Transistor Q5 drives the FM PEAK DEVIATION potentiometer (Service Sheet 6), and Q6 drives the AM MODULATION potentiometer (Service Sheet 14).

TROUBLESHOOTING

It is assumed that a problem has been isolated to the variable-frequency modulation oscillator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter . . . . HP 3490A
Oscilloscope . . . . HP 180C/1801A/1820C

Initial Test Conditions

Top and bottom covers removed (see Service Sheet G for removal procedure). Extend A11 Variable-Frequency Modulation Oscillator Assembly on extender board (see Service Sheet E for removal procedure).

Initial Control Settings

AM . . . . INT
AUDIO OUTPUT LEVEL . . . . cw
MODULATION FREQUENCY . . . 400 Hz (Fixed)

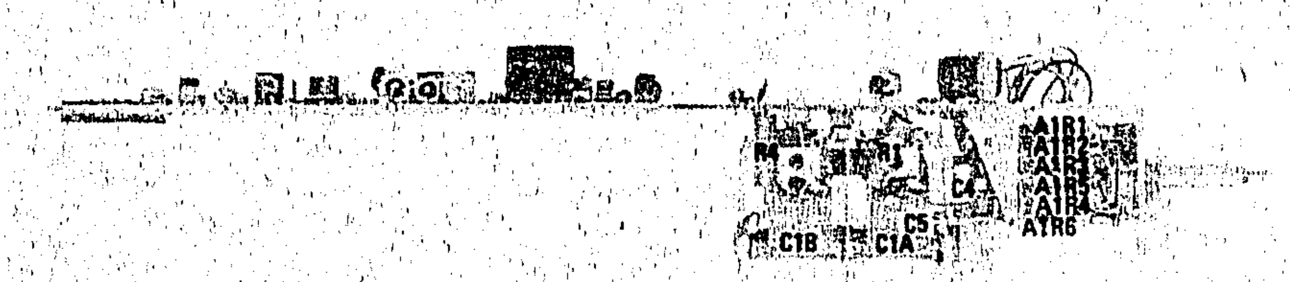
Amplitude Stability and Distortion

The signal level of the oscillator is set by adjusting R28 for best compromise between harmonic distortion and amplitude stability (squegging at turn-on or range change).

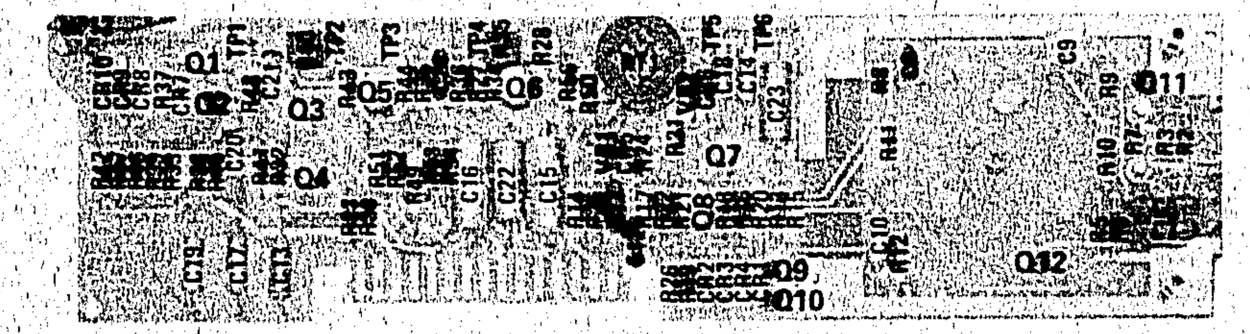
Variable-Frequency Modulation Oscillator Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
MODULATION OSCILLATOR ASSY (A11)	Initial conditions and settings. Then set MODULATION FREQUENCY to 1 kHz (fixed) and to each of the variable ranges (X1, X10, etc.) Vary the vernier on each range.	Peak-to-peak voltages are as shown on schematic	Check appropriate circuit and replace faulty component
	Set AM to OFF	DC voltages are as shown on schematic	Replace faulty component

A11 ASSEMBLY (OPTION 001)
With Covers Removed



A11 ASSEMBLY (OPTION 001)
With Covers Removed

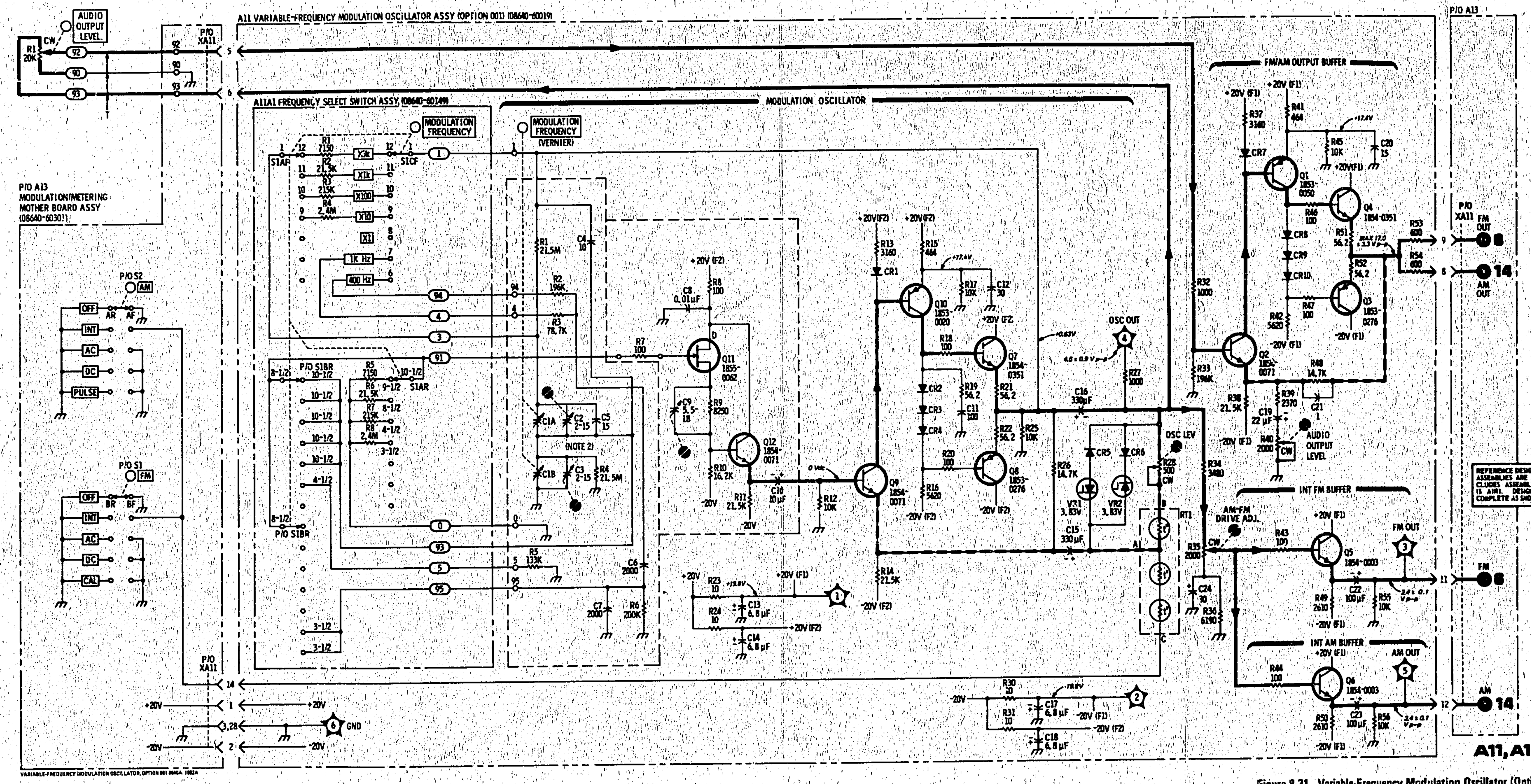


A11 ASSEMBLY (OPTION 001)
With Covers Removed

Figure 8-30. A11 Variable-Frequency Modulation Oscillator Assembly (Option 001) Component Locations

A13

Component Locations for A13 Assembly are on Service Sheet 25.



NOTES:

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.
2. THE COMBINED CAPACITANCE OF A11C1A AND A11C1B IS APPROXIMATELY 10-365 pF.

REFERENCE DESIGNATIONS

NO PREFIX	A11A1 ASSY
R1	R1-8 S1
A11 ASSY	A13 ASSY
C1-24 CR1-10 Q1-12 R1-28, 30-56 RT1 TP1-6 VR1,2	P/O S1,2 XA11

NOT ASSIGNED: A11R29

REFERENCE DESIGNATIONS WITHIN OUTLINED (—— - - ——) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER: e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

9A

A11, A13 OPTION 001

Figure 8-31. Variable-Frequency Modulation Oscillator (Option 001) Schematic Diagram

SERVICE SHEET 10

PRINCIPLES OF OPERATION

Divider/Filter Assembly — General

The A10 Divider/Filter Assembly frequency-divides and filters the signal from the RF oscillator. The divider network (see Figure 8-35) consists of a chain of nine binary dividers (÷2). The output is taken either from the RF oscillator buffer or from an OR gate at the output of one of the dividers, depending on the frequency range selected; all other divider output gates are disabled and also the divider immediately following the output divider. The signal from the output gates is transformer coupled out to a power amplifier which drives the modulator. The modulator controls the signal level and adds AM.

The output from the dividers (and the modulator) is approximately a square wave. The low-pass filters remove the signal's harmonics. On the four lowest frequency ranges, the square wave output is quite symmetrical (i.e., second harmonics are well suppressed). In the lower portion of these ranges, the filters suppress only the third harmonic and higher.

On higher frequency ranges the divider output is more asymmetrical and more second harmonic is present. Each of these ranges has two filters. In the lower portion of these ranges, the first filter's stop-band frequency is made low enough to suppress the second harmonic. In the higher portion of the range, a filter with a higher stop-band frequency is switched in to suppress the second harmonic. The high band filter is switched in at approximately the geometric mean of the frequency extremes of the range. A Schmitt Trigger senses a dc voltage, V_T, which is proportional to the frequency, and relays switch the filters at the geometric mean. On the four lowest ranges, the low band filter for the 16–32 MHz range is also switched in series with the range filters to improve the rejection of high-order harmonics. All range switching is done by cam-operated slide switches on the filter board (A10A1). The filters drive the output amplifier which drives the RF output and AGC circuits. The filters are inside the AGC feedback loop.

RF Filters (A10A1)

The A10A1 RF Filter Assembly contains sixteen RF low-pass filters and six slide switches that are controlled by the RANGE switch. The filters for the four lowest ranges (0.5 to 8 MHz) are sharp-cutoff, elliptic-function filters. The remaining filters are Chebyshev filters. In the six highest ranges, relays K1 and K3 switch in the low band filters when the frequency is below the geometric mean frequency of the range and relays K2 and K4 switch in the high band filters when above the geometric mean. The slide switches route the RF signal to the proper filters, activate the frequency dividers, and route the RF signal to and from dividers. Each slider has three detented positions. Mechanical action of the RANGE switch is shown in Figure 8-32.

SERVICE SHEET 10 (Cont'd)

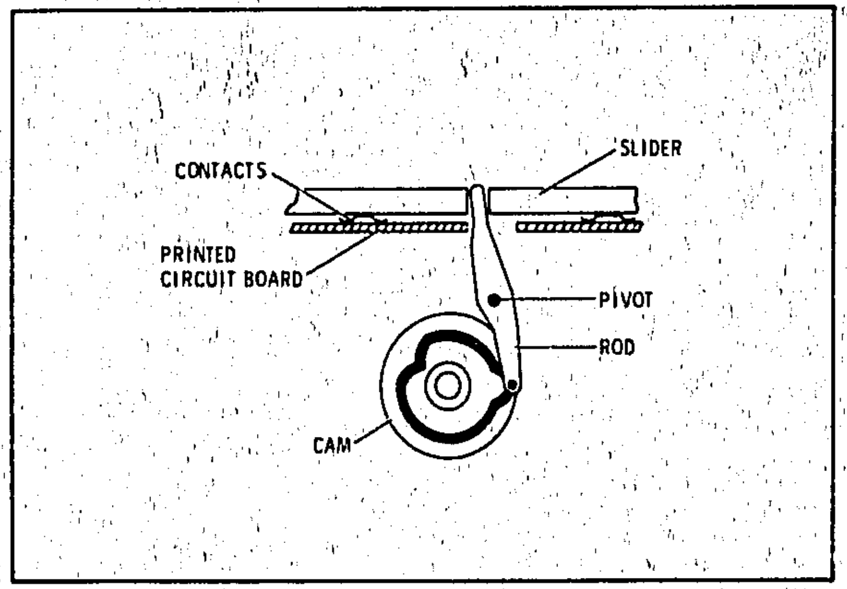


Figure 8-32. Action of RANGE Switch

TROUBLESHOOTING

It is assumed that a problem has been isolated to the RF Filter circuits as a result of using the troubleshooting block diagrams. The quickest way to isolate a Divider/Filter problem is to step through the ranges, tuning to both high and low band frequencies, while monitoring the output level meter. Start by performing the initial test conditions and control settings, and following the procedure outlined in the tables.

Test Equipment

Digital Voltmeter .... HP 3490A

Initial Test Conditions

Top cover removed (see Service Sheet C for removal procedure). A10 Divider/Filter Assembly casting cover removed, A10A2 RF Divider Assembly removed and extended for service with access to A10A1 RF Filter Assembly (see Service Sheet E for procedures).

Initial Control Settings

Meter Function .... LEVEL
AM .... OFF
FM .... OFF
RANGE .... 256–512 MHz
FREQUENCY TUNE .... 550 MHz
OUTPUT LEVEL .... –10 dBm
RF ON/OFF .... ON

SERVICE SHEET 10 (Cont'd)

Symptom	Probable Cause
No output on one range only	Defective output circuit for one of the dividers, a filter, or a slide switch
No output on one range and all ranges below that range	Defective divider or 16–32 MHz low band filter or 0.5 to 8 MHz divider output transformer
Low power at highest end of ranges (8 to 1024 MHz) only	Defective geometric mean switching (high band filters not being switched in)
Overly high harmonics at lowest end of ranges (8 to 1024 MHz) only	Defective geometric mean switching (low band filters not being switched in)
Intermittent power	Poor contact on slide switch
Changing range does not change output frequency	Loose coupler between RANGE switch and Divider/Filter switch assembly

The dividers and the Schmitt Trigger circuits are shown and discussed on Service Sheet 11 (the relays driven by the Schmitt Trigger circuits are shown on this service sheet).

NOTE

The following procedure checks gross failure. A more comprehensive check can be made by performing the Filter Adjustment in Section V.

Variable-Frequency Modulation Oscillator (Option 001) (A11)
◀ SERVICE SHEET 9A

SERVICE SHEET 10 (Cont'd)

RF Filter Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
HIGH/LOW BAND RELAYS (A10A1)	Initial conditions and settings	DC continuity across contacts of K2 and K4	Check K2, K4, and associated circuitry
	Set FREQUENCY TUNE to 256 MHz	DC continuity across contacts of K1 and K3	Check K1, K3 and associated circuitry
RF FILTERS (A10A1)	Initial conditions and settings then set RANGE to each position and tune FREQUENCY TUNE full cw and full ccw	–10 dBm on panel meter	Check appropriate switch contacts and appropriate high and low band filters

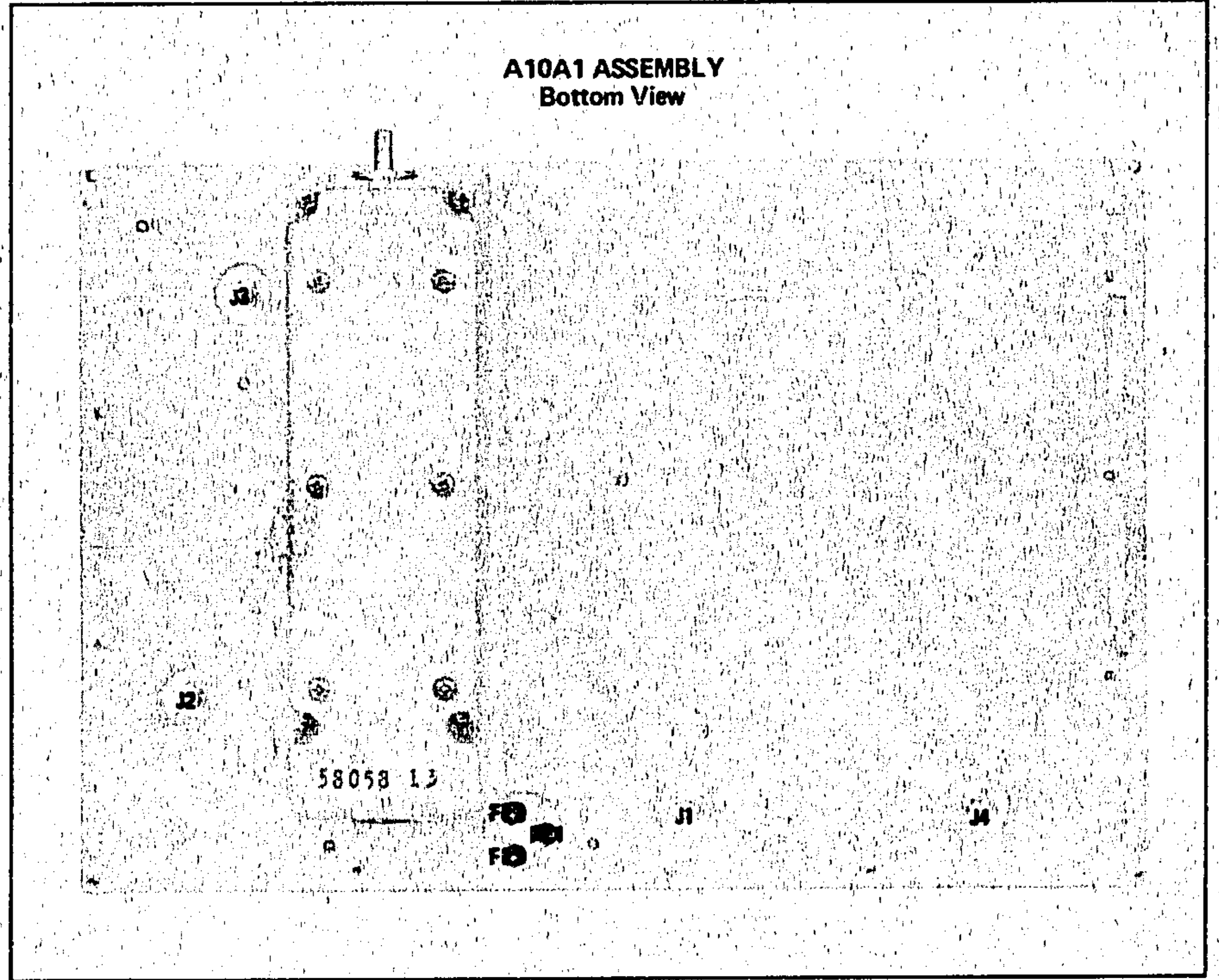


Figure 8-33. A10A1 RF Filter Assembly Component Locations (1 of 2)

A10A1 ASSEMBLY
Top View

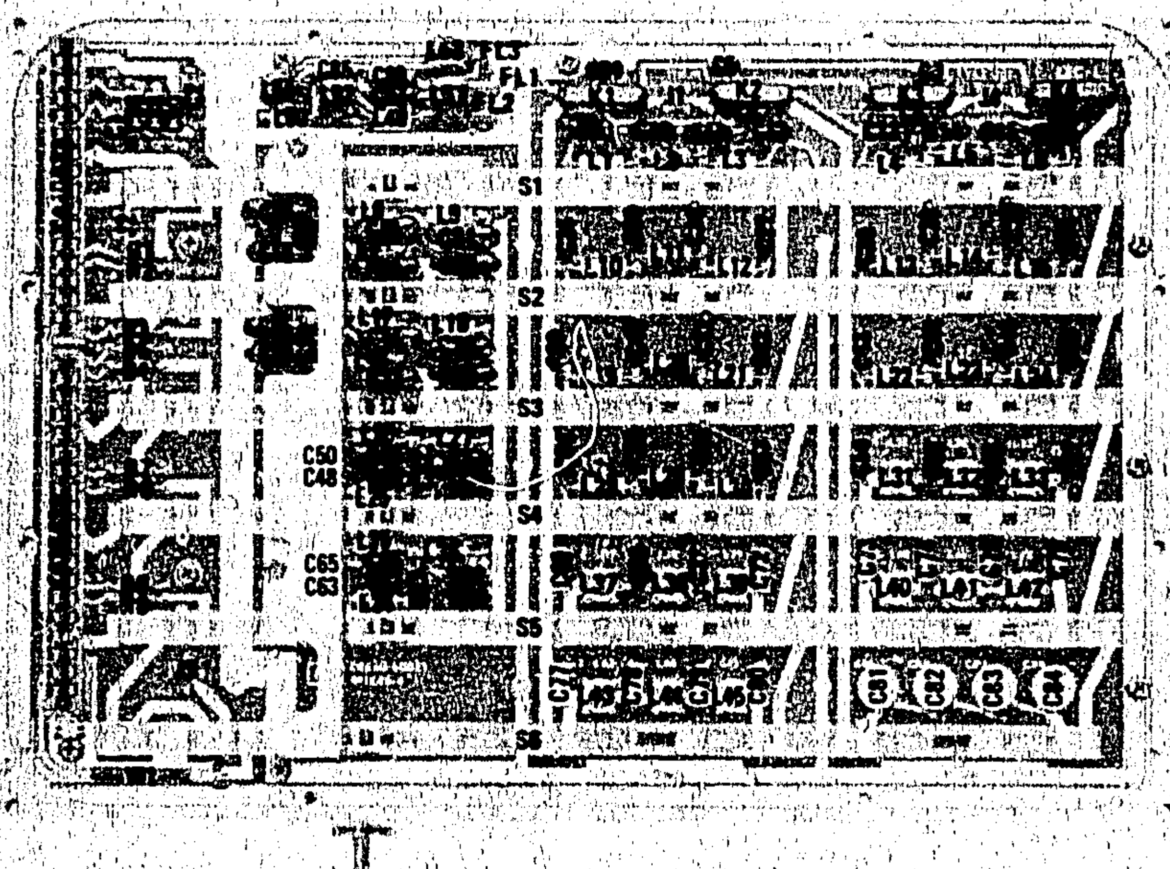
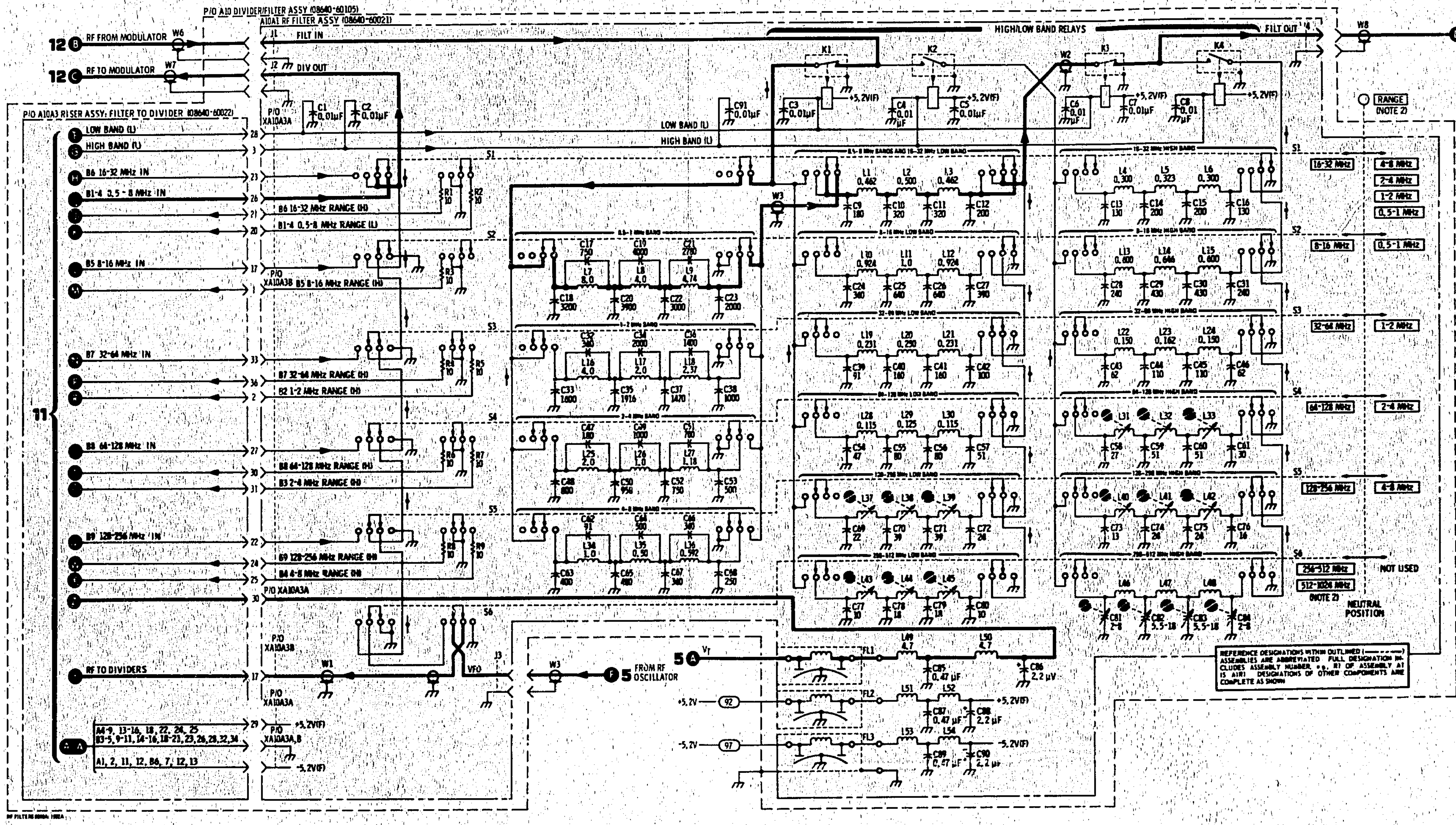


Figure 8-33. A10A1 RF Filter Assembly Component Locations (2 of 2)



NOTES:

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.
2. ALL SWITCHES SHOWN SET FOR 0.5-1 MHz RANGE.
3. LOGIC LEVELS ON THIS SCHEMATIC BELONG TO ECL AND EECL FAMILIES. GROUND IS HIGH AND OPEN (NEGATIVE) IS LOW. EXCEPTIONS ARE LINES LABELED "LOW BAND" AT INPUT E., "HIGH BAND" AT INPUT G, AND "B1-4" AT OUTPUT K WHICH ARE TTL FOR WHICH OPEN (POSITIVE) IS HIGH AND GROUND IS LOW.

REFERENCE DESIGNATIONS

NO PREFIX	A10A1 ASSY
P/O W3,W6 P/O W7,W8	C1-91 FL1-3 J1-4 K1-4 L1-54 R1-9 S1-6 W1-3 XA10A3A/B

10

A10A1

Figure 8-34. RF Filters Schematic Diagram

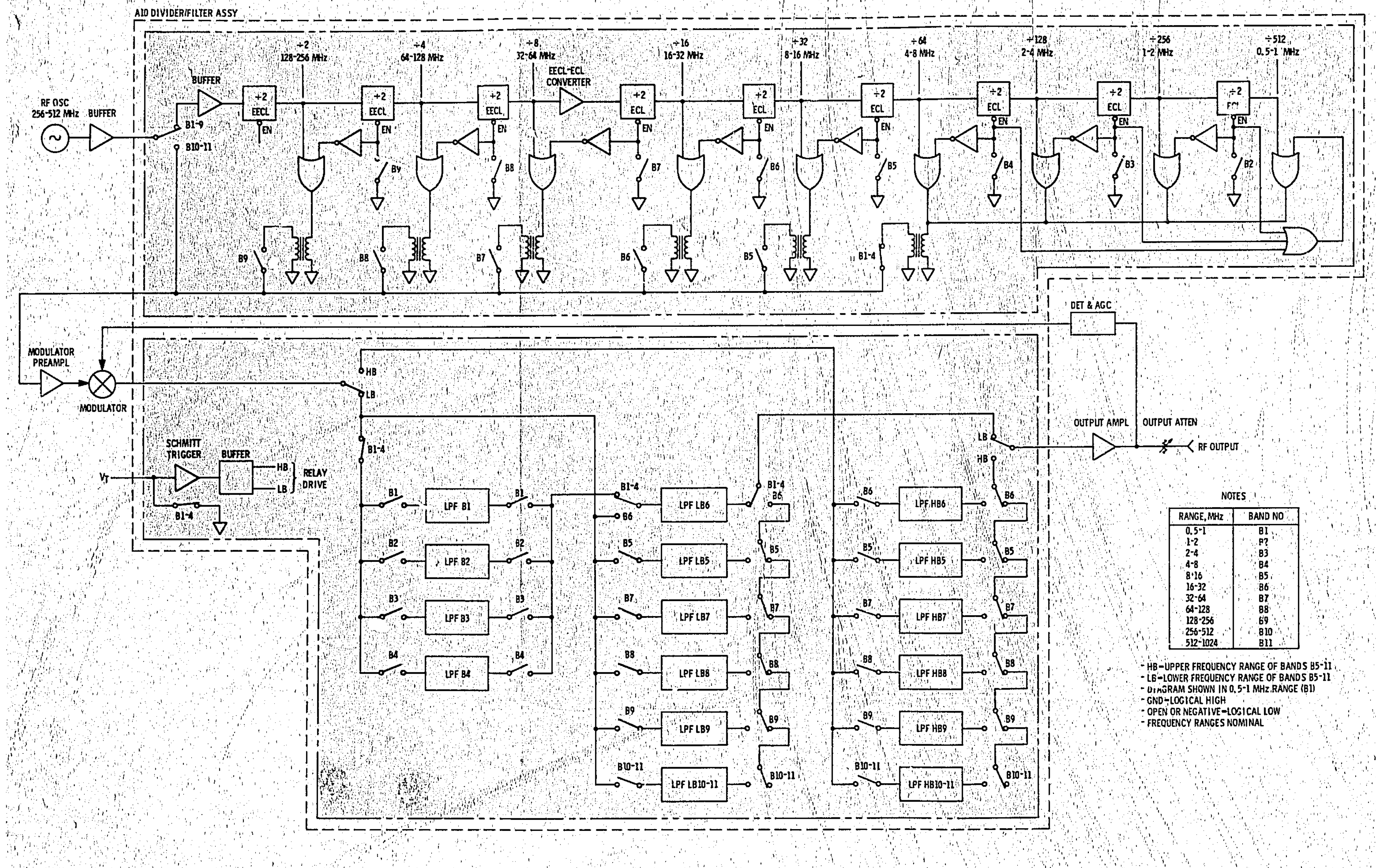


Figure 8-35. Simplified Logic Diagram of the Divider/Filter Assembly

SERVICE SHEET 11

PRINCIPLES OF OPERATION

RF Dividers (A10A2)

The A10A2 RF Divider Assembly frequency-divides the 256—512 MHz signal from the RF oscillator to obtain lower output frequencies. The overall operation of the A10 Divider/Filter Assembly is described on Service Sheet 10. Refer also to Figure 8-35 for a simplified logic diagram of the RF Dividers and Filters. On the two highest frequency ranges (256—512 MHz and 512—1024 MHz) the dividers are bypassed. On all other ranges, the signal from the oscillator is amplified and limited by buffer amplifier U11.

The outputs of the first three dividers drive complementary-output OR gates (U10A, U13B, and U15B) which drive the next divider stage with one output and another complementary-output OR gate (U10B, U13A, and U15A) with the other. The latter gates drive output transformers T1, T2, and T3 in push-pull, and are enabled by inverter transistors Q2, Q3, and Q4 respectively.

When an output OR gate is enabled, the next divider stage is disabled. (Note that ground is a logical high and negative or open a logical low for EECL and ECL devices.) The Q and $\overline{Q}$ outputs of the next two stages each drive NOR gates (U17B, U17C, U19B, and U19C) in push-pull which in turn drive transformers T4 and T5 in push-pull. The final four divider stages operate in a manner similar to the previous two stages. The NOR-gate outputs, however, drive a common output transformer T6. The last NOR-gate output pair is enabled through diodes CR1, CR2, and CR3 connected in a logical OR configuration.

All output transformers drive pi-network pads which are switched onto the line leading to the modulator circuits. The attenuation of the first three pads (R6-8, R12-14, and R18-20) is selected (from 3 to 6 dB) to prevent excessive signal level from being applied to A26U2 (Service Sheet 12 or 12A). The attenuation level is selected by changing the value of the resistors.

Schmitt Trigger (A10A2)

Amplifier U1 is a Schmitt Trigger which senses when the voltage V_T (proportional to the RF oscillator frequency) reaches the value corresponding to the geometric mean of the frequency range. The reference voltage is determined by resistors R55, and R57; R58 adds a small amount of hysteresis. Transistor Q1 complements the amplifier output. Inverter U6A activates the low band relays A10A1K1 and K3 (Service Sheet 10); and U6B activates the high band relays A10A1K2 and K4 (Service Sheet 10). The inverters are driven in complement except that capacitors C18 and C19 hold both inverters on simultaneously for a few milliseconds during a transition to provide a make-before-break action.

SERVICE SHEET 11 (Cont'd)

TROUBLESHOOTING

It is assumed that a problem has been isolated to the RF Filter circuits as a result of using the troubleshooting block diagrams. The quickest way to isolate a divider/filter problem is to step through the ranges, tuning to both high and low band frequencies, while monitoring the output level meter. Start by performing the initial test conditions and control settings, and following the procedure outlined in the tables.

Test Equipment

Digital Voltmeter . . . . HP 3490A

NOTE

If problems occur only on the lower ranges, an oscilloscope can be used to locate the defective RF cirucit. On the higher ranges, either a high frequency oscilloscope, a sampling oscilloscope, or a spectrum analyzer (with a 511Ω resistor in series with the input) can be used.

Initial Test Conditions

Top cover removed (see Service Sheet G for removal procedure) and A10 Divider/Filter Assembly casting cover removed (see Service Sheet F for removal procedure).

Initial Control Settings

Meter Function . . . . LEVEL
AM . . . . OFF
FM . . . . OFF
RANGE . . . . 256 - 512 MHz
FREQUENCY TUNE . . . . 550 MHz
OUTPUT LEVEL . . . . −10 dBm
RF ON/OFF . . . . ON

RF Filters (A10A1)
SERVICE SHEET 10

SERVICE SHEET 11 (Cont'd)

Symptom	Probable Cause
No output on one range only	Defective output circuit for one of the dividers, a filter, or a slide switch
No output on one range and all ranges below that range	Defective divider or 16—32 MHz low band filter or 0.5 to 8 MHz divider output transformer
Low power at highest end of ranges (8 to 1024 MHz) only	Defective geometric mean switching (high band filters not being switched in)
Overly high harmonics at lowest end of range (8 to 1024 MHz) only	Defective geometric mean switching (low band filters not being switched in)
Intermittent power	Poor contact on slide switch
Changing range does not change output frequency	Loose coupler between RANGE switch and Divider/Filter switch assembly

The filters, slide-switches, and the relays driven by the Schmitt Trigger circuits are shown and discussed on Service Sheet 10.

NOTE

Check that the control inputs to the RF gates are correct before suspecting the gates themselves.

RF Divider Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
SCHMITT TRIGGER (A10A2)	Initial conditions and settings	≈ +10V at TP1 (V_T)	Check slide-switches (Service Sheet 10) and V_T pot (Service Sheet 5)
		≈ −3V at TP2 (ST OUT)	Check U1 and associated circuitry
		≈ 0V at TP3	Check U6 and associated circuitry
		≈ +5V at TP4	Check U6, Q1 and associated circuitry
	Set FREQUENCY TUNE to 230 MHz	≈ 0V at TP1 (V_T)	Check V_T pot (Service Sheet 5)
		≈ +5V at TP2 (ST OUT)	Check U1 and associated circuitry
		≈ +5V at TP3	Check U6 and associated circuitry
		≈ 0V at TP4	Check U6, Q1 and associated circuitry
RF DIVIDERS (A10A2)	Initial conditions and settings then set RANGE to to each position	−10 dBm on panel meter	Check appropriate divider and associated circuitry. Check that following divider is off

A10A2 ASSEMBLY

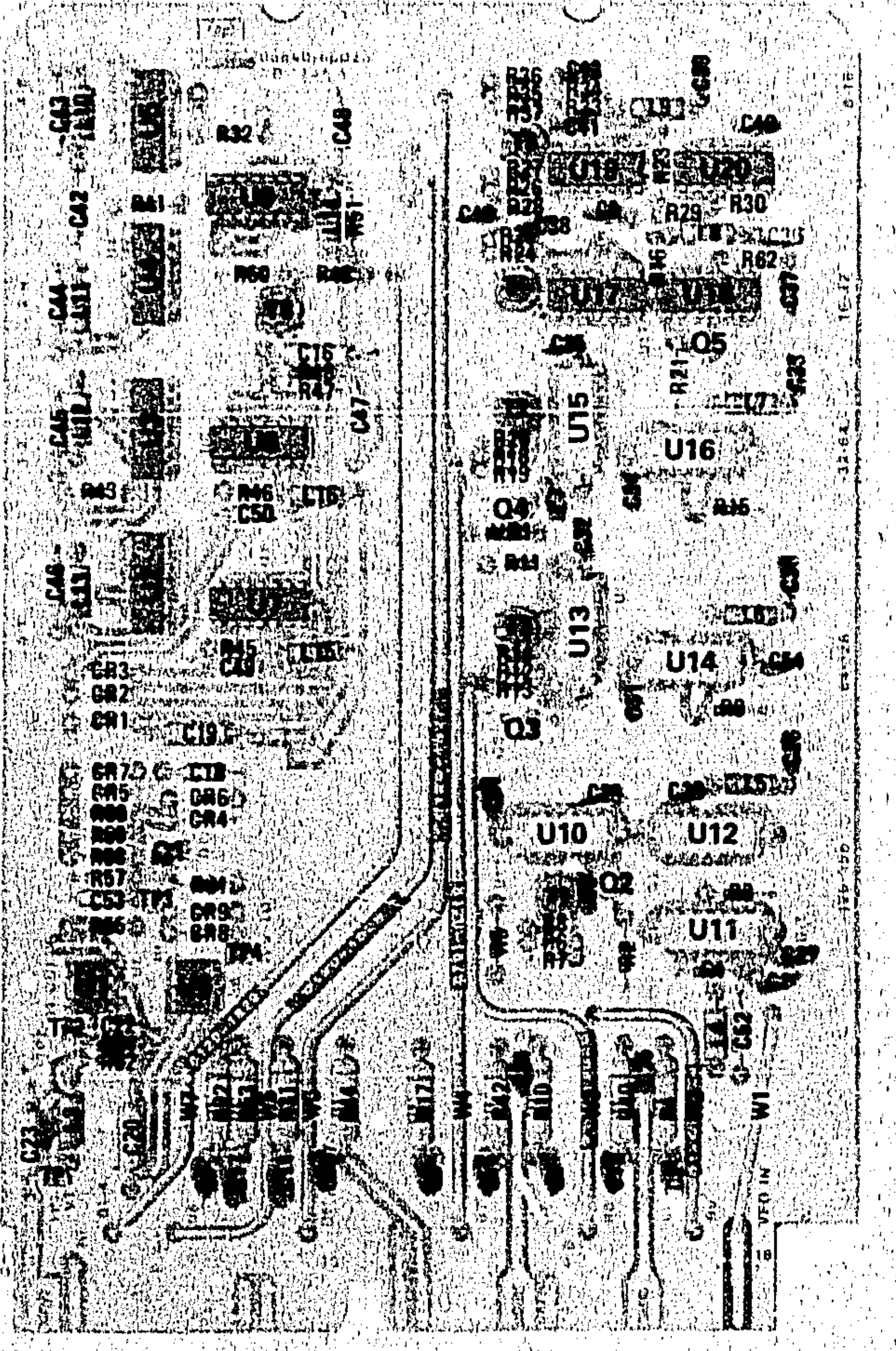


Figure 8-36. A10A2 RF Divider Assembly Component Locations

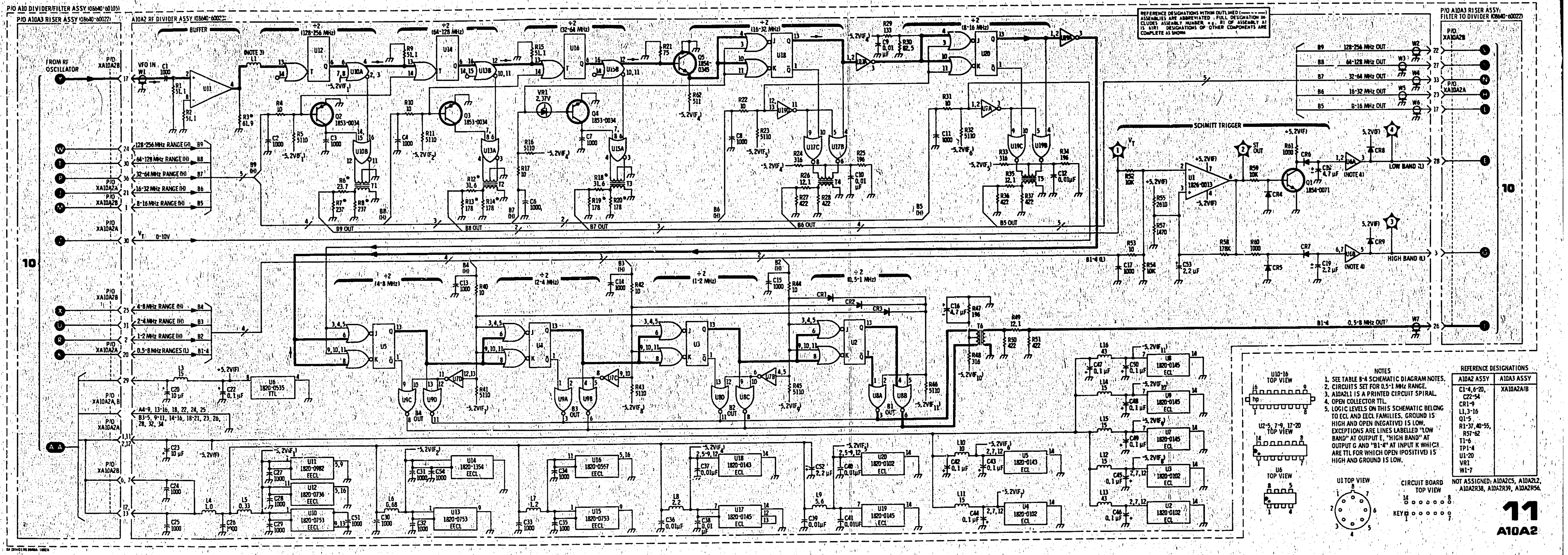


Figure 8-37. RF Dividers Schematic Diagram

SERVICE SHEET 12

PRINCIPLES OF OPERATION

General

This Service Sheet documents instruments without the internal doubler (Option 002). The A26A3 Modulator Assembly contains a current-controlled attenuator which varies the RF output level. The A26A4 AGC Amplifier controls the drive to the modulator. Attenuation is determined by the OUTPUT LEVEL vernier and by the AM input signal when the AM switch is on or by the pulse input signals when AM is set to PULSE.

Modulator (A26A3)

The RF signal from the binary dividers is amplified by Modulator Preamplifier A26U2. The amplifier is a sealed microcircuit. The amplifier drives the AUX RF OUTPUT jack through resistor R1 and drives the modulator diodes. Diodes CR1 through CR8 form a balanced resistive network in which the resistance is controlled by the current biasing them. Capacitors C3 through C6 improve the modulator balance at high frequencies. The control current comes from the AGC output amplifier through choke L2 and then splits between R4, CR1 to CR4, and R3 or R5, CR5 to CR8, and R2. The RF signal is coupled into the modulator through T1 and out through T2. The modulator output drives the RF filters (Service Sheet 10).

AGC Amplifier (A26A4)

The AGC Amplifier sums the negative detector output from the A26A1 Detector Buffer Amplifier (Service Sheet 13) with the positive AGC reference voltage from the OUTPUT LEVEL vernier A1R1 (Service Sheet 16). The input to the vernier is a 2 Vdc reference voltage upon which may be superimposed a preamplified AM signal (±2 Vpk for 100% AM). When AM is set to PULSE, the amplifier's output (and therefore, the modulator) is switched on and off by the input pulses.

Summing Amplifier (A26A4)

Transistors Q1, Q2, and Q3 form a Summing Amplifier. The output of Q3 is the amplified sum of the detector and reference currents and represents the output level error. Resistor R1 is adjusted to give the correct RF output voltage corresponding to the AGC reference. Switch S1 allows the AGC circuits to be tested in an open-loop condition.

Modulator Driver Amplifier (A26A4)

Transistors Q4, Q5, and Q6 form the Modulator Driver Amplifier. R32 and C9 frequency-compensate the AGC system. Capacitor C10 is switched in parallel with C9 in the 0.5–1 and 1–2 MHz ranges (called LO BAND 1) to give added compensation. The LO BAND 1 line is grounded in LO BAND 1 ranges and causes inverter U3B to go high and inverter U4F (an open collector output gate) to go low which switches in C10. In a similar manner capacitor C11 is switched in parallel with C9 in the 2–4 and 4–8 MHz ranges (called LO BAND 2). Transistor Q5 is a current source. Transistor Q6 is a constant current sink. The difference between the collector currents of Q5 and Q6 is the modulator drive current.

In the pulse modulation mode of operation, Q5 is switched on and off at the pulse repetition rate by transistor switch Q7 which is driven by the pulse Schmitt Trigger output of A26A2 (Service Sheet 13). When Q7 is on, Q5 and the modulator are off, (i.e., when either the MOD PULSE line is low or when the RF OFF line is low). Hot carrier diodes CR13 and CR14 prevent saturation of Q7 and Q6 for rapid switching. Capacitor C15 is switched in across the modulator drive line by gates U3C and U4E to lower the rise and fall time of the modulator in LO BAND 1 ranges to reduce RF ringing in the filters following the modulator. Similarly, capacitor C16 is switched in for LO BAND 2 ranges.

Pulse Overload Detector (A26A4)

In the pulse modulation mode, the peak detector in A26U1 (Service Sheet 13) samples the RF output only when an input pulse is present; when no pulse is present, the detector output is stored on a capacitor. If the OUTPUT LEVEL vernier is reduced while in the pulse mode, the error voltage of the summing amplifier becomes very large and the modulator is turned off. The detector storage capacitor then discharges only during each pulse-on period until the error is zero. At low repetition rates and short on-periods, the capacitor discharge time is very long. To correct for this, Pulse Overload Detector U1B senses the condition of large error (i.e., when the collector voltage of Q3 exceeds +0.4 Vdc) and switches a discharge resistor on to bring the system to a near zero error condition.

Meter Amplifier (A26A4)

Amplifier U1A is an inverting amplifier with a gain of about −1.3 (adjusted by R12) which scales the detector output voltage to drive the metering circuits. Capacitor C8 filters any superimposed modulation signal on the detector output.

Modulator Overload Detector (A26A4)

If the OUTPUT LEVEL vernier setting or input modulation signal requires the output to exceed its maximum capability, Modulator Overload Detector U2 senses the condition and lights the REDUCE PEAK POWER annunciator A6DS3 (Service Sheet 16). The reference voltage is set by resistors R29, R30, and R31. When the output from the OUTPUT LEVEL vernier exceeds the reference, the output of U2 goes high and turns on Q9 and the annunciator. Since the overload condition may be of short duration, capacitor C13 holds the output of U2 high to keep the annunciator lighted for a longer period.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the AGC amplifier or the modulator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter .... HP 3490A
Oscilloscope .... HP 180C/1801A/1820C

Initial Test Conditions:

To test A26A4 AGC Amplifier Assembly, remove top cover (see Service Sheet G for removal procedure) and remove A26A4 and extend for service (see Service Sheet F for procedure).

To test A26A3 Modulator Assembly and A26U2 Modulator Preamplifier, remove bottom cover (see Service Sheet G for removal procedure) and remove A26 casting bottom cover (see Service Sheet F for procedure).

Initial Control Settings

Meter Function .... LEVEL
AM .... INT
MODULATION 100%
MODULATION FREQUENCY .... 1 kHz
FM .... OFF
RANGE .... 8–16 MHz
FREQUENCY TUNE .... 7.20 MHz
OUTPUT LEVEL Switch .... +10 dBm
OUTPUT LEVEL Vernier .... Fully cw
RF ON/OFF .... ON

RF Dividers (A10A2)
SERVICE SHEET 11

SERVICE SHEET 12 (Cont'd)

AGC Amplifiers and Amplitude Modulator Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
SUMMING AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	≈ 800 mVp-p sine wave (1 kHz) at TP6 (CQ1)	Check Q1, Q2, Q3 and associated circuitry
MODULATOR DRIVER AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	≈ 2 Vp-p sine wave (1 kHz) at TP7 (DRVR) ≈ 8 Vp-p sine wave (1 kHz) at TP8 (MOD)	Check Q4 and associated circuitry Check Q5, Q6, Q7 and associated circuitry
	Set RANGE to 4–8 MHz (LO BAND 2)	≈ 7.2 Vp-p sine wave (1 kHz) at TP8 (MOD)	Check U3A, U3D, U4B, U4D, and associated circuitry
	Set RANGE to 1 - 2 MHz (LO BAND 1)	≈ 6 Vp-p sine wave (1 kHz) at TP8 (MOD)	Check U3B, U3C, U4E, U4F and associated circuitry
MODULATOR PREAMPLIFIER (A26U2)	Initial conditions and settings (AGC switch, A26A4S1, set to AGC on position)	>−5 dBm (>125 mVrms into 50Ω) at AUX RF OUTPUT jack on rear panel	Check A26U2 and associated circuitry
METER AMPLIFIER (A26A4)	Initial conditions and settings	Panel meter indicates +10 dBm (707 mV)	Check U1A and associated circuitry
MODULATION OVERLOAD DETECTOR (A26A4)	Initial conditions and settings	REDUCE PEAK POWER annunciator unlighted	Check U2, Q9 and associated circuitry
	Set OUTPUT LEVEL switch one step cw	REDUCE PEAK POWER annunciator lighted **NOTE** *Annunciator should be off at +19 dBm RF output and on at +20 dBm output.*	
PULSE OVERLOAD DETECTOR (A26A4)	Initial conditions and settings except set AM to OFF **CAUTION** *Check that OUTPUT LEVEL switch is set one step ccw from full cw.*	≈ +9V at TP3 (OVLD)	Check U1B and associated circuitry
	Short TP5 (GND) to TP4 (VERN)	≈ 0 Vdc at TP3 (OVLD)	

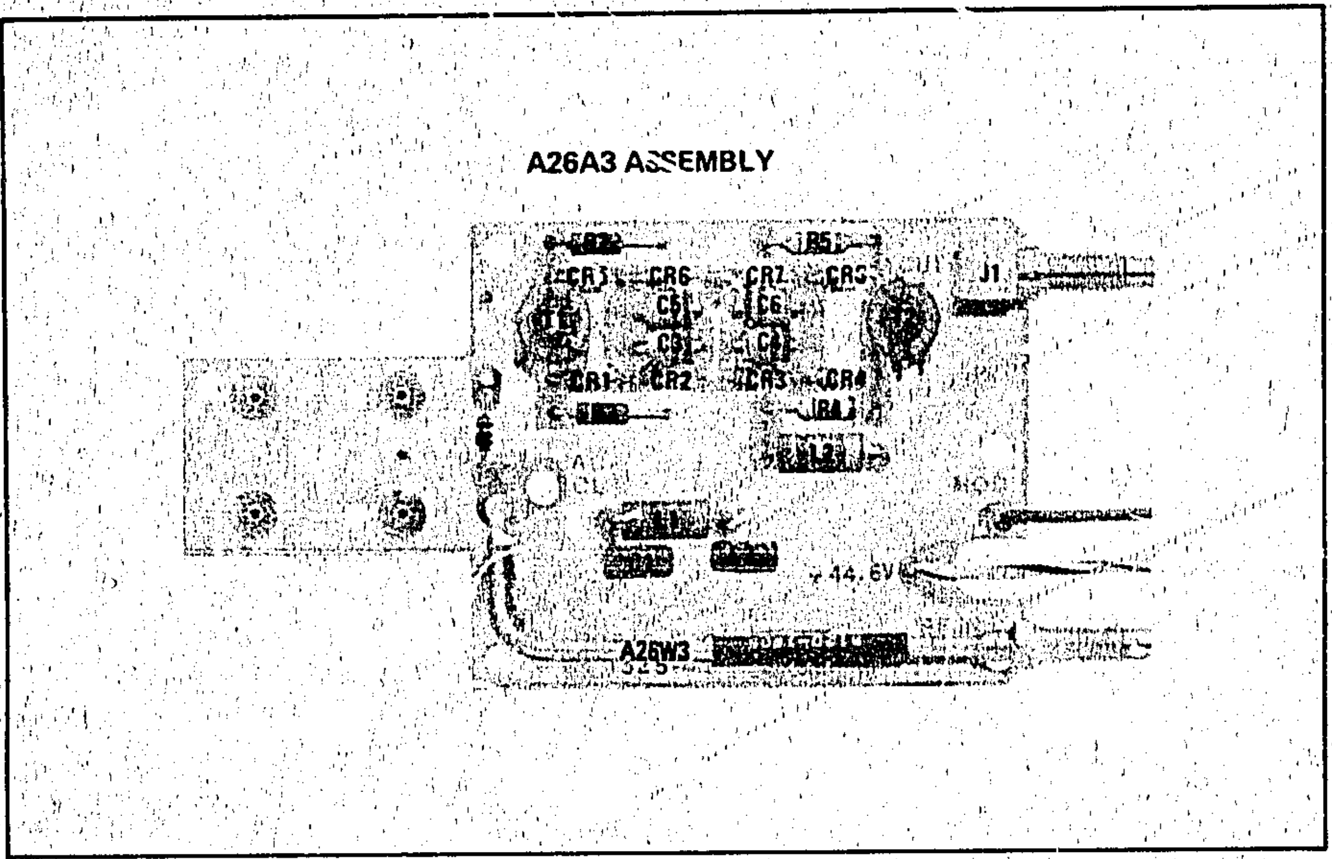


Figure 8-38. A26A3 Modulator Assembly Component Locations

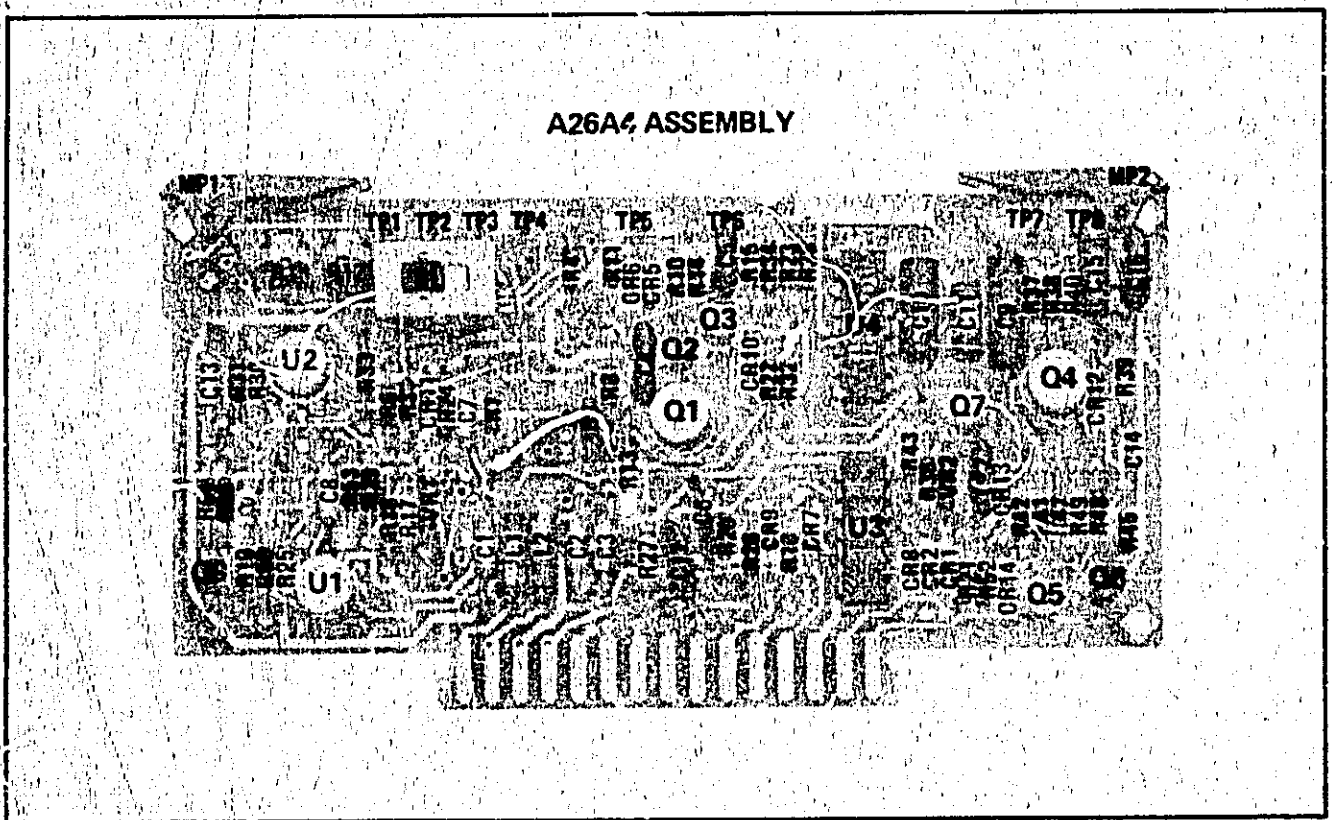
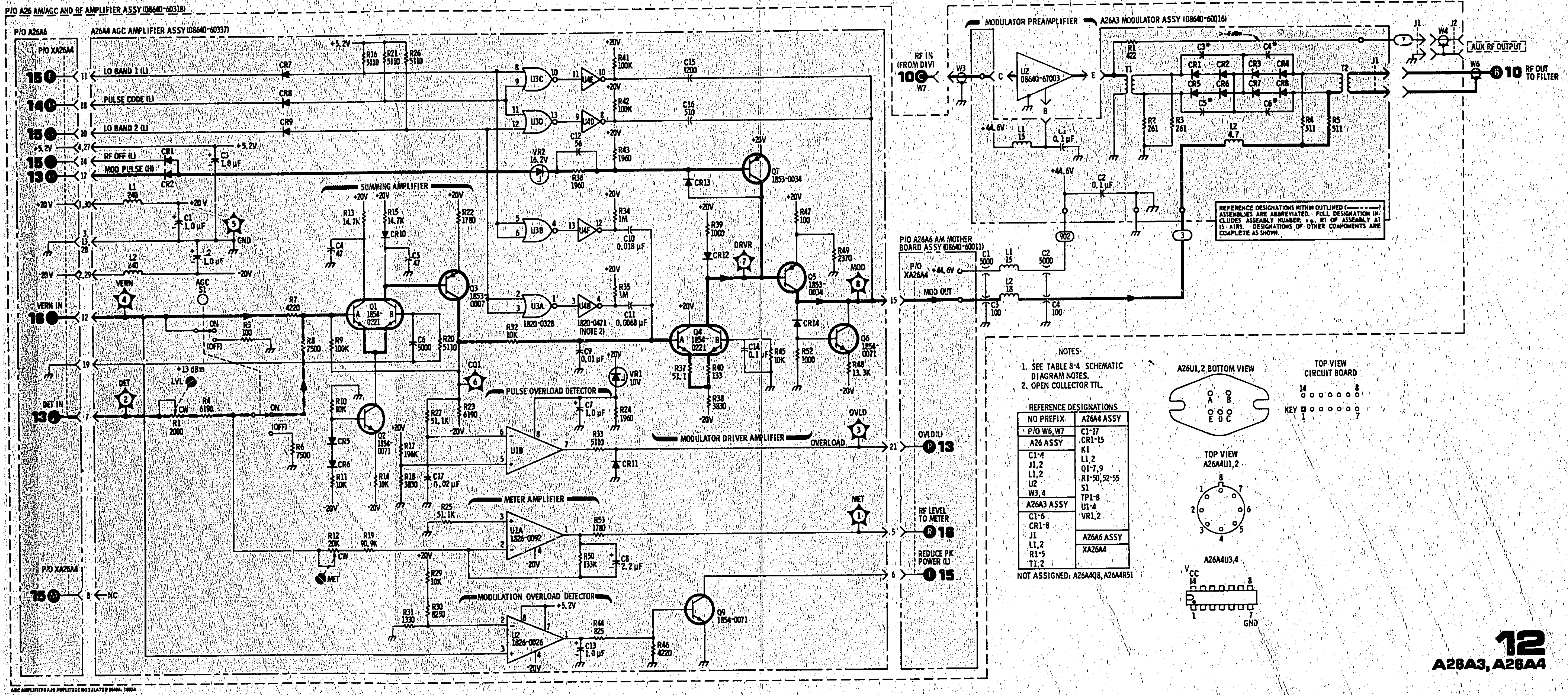


Figure 8-39. A26A4 AGC Amplifier Assembly Component Locations



NOTES

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.
2. OPEN COLLECTOR TTL.

REFERENCE DESIGNATIONS

NO PREFIX	A26A4 ASSY
P/O W6, W7	C1-17
A26 ASSY	CR1-15
C1-4	K1
J1,2	L1,2
L1,2	Q1-7,9
U2	R1-50, 52-55
W3,4	S1
A26A3 ASSY	TP1-8
C1-6	U1-4
CR1-8	VR1,2
J1	A26A6 ASSY
L1,2	XA26A4
R1-5	
T1,2	

NOT ASSIGNED: A26A4Q8, A26A4R51

12
A26A3, A26A4

Figure 8-40. AGC Amplifiers and Amplitude Modulator Schematic Diagram

SERVICE SHEET 12A (Option 002)

PRINCIPLES OF OPERATION

General

This Service Sheet documents instruments with the internal doubler (Option 002). The A26A3 Modulator Assembly contains a current-controlled attenuator which varies the RF output level. The A26A4 AGC Amplifier controls the drive to the modulator. Attenuation is determined by the OUTPUT LEVEL vernier and by the AM input signal when the AM switch is on or by the pulse input signals when AM is set to PULSE.

Modulator (A26A3)

The RF signal from the binary dividers is amplified by Modulator Preamplifier A26U2. The amplifier is a sealed microcircuit. The amplifier drives the AUX RF OUTPUT jack through resistor R1 and drives the modulator diodes. Diodes CR1 through CR8 form a balanced resistive network in which the resistance is controlled by the current biasing them. Capacitors C3 through C6 improve the modulator balance at high frequencies. The control current comes from the AGC output amplifier through choke L2 and then splits between R4, CR1 to CR4, and R3 or R5, CR5 to CR8, and R2. The RF signal is coupled into the modulator through T1 and out through T2. The modulator output drives the RF filters (Service Sheet 10).

AGC Amplifier (A26A4)

The AGC Amplifier sums the negative detector output from the A26A1 Detector Buffer Amplifier (Service Sheet 13A) with the positive AGC reference voltage from the OUTPUT LEVEL vernier A1R1 (Service Sheet 16). The input to the vernier is a 2 Vdc reference voltage upon which may be superimposed an AM input signal (±2 Vpk for 100% AM). When AM is set to PULSE, the amplifier's output (and therefore, the modulator) is switched on and off by the input pulses.

Summing Amplifier (A26A4)

Transistors Q1, Q2, and Q3 form a Summing Amplifier. The output of Q3 is the amplified sum of the detector and reference currents and represents the output level error. Resistor R1 is adjusted to give the correct RF output voltage corresponding to the AGC reference. When the 512–1024 MHz RANGE is selected, relay K1 switches summing resistors R2 and R5 into the summing line to adjust for the doubler amplitude characteristic. Pot R54 adjusts offset of the doubler detector to match the offset of the microcircuit detector used on the lower ranges (Service Sheet 13A). Switch S1 allows the AGC circuits to be tested in an open-loop condition.

Modulator Driver Amplifier (A26A4)

Transistors Q4, Q5, and Q6 form the Modulator Driver Amplifier. R32 and C9 frequency-compensate the AGC system. Capacitor C10 is switched in parallel with C9 in the 0.5–1 and 1–2 MHz

SERVICE SHEET 12A (Option 002) (Cont'd)

ranges (called LO BAND 1) to give added compensation. The LO BAND 1 line is grounded in LO BAND 1 ranges and causes inverter U3B to go high and inverter U4F (an open collector output gate) to go low which switches in C10. In a similar manner capacitor C11 is switched in parallel with C9 in the 2–4 and 4–8 MHz ranges (called LO BAND 2). Transistor Q5 is a current source. Transistor Q6 is a constant current sink. The difference between the collector currents of Q5 and Q6 is the modulator drive current.

In the pulse modulation mode of operation, Q5 is switched on and off at the pulse repetition rate by transistor switch Q7 which is driven by the pulse Schmitt Trigger output of A26A2 (Service Sheet 13). When Q7 is on, Q5 and the modulator are off, (i.e., when either the MOD PULSE line is low or when the RF OFF line is low). Hot carrier diodes CR13 and CR14 prevent saturation of Q7 and Q6 for rapid switching. Capacitor C15 is switched in across the modulator drive line by gates U3C and U4E to lower the rise and fall time of the modulator in LO BAND 1 ranges to reduce RF ringing in the filters following the modulator. Similarly, capacitor C16 is switched in for LO BAND 2 ranges.

Pulse Overload Detector (A26A4)

In the pulse modulation mode, the peak detector in A26U1 (Service Sheet 13A) samples the RF output only when an input pulse is present; when no pulse is present, the detector output is stored on a capacitor. If the OUTPUT LEVEL vernier is reduced while in the pulse mode, the error voltage of the summing amplifier becomes very large and the modulator is turned off. The detector storage capacitor then discharges only during each pulse-on period until the error is zero. At low repetition rates and short on-periods, the capacitor discharge time is very long. To correct for this, Pulse Overload Detector U1B senses the condition of large error (i.e., when the collector voltage of Q3 exceeds +0.4 Vdc) and switches a discharge resistor on to bring the system to a near zero error condition.

Meter Amplifier (A26A4)

Amplifier U1A is an inverting amplifier with a gain of about −1.3 (adjusted by R12) which scales the detector output voltage to drive the metering circuits. Capacitor C8 filters any superimposed modulation signal on the detector output.

Modulator Overload Detector (A26A4)

If the OUTPUT LEVEL vernier setting or input modulation signal requires the output to exceed its maximum capability, Modulator Overload Detector U2 senses the condition and lights the REDUCE PEAK POWER annunciator A6DS3 (Service Sheet 16). The reference voltage is set by resistors R29, R30, and R31 and in addition by R28 when the 512–1024 MHz RANGE is selected.

SERVICE SHEET 12A (Option 002) (Cont'd)

When the output from the OUTPUT LEVEL vernier exceeds the reference, the output of U2 goes high and turns on Q9 and the annunciator. Since the overload condition may be of short duration, capacitor C13 holds the output of U2 high to keep the annunciator lighted for a longer period.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the AGC amplifier or the modulator as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter .... HP 3490A
Oscilloscope .... HP 180C/1801A/1820C

Initial Test Conditions

To test A26A4 AGC Amplifier Assembly, remove top cover (see Service Sheet G for removal procedure), and remove A26A4 and extend for service (see Service Sheet F for procedure).

To test A26A3 Modulator Assembly and A26U2 Modulator Preamplifier, remove bottom cover (see Service Sheet G for removal procedure) and remove A26 casting bottom cover (see Service Sheet F for procedure).

Initial Control Settings

Meter Function .... LEVEL
AM .... INT
MODULATION 100%
MODULATION FREQUENCY .... 1 kHz
FM .... OFF
RANGE .... 8–16 MHz
FREQUENCY TUNE .... 7.20 MHz
OUTPUT LEVEL Switch .... +10 dBm
OUTPUT LEVEL Vernier .... Fully cw
RF ON/OFF .... ON

SERVICE SHEET 12A (Option 002) (Cont'd)

AGC Amplifiers and Amplitude Modulator Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
SUMMING AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	≈ 800 mV p-p sine wave (1 kHz) at TP6 (CQ1)	Check Q1, Q2, Q3 and associated circuitry
MODULATOR DRIVER AMPLIFIER (A26A4)	Initial conditions and settings. Set AGC switch, S1, to AGC off position.	≈2 V p-p sine wave (1 kHz) at TP7 (DRVR) ≈8 Vp-p sine wave (1 kHz) at TP8 (MOD)	Check Q4 and associated circuitry Check Q5, Q6, Q7 and associated circuitry
	Set RANGE to 4–8 MHz (LO BAND 2)	≈ 7.2 Vp-p sine wave (1 kHz) at TP8 (MOD)	Check U3A, U3D, U4B, U4D, and associated circuitry
	Set RANGE to 1–2 MHz (LO BAND 2)	≈6 Vp-p sine wave (1 kHz) at TP8 (MOD)	Check U3B, U3C, U4E, U4F and associated circuitry
MODULATOR PREAMPLIFIER (A26U2)	Initial conditions and settings (AGC switch, A26A4S1, set to AGC on position).	>−5 dBm (>125 mVrms into 50Ω) at AUX RF OUTPUT jack on rear panel	Check A26U2 and associated circuitry
METER AMPLIFIER (A26A4)	Initial conditions and settings	Panel meter indicates +10 dBm (707 mV)	Check U1A and associated circuitry
MODULATION OVERLOAD DETECTOR (A26A4)	Initial conditions and settings	REDUCE PEAK POWER annunciator unlighted	Check U2, Q8, Q9, and associated circuitry
	Set OUTPUT LEVEL switch one step cw	REDUCE PEAK POWER annunciator lighted **NOTE** *Annunciator should be off at +19 dBm RF output and on at +20 dBm output.*	
PULSE OVERLOAD DETECTOR (A26A4)	Initial conditions and settings except set AM to OFF **CAUTION** *Check that OUTPUT LEVEL switch is set one step ccw from full cw.*	≈ +9V at TP3 (OVLD)	Check U1B and associated circuitry
	Short TP5 (GND) to TP4 (VERN)	≈0 Vdc at TP3 (OVLD)	

A26A3 ASSEMBLY

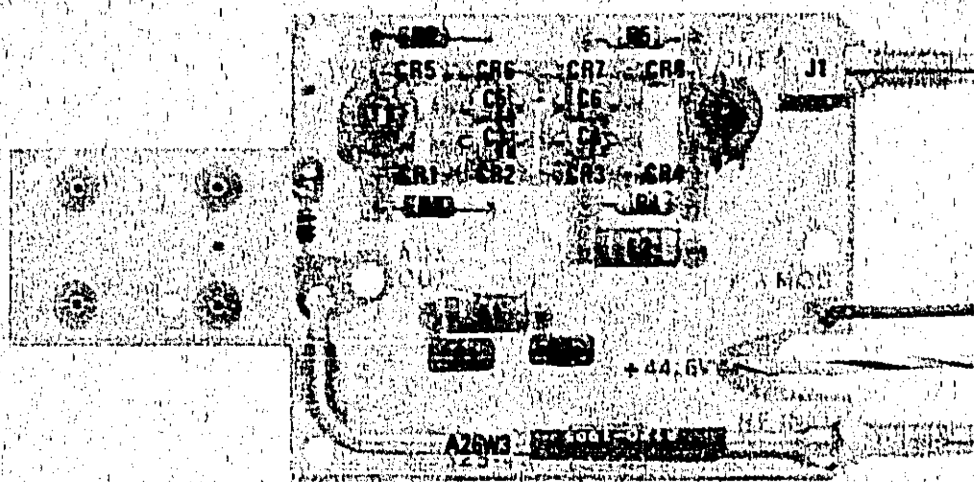


Figure 8-41. A26A3 Modulator Assembly Component Locations

A26A4 ASSEMBLY (OPTION 002)

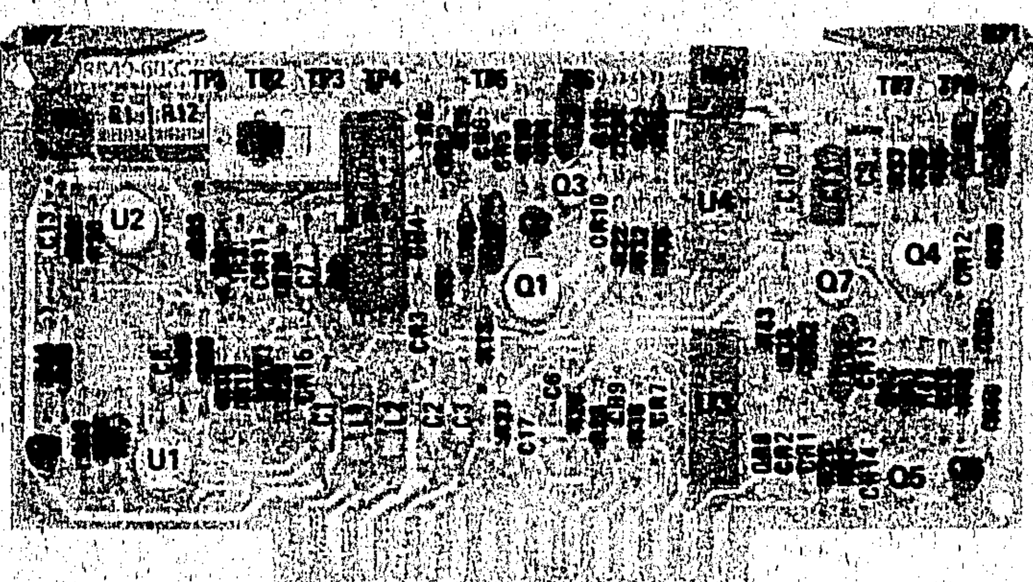


Figure 8-42. A26A4 AGC Amplifier Assembly Component Locations (Option 002)

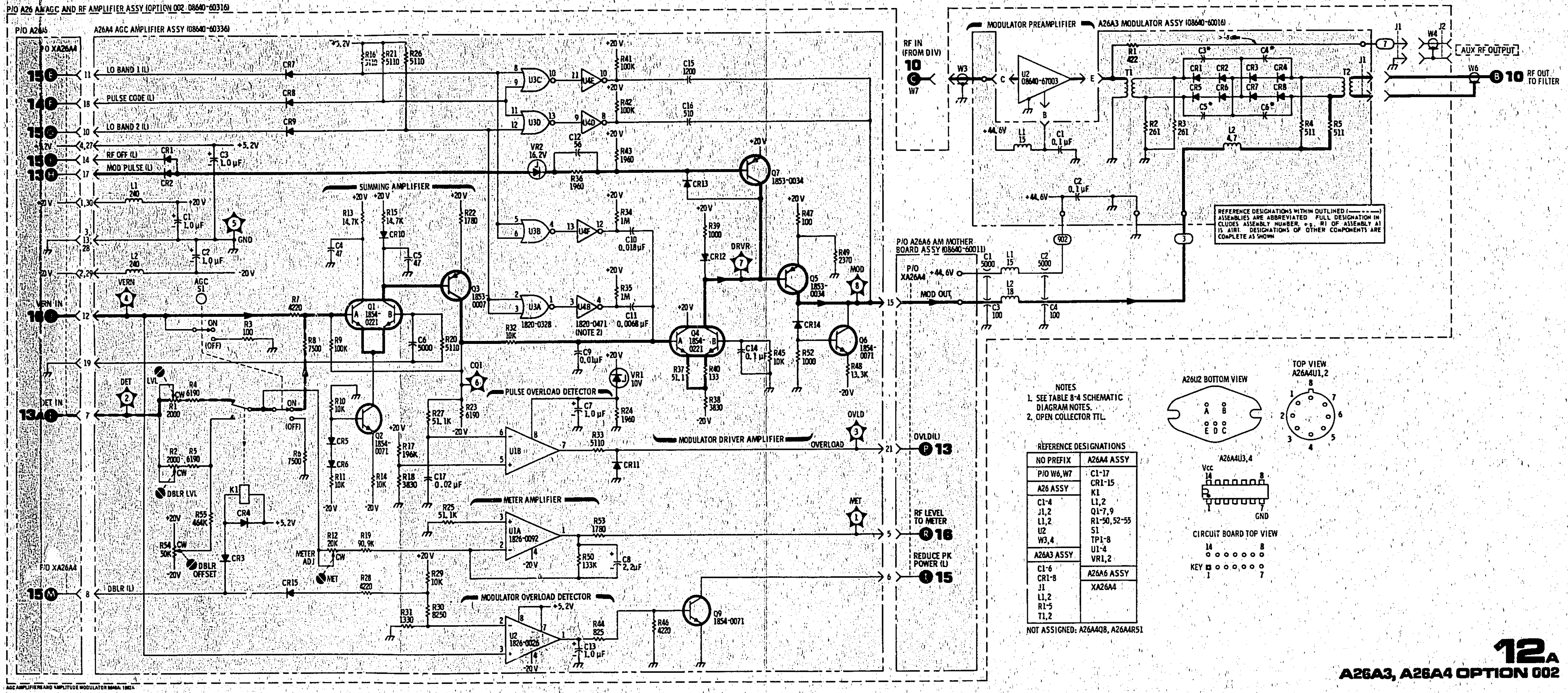


Figure 8-43. AGC Amplifiers and Amplitude Modulator (Option 002) Schematic Diagram

SERVICE SHEET 13

PRINCIPLES OF OPERATION

General

This Service Sheet documents instruments without the internal doubler (Option 002). The RF signal from the RF Filters is amplified by RF Output Amplifier A26U1. The amplifier, a sealed microcircuit, drives the Output Attenuator. The step attenuator consists of resistive attenuator sections which are switched in and out by cam driven microswitches. The attenuator steps are 10 dB.

AGC Detector (A26U1)

The AGC detector CR1 detects the negative peaks of the RF signal from the Output Amplifier. The detector output is summed with the positive AGC reference voltage in the Summing Amplifier (Service Sheet 12). Detector diode CR1 conducts whenever the RF amplifier output is one diode junction voltage drop below the voltage across C3. The capacitor is then negatively charged until the amplifier voltage rises, at which time CR1 shuts off. C3 then slowly discharges through resistors A26A1R22 and R23 until another negative peak recharges it.

AM Bandwidth Control (A26A1)

In the 2–4 and 4–8 MHz (or LO BAND 2) frequency ranges, capacitor C5 is switched in parallel with A26U1C3 by Q7. Transistor Q7 is a switch which operates in the inverted mode (i.e., the emitter functions as a collector and the collector as an emitter). The added capacitance of C5 reduces the amount of capacitor discharge between RF voltage peaks on the lower frequency ranges, but limits the AM bandwidth. Capacitor C4 is also switched in for 0.5–1 and 1–2 MHz (or LO BAND 1) ranges by Q6.

In the pulse modulation mode Q5, Q8, and Q9 are switched on. This switches out C4 and C5 and switches C6 in. Switching of Q5–Q9 is multiplexed onto one line by transistors A26A2Q8 and Q9. A26A2Q8 is a switchable current source. In LOW BAND 2 it generates just enough current to turn on the collector-base junction of Q7. In LOW BAND 1 the current increases enough to turn on both Q6 and Q7 (because the voltage drop across R4 is enough to turn on zener diode VR2). When the PULSE CODE line is low, A26A2Q9 is on which turns on Q5. Q8 and Q9 through zener diode VR1.

Sample and Hold (A26A1)

The Schmitt Trigger (A26A2) and Q4 bias FET Q3 (normally biased on) off between pulses, which prevents C6 from discharging. (If C6 were to discharge between pulse bursts, the Modulator would be driven to maximum output when the next pulse arrived.)

SERVICE SHEET 13 (Cont'd)

Schmitt Trigger (A26A2)

The Schmitt Trigger formed by U1 and U2A converts the pulse input voltage into TTL pulses. When the PULSE CODE line is low, the Schmitt Trigger output is enabled at U2C. Resistors R20 and R21 set the trigger reference at about 0.5 Vdc. When the input to U1 is above the reference, the output of U2A is low. When the input goes below the reference, the output of U2A goes high (+5V). Resistor R23 adds a small amount of hysteresis to the reference voltage.

In the pulse modulation mode, NAND gate U2C inverts the trigger output and switches transistors A26A1Q4 and Q3 on when the input pulse is high, or off when the input pulse is low. Thus the charge on capacitor A26A1C6 is stored between pulses. Similarly, NAND gate U2D inverts the trigger output and switches the Modulator Driver Amplifier A26A4 (Service Sheet 12).

Detector Buffer Amplifier (A26A1)

Transistor Q1 and FET Q2 form a high impedance, unity gain buffer amplifier. Diode CR6 and resistor R19 add a dc offset which compensates for the junction voltage drop of the detector diode to maintain constant % AM when OUTPUT LEVEL vernier is varied.

Rate Detector (A26A2)

Flip-flops U3A and U3B form a rate detector to turn off the RF level drive to the meter circuits whenever the pulse repetition rate falls below 20 Hz. Below 20 Hz rates, the output leveling system cannot accurately control the output amplitude. The flip-flops are arranged as retriggerable monostable (one-shot) multivibrators with timing elements R25 and C10, and R28 and C11. A low-going output from U2A triggers U3A and the $\overline{Q}$ output of U3A goes low for 50 ms. If the repetition rate of the incoming pulses is higher than 20 Hz, U3A retriggers and the $\overline{Q}$ output remains low. In the absence of pulses from the $\overline{Q}$ output of U3A, the Q output of U3B is low, transistor Q7 is off, and the meter operates normally. For pulse repetition rates less than 20 Hz, U3B is periodically triggered by the $\overline{Q}$ output of U3A. The Q output of U3B goes high for 100 ms (or longer if U3B is retriggered by U3A) and turns on Q7 which disables the meter drive amplifier output, and the meter reads zero. Thus the meter is turned off for low rate pulses. When not in the pulse modulation mode, the output of inverter U2B is low; the output of U2C is high and A26A1Q4 and Q3 are held on; the output of U2D is high and the modulator is held in its normal on mode; and Q7 is held off.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the power amplifier and AGC detector or to the AM offset and pulse switching circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter .... HP 3490A
Oscilloscope .... HP 180C/1801A/1820C
Pulse Generator .... HP 8003A
Power Meter .... HP 435A
Power Sensor .... HP 8482A

Initial Test Conditions

To test A26A2 AM Offset and Pulse Switching Assembly, remove top cover (see Service Sheet G for removal procedure) and remove A26A2 and extend for service (see Service Sheet F for procedure).

To test A26U1 Output Amplifier and A26A1 AGC Detector Assembly, remove bottom cover (see Service Sheet G for removal procedure) and remove A26 casting bottom cover (see Service Sheet F for procedure).

Connect the pulse generator to AM INPUT. Set the pulse generator for a repetition rate of 20 Hz, a pulse width of 25 ms, and an amplitude of 1V.

Initial Control Settings

Meter Function .... LEVEL
AM .... OFF
MODULATION .... Fully cw
MODULATION FREQUENCY .... 1 kHz
FM .... OFF
RANGE .... 8–16 MHz
FREQUENCY TUNE .... 7.20 MHz
OUTPUT LEVEL .... +19 dBm
RF ON/OFF .... ON

NOTE

If pulse burst amplitude is too high for low-duty cycle pulses, check A26A1Q3, Q2, C6, and interconnecting lines for dc current leakage.

AGC Amplifiers and Amplitude Modulator
(Option 002) (A26A3, A26A4)
SERVICE SHEET 12A

SERVICE SHEET 13 (Cont'd)

RF Amplifier, Pulse Switching and Step Attenuator Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
OUTPUT AMPLIFIER (A26U1)	Initial conditions and settings (+19 dBm output). Connect power meter and sensor to RF OUTPUT.	+19 dBm at RF OUTPUT	Check A26U1 and associated circuitry
	Set AGC switch (A26A4S1) to AGC off. Adjust OUTPUT LEVEL vernier for +13 dBm at RF OUTPUT.	≈ −2 Vdc at TP2 (A26A1Q6-G1)	
DETECTOR BUFFER AMPLIFIER (A26A1)	As above	≈ −3 Vdc at TP1 (DET)	Check Q1, Q2, and associated circuitry
SCHMITT TRIGGER (A26A2)	Initial conditions and settings except set AM to PULSE (AGC switch, A26A4S1, set to AGC on position).	≈ 5V pulse at TP6 (MOD PUL) and ≈ 4V pulse at TP5 (DET PUL)	Check A26A2U1, U2, and associated circuitry
RATE DETECTOR (A26A2)	Initial conditions and settings except set AM to PULSE	Panel meter reads normal (+19 dBm)	Check A26A2U3, Q7, and associated circuitry
	Set pulse generator pulse repetition rate to 15 Hz	Panel meter reads approximately zero	
BW CONTROL (A26A2)	Initial conditions and settings	<+1V at TP8 (BW)	Check A26A2Q8, Q9, and associated circuitry
	Set RANGE to 4–8 MHz	≈ +5V at TP8 (BW)	
	Set RANGE to 1–2 MHz	≈ +12V at TP8 (BW)	
	Set AM to PULSE	≈ +19V at TP8 (BW)	
BW CONTROL (A26A1)	Initial conditions and settings except set AM to INT	Same signal level on both sides of C4 and C5	————
	Set RANGE to 4–8 MHz	Signal level differs from C5 (i.e., no signal at Q7-e)	Check C5, Q7, Q9 and associated circuitry
	Set RANGE to 1–2 MHz	Signal level differs across C4 (i.e., no signal at Q6-e)	Check C4, Q6, Q8, VR2 and associated circuitry
	Set AM to PULSE	Signal level differs across C6 (i.e., no signal at Q5-e)	Check Q5-9, VR1, and associated circuitry

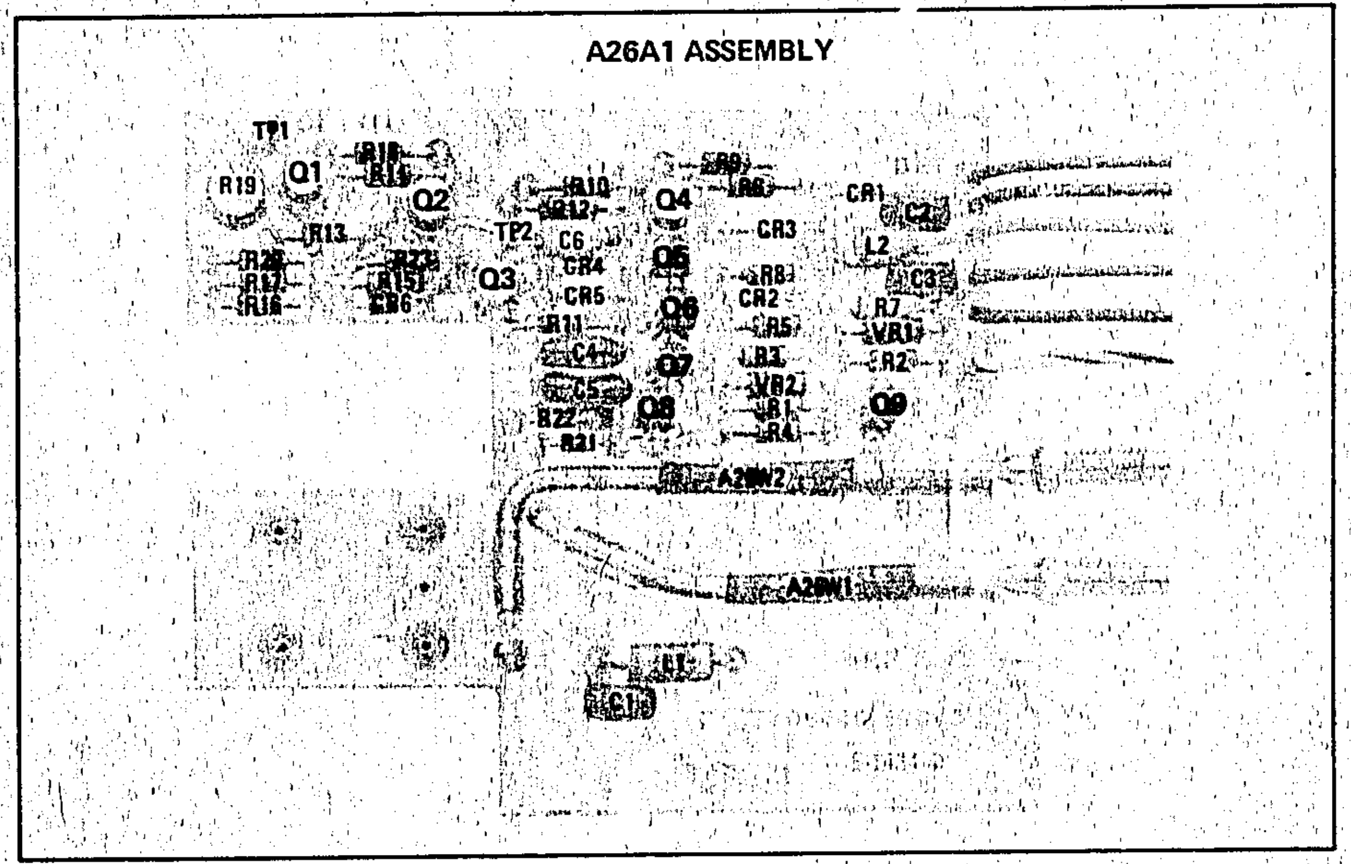


Figure 8-44. A26A1 Power Amplifier and AGC Detector Assembly Component Locations

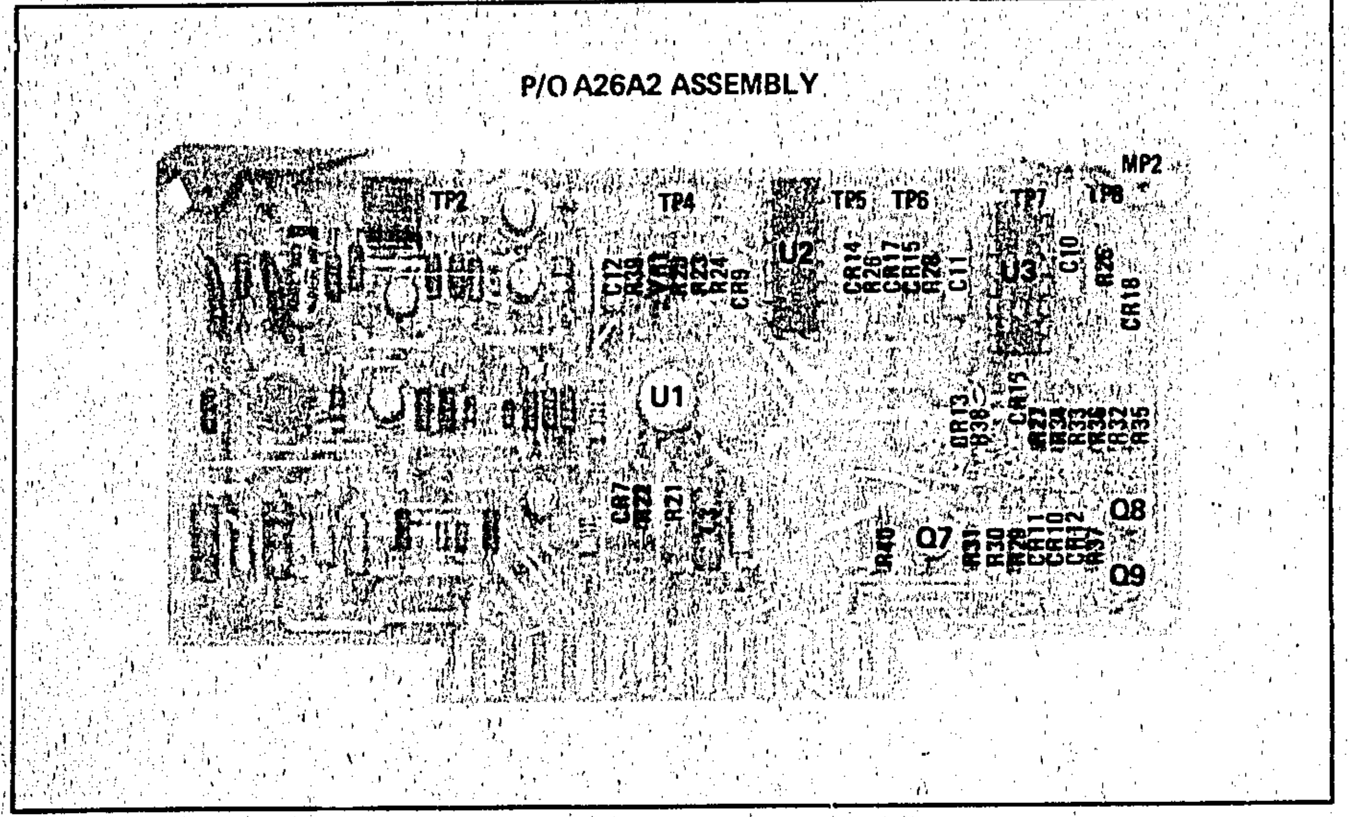
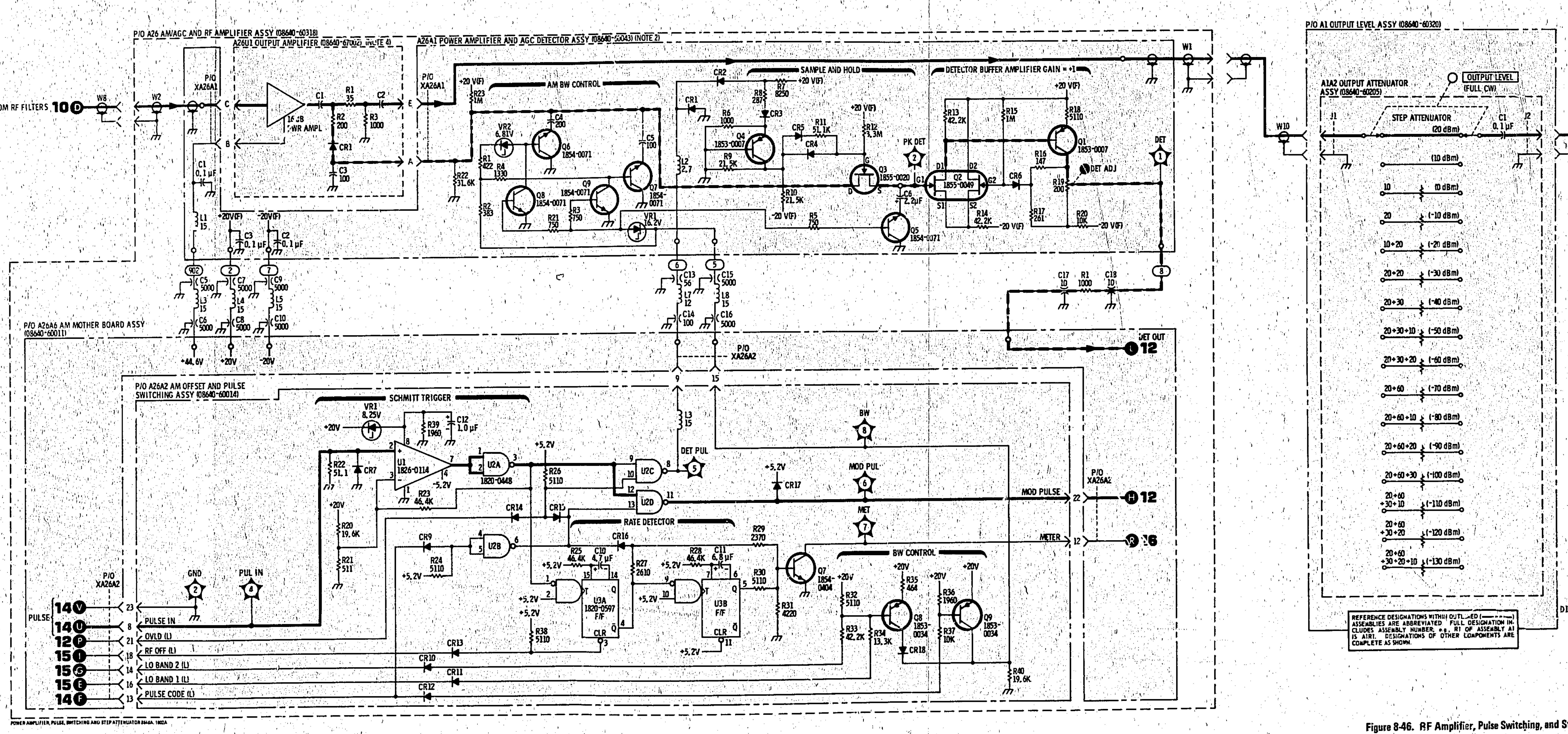
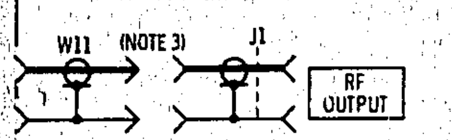


Figure 8-45. P/O A26A2 AM Offset and Pulse Switching Assembly Component Locations





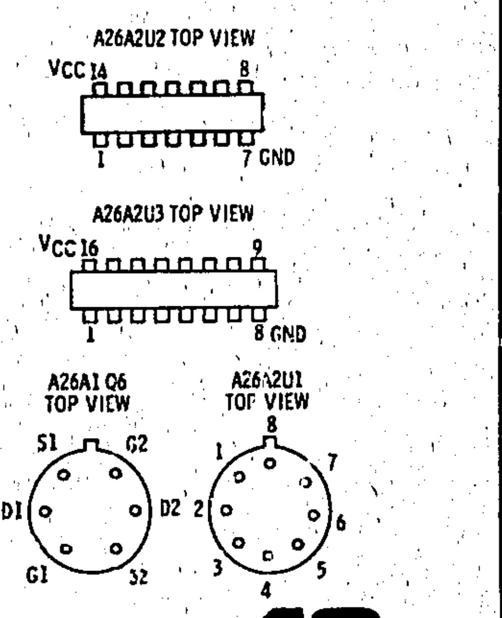
NOTES

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.
2. IF OPTION 002 IS INSTALLED REFER TO SERVICE SHEET 13A.
3. IF OPTION 003 IS INSTALLED REFER TO SERVICE SHEET 13B.
4. SEE SERVICE SHEET 12 FOR A26U1 PIN ASSIGNMENTS.

REFERENCE DESIGNATIONS

NO PREFIX	A26A1 ASSY
J1 W8, 10, 11	C1-6 CR7, 9-18 L1, 2 Q1-9 R1-23 TP1, 2 VR1, 2 XA26U1
A1A2 ASSY	
C1 J1, 2	
A26 ASSY	**A26A2 ASSY**
C5-10, 13-18 L3-5, 7, 8 R1 U1 W1, 2	C10-12 CR7, 9-18 L3 Q7-9 R20-40 TP2, 4-8 U1-3 VR1

NOT ASSIGNED: A26C11, 12; A26L6; A26A2C9; A26A2CR5, 6, 9.



13

A1, A26A1
A26A2

Figure 8-46. RF Amplifier, Pulse Switching, and Step Attenuators Schematic Diagram

SERVICE SHEET 13A (Option 002)

PRINCIPLES OF OPERATION

General

This Service Sheet documents instruments with the internal doubler (Option 002). The RF Signal from the RF Filters is amplified by Output Amplifier A26U1. The amplifier is a sealed microcircuit; it drives either the Output Attenuator via A26A1W1 and FL1, or the doubler circuits when the generator RANGE switch is set to 512—1024 MHz. FL1 prevents harmonics above 1120 MHz, which would not otherwise be effectively attenuated, from reaching the Output Attenuator. The step attenuator consists of resistive attenuator sections which are switched in and out by cam driven microswitches. The attenuator steps are 10 dB.

Passive Doubler (A26A1)

When the generator RANGE switch is set to 512—1024 MHz, relays K1 and K2 are energized. K1A switches the RF signal from the Output Amplifier to the doubler circuits. T1 matches the unbalanced signal path from the Output Amplifier to the balanced input of the bridge rectifier. Diodes CR1 to CR4 form the full wave rectifier which doubles the frequency of the input signal.

Doubler Amplifier (A26A1)

Transistors Q1 and Q2 amplify the RF signal approximately 10 dB (to restore signal amplitude lost in the Passive Doubler). Q3 provides active current bias to Q1. When the collector voltage of Q1 varies it is sensed at the emitter of Q3, causing the current through Q3 to vary. This changes the base current through Q1 to return Q1 to its original conducting state. Q4 controls the bias of Q2 in the same manner. Capacitor C9 functions with inductor L5 to adjust the flatness of the amplifier over the doubler frequency range. K2 switches the output of the doubler amplifier to the Output Attenuator. Diode CR5, capacitors C13, C20, and C21, and resistor R9 function as the AGC negative peak detector for the doubler range.

AGC Detector (A26A1)

In all ranges except 512—1024 MHz, the AGC detector A26U1CR1 detects the negative peaks of the RF signal from the Output Amplifier. The detector output is summed with the positive AGC reference voltage in the Summing Amplifier (Service Sheet 12A). Detector diode A26U1CR1 conducts whenever the RF amplifier output is one diode junction voltage drop below the voltage across A26U1C3. The capacitor is then negatively charged until the amplifier voltage rises, at which time A26U1CR1 shuts off. A26U1C3 then slowly discharges through resistors R12 and R13 until another negative peak recharges it. In the 512—1024 MHz range, K1B switches out A26U1CR1 and switches CR5 in. CR5, C13, C20, and C21 then function as the AGC detector in the same manner as described above.

SERVICE SHEET 13A (Option 002) (Cont'd)

Bandwidth Control (A26A1)

In the 2—4 and 4—8 MHz (or LO BAND 2) frequency ranges, capacitor C16 is switched in parallel with A26U1C3 by Q8. Transistor Q8 is a switch which operates in the inverted mode (i.e., the emitter functions as a collector and the collector as an emitter). The added capacitance of C16 reduces the amount of capacitor discharge between RF voltage peaks on the lower frequency ranges but limits the AM bandwidth. Capacitor C15 is also switched in for the 0.5—1 and 1—2 MHz (or LO BAND 1) ranges by Q6.

In the pulse modulation mode Q5, Q7, and Q11 are switched on. This switches out C15 and C16 and switches C17 in. Switching of Q5-Q8 and Q11 is multiplexed onto one line by the BW control circuit (A26A2). BW Control is a switchable current source (see Service Sheet 13 for details). In LOW BAND 2 it generates just enough current to turn on the collector-base junction of Q8. In LOW BAND 1 the current increases enough to turn on both Q6 and Q8 (because the voltage drop across R18 is enough to turn on zener diode VR2). When the PULSE CODE line is low, the BW Control turns on Q5, Q7 and Q11.

Sample and Hold (A26A1)

The Schmitt Trigger (A26A2) and Q9 bias FET Q10 (normally biased on) off between pulses, which prevents C17 from discharging. (If C17 were to discharge between pulse bursts, the Modulator would be driven to maximum output when the next pulse arrived).

When the PULSE CODE line is low, the Schmitt Trigger is enabled (see Service Sheet 12 for details). The Schmitt Trigger converts the pulse input voltage to TTL pulses. In the pulse modulation mode the Schmitt Trigger switches transistors Q9 and Q10 on when the input pulse is high, or off when the input pulse is low. Thus the charge on capacitor C17 is stored between pulses.

Detector Buffer Amplifier (A26A1)

Transistor Q13 and FET Q12 form a high impedance, unity gain buffer amplifier. Diode CR12 and resistor R34 add a dc offset which compensates for the junction voltage drop of the detector diode to maintain constant % AM when OUTPUT LEVEL vernier is varied.

TROUBLESHOOTING

It is assumed that a problem has been isolated to the output amplifier, doubler, and AGC detector circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

SERVICE SHEET 13A (Option 002) (Cont'd)

Test Equipment

Digital Voltmeter .... HP 3490A
Oscilloscope ....HP 180C/1801A/1820C
Pulse Generator.............................. HP 8003A
Power Meter .... HP 435A
Power Sensor................................. HP 8482A
Spectrum Analyzer .... HP 8554B/8553B/141T

Initial Test Conditions

To test A26U1 Output Amplifier and A26A1 AGC Detector Assembly, remove bottom cover (see Service Sheet G for removal procedure) and remove A26 casting bottom cover (see Service Sheet F for procedure).

Connect the pulse generator to AM INPUT. Set the pulse generator for a repetition rate of 20 Hz, a pulse width of 25 ms, and an amplitude of 1V.

Spectrum analyzer waveforms shown in the table are typical for frequencies (F) within the doubler range. (F is shown at 800 MHz). Level F should be as displayed, ±3 dB. Level 1/2F should be >20 dB below F. Set spectrum analyzer frequency span per division (scan width) to 200 MHz, 10 dB per division with a 0 dBm reference level.

NOTE

When taking readings within the doubler amplifier use a cable assembly, blocking capacitor, voltage divider, and ground clip (such as those suggested in Table 1-3 and shown in Figure 8-47). This will produce a measureable signal without loading the circuit excessively.

Initial Control Settings

Meter Function.....................................LEVEL
AM ....OFF
MODULATION......................................Fully cw
MODULATION FREQUENCY...........................1 kHz
FM ....OFF
RANGE.. 8—16 MHz
FREQUENCY TUNE ....7.20 MHz
OUTPUT LEVEL .... +13 dBm
RF ON/OFF ....ON

NOTE

If pulse burst amplitude is too high for low-duty cycle pulses, check A26A1Q12, Q10, C17, and interconnecting lines for dc current leakage.

AGC Detector and Pulse Switching Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
OUTPUT AMPLIFIER (A26U1)	Initial conditions and settings (+13 dBm output). Connect power meter and sensor to RF OUTPUT.	+13 dBm at RF OUTPUT	Check A26U1, A26A1Q10 and associated circuitry
	Set AGC switch (A26A4S1) to AGC off. Adjust OUTPUT LEVEL vernier for +10 dBm at RF OUTPUT.	≈ −3 Vdc at TP2 (A26A1Q12-G1)	————
DETECTOR BUFFER AMPLIFIER (A26A1)	As above	≈−3 Vdc at TP1 (DET)	Check Q12, Q13 and associated circuitry
BW CONTROL (A26A1)	Initial conditions and settings except set AM to INT	Same signal level on both sides of C15 and C16	————
	Set RANGE to 4—8 MHz	Signal level differs across C16 (i.e., no signal at Q8-e)	Check C16, Q7, Q8 and associated circuitry
	Set RANGE to 1—2 MHz	Signal level differs across C15 (i.e., no signal at Q6-e)	Check C15, Q5, Q6, VR2 and associated circuitry
	Set AM to PULSE	Signal level differs across C17 (i.e., no signal at Q11-e)	Check Q5—8, Q11, VR1, and associated circuitry

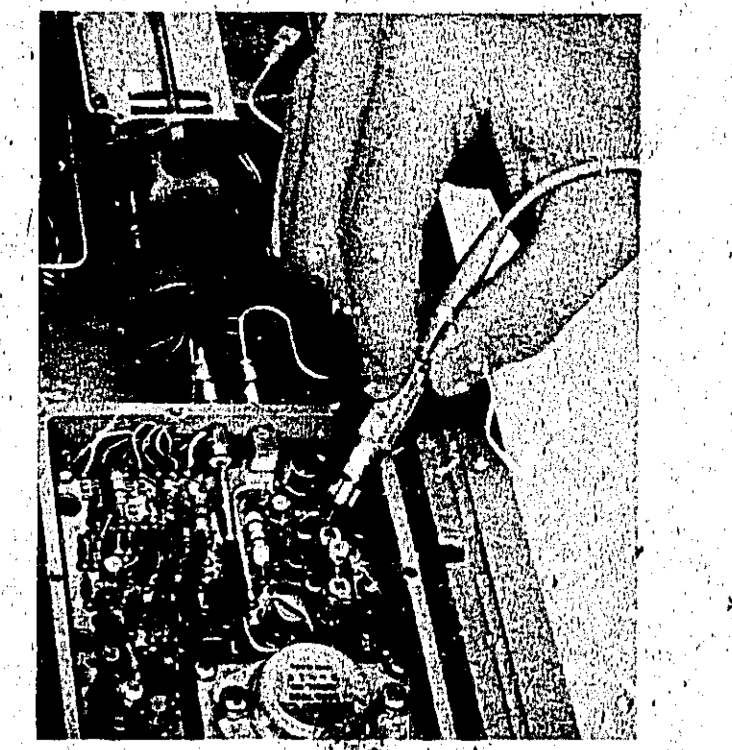
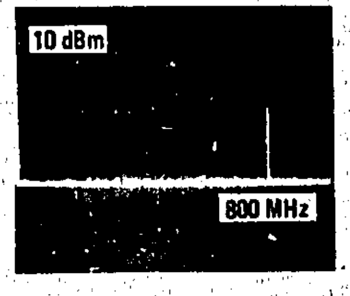
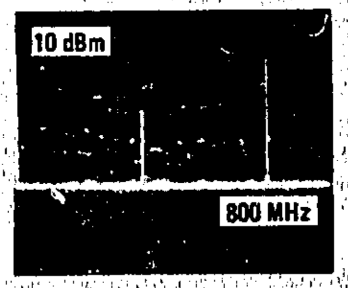
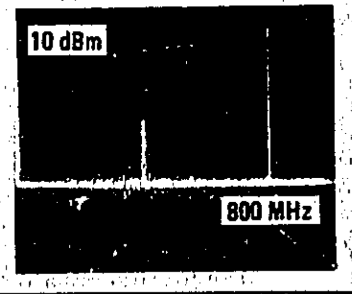


Figure 8-47. Troubleshooting Probe for use within Doubler Amplifier (Option 002)

Doubler Amplifier Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
DOUBLER AMPLIFIER (A26A1)	Initial conditions and settings except set RANGE to 512—1024 MHz, FREQUENCY TUNE to 800 MHz, and OUTPUT LEVEL to −7 dBm. Test probe at Q1-b.		Check passive doubler Q1, and associated circuitry
	Same as above except test probe at Q1-c.		Check Q1 and associated circuitry
	Same as above except test probe at Q2-c.		Check Q2 and associated circuitry

A26A1 ASSEMBLY (OPTION 002)

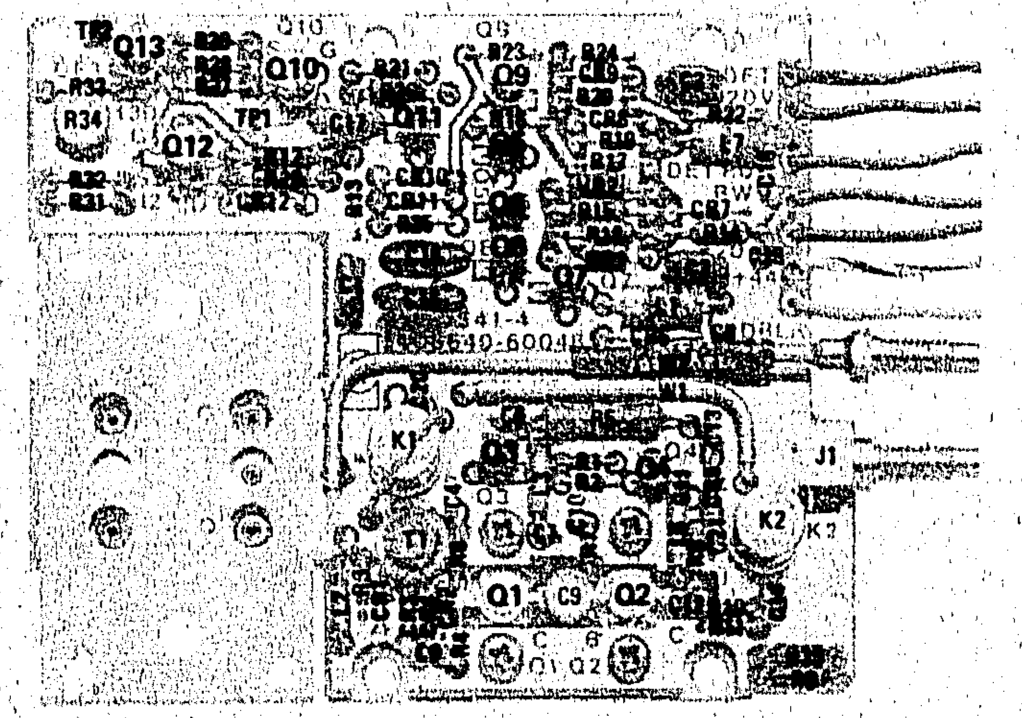


Figure 8-48. A26A1 Output Amplifier, Doubler, and AGC Detector Assembly Component Locations (Option 002)

A26A2

Component Locations for A26A2 Assembly are on Service Sheet 13.

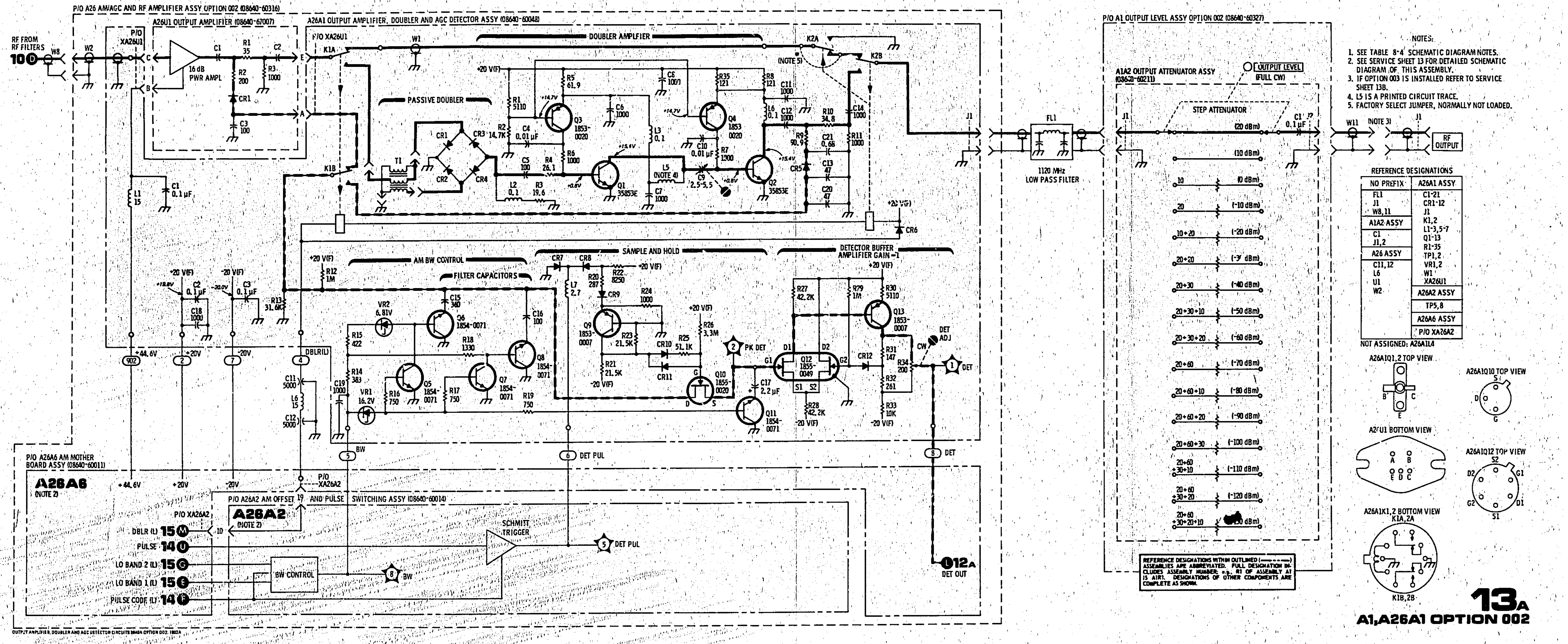


Figure 8-49. Output Amplifier, Doubler, and AGC Detector (Option 002) Schematic Diagram

SERVICE INFO

CON'T

SERVICE SHEET 13B (Option 003)

PRINCIPLES OF OPERATION

General

This Service Sheet documents instruments with reverse power protection (Option 003). The Reverse Power Protection circuit opens a relay contact in the RF signal path if excessive power is applied to the output jack A21J2 to prevent damage to the generator's output circuits. During the time required to open the relay (≈ 50 μs), the Limiter maintains a safe signal level at the output circuits of the generator. (With LINE switch set to OFF, the relay contacts are open.)

Detector (A21A1)

The Detector is a peak-to-peak detector which senses the RF level. The signal is first reduced by a capacitive voltage divider to protect the detector against large RF levels. It is formed by C10 and the parallel capacitances of C8, CR4, and CR2 with VR2. During negative excursions of the RF signal, current flows through CR4 and charges C10 to approximately Vpk/8. During positive excursions, the stored charge adds to the signal passed by C10 and passes through detector diode CR2. The detected output is stored in the parasitic capacitance of VR2. VR2 also protects the comparator by limiting the maximum signal applied to the comparator.

Level Sensor and Relay Driver (A21A1)

Normally, the RF output signal passes through relay K1 to the output jack A21J2. K1 is held closed by the action of the Detector, Level Sensor, and Relay Driver. Resistors R1 and R2 set a reference level at the non-inverting input of comparator U1. This reference level is more positive than the normal Detector voltage, so the comparator output is pulled high through resistor R7 (U1 is an open-collector output device requiring an external pull-up resistor). The high level on the base of transistor Q1 biases Q1 and Q2 on, thus energizing relay K1 (closed).

An increased signal level at A21J2 will cause an increased Detector ouput level. If the level from the Detector exceeds the reference level, the comparator output will switch low. (Resistor R4 provides hysteresis to the comparator input to prevent oscillations and ensure positive switching.) A low level on the base of Q1 will bias Q1 and Q2 off. Relay K1 will de-energize (open) when the collector current of Q2 stops flowing. Collector voltage of Q2 will approach source potential to drive transistor Q3 into conduction and supply approximately +4V at 50 mA to FL2. When the relay opens, capacitor C11 provides a discharge path for the current induced in the relay coil.

When reverse power is removed, the Detector voltage drops below the reference level. The comparator output starts rising toward its high state to close the relay. Capacitor C4 slows the

SERVICE SHEET 13B (Option 003) (Cont'd)

rate of change to decrease relay contact chatter if the reverse power signal is pulsed.

Limiter (A21A1)

The limiter clips any RF voltage imposed on it (from any direction) at approximaely 21.2V peak-to-peak as described below.

Assume a reverse power signal entering from RF Output. During the first incoming RF cycle, CR3 clips off any negative signal voltage lower than one diode junction drop. During the following half cycle, capacitors C2 and C6 store a charge that positively offsets the cathode of CR3. This has the effect of re-referencing the subsequent RF signal at CR3 so that its peak negative voltage occurs just one diode junction drop below ground. For example, a 5V p-p signal at J2 has excursions of ±2.5Vp. The re-referenced signal at CR3 will have a positive excursion of +4.4V and a negative excursion of −0.6V. During the second RF cycle, the anode of CR1 acquires a similar but negative offset. A re-referenced 5Vp-p signal at CR1 will have a positive excursion of +0.6V and a negative excursion of −4.4V. Once these offsets are established, the sum of the re-referenced in-phase RF signals across VR1 and VR3 is a dc voltage equal to the peak-to-peak RF voltage minus the two diode junction drops of CR1 and CR3. For the 5Vp-p signal, this voltage from CR1 anode to CR3 cathode, would be approximately +3.8 Vdc, insufficient to cause the zeners to conduct. When this dc voltage exceeds the sum of the breakdown voltages of VR1 and VR2, the limiter symmetrically clips the RF waveform. This occurs at RF inputs greater than 21.2Vp-p. Note that the limiter acts on RF from either direction, the generator or reverse power.

Capacitors C8, C9, and C10, inductors L1 and L2, and the parasitic capacitances of CR1 and CR3 form a low-pass filter to maintain level flatness of the output signal over the range of the generator. Capacitors C3, C5, and C7, and resistors R5, R8, and R9 prevent RF from entering the Relay Driver.

TROUBLESHOOTING

Troubleshoot the A21 assembly by using the test equipment and following the procedure listed below.

Test Equipment

Digital Voltmeter .... HP 3490A
Oscilloscope ....HP 180C/1801A/1820C
Test Oscillator..................... HP 200CD
50-Ohm Load .... HP 11593A

Limiter

1. With LINE set to OFF, connect test oscillator output to RF IN (FROM ATTEN), A21J1, through a coaxial tee. Connect other port of the tee to an oscilloscope.
2. Set test oscillator to 600 kHz with amplitude turned down. Set oscilloscope to display a 600 kHz signal with 10V per vertical division.
3. Increase test oscillator output level until clipping of the signal appears on oscilloscope. Amplitude of the clipped waveform should be 19 to 23 Vp-p.

Detector

1. With LINE set to OFF, disconnect output cable W11 and connect 50 ohm load to RF OUT (TO FRONT PANEL), A21J2.
2. Orient the Reverse Power Protection Assembly so that comparator A21U1 is accessible.
3. Set OUTPUT LEVEL to +19 dBm (not on 512—1024 MHz range, Option 002/003) and LINE to ON.
4. Observe dc voltage at pin 3 of A21U1 while adjusting OUTPUT LEVEL over full vernier ranges. The voltage should vary from approximately 50 to 250 mVdc.

Level Sensor, Relay Driver, and Indicator Driver

1. Short pin 2 of comparator A21U1 to ground. The Level Sensor, Relay Driver, and Indicator Driver circuits should switch to "relay-open" conditions (see appropriate dc voltages on schematic).

Output Amplifier, Doubler, and AGC Detector (Opt. 002) (A26A1)
◀ SERVICE SHEET 13A

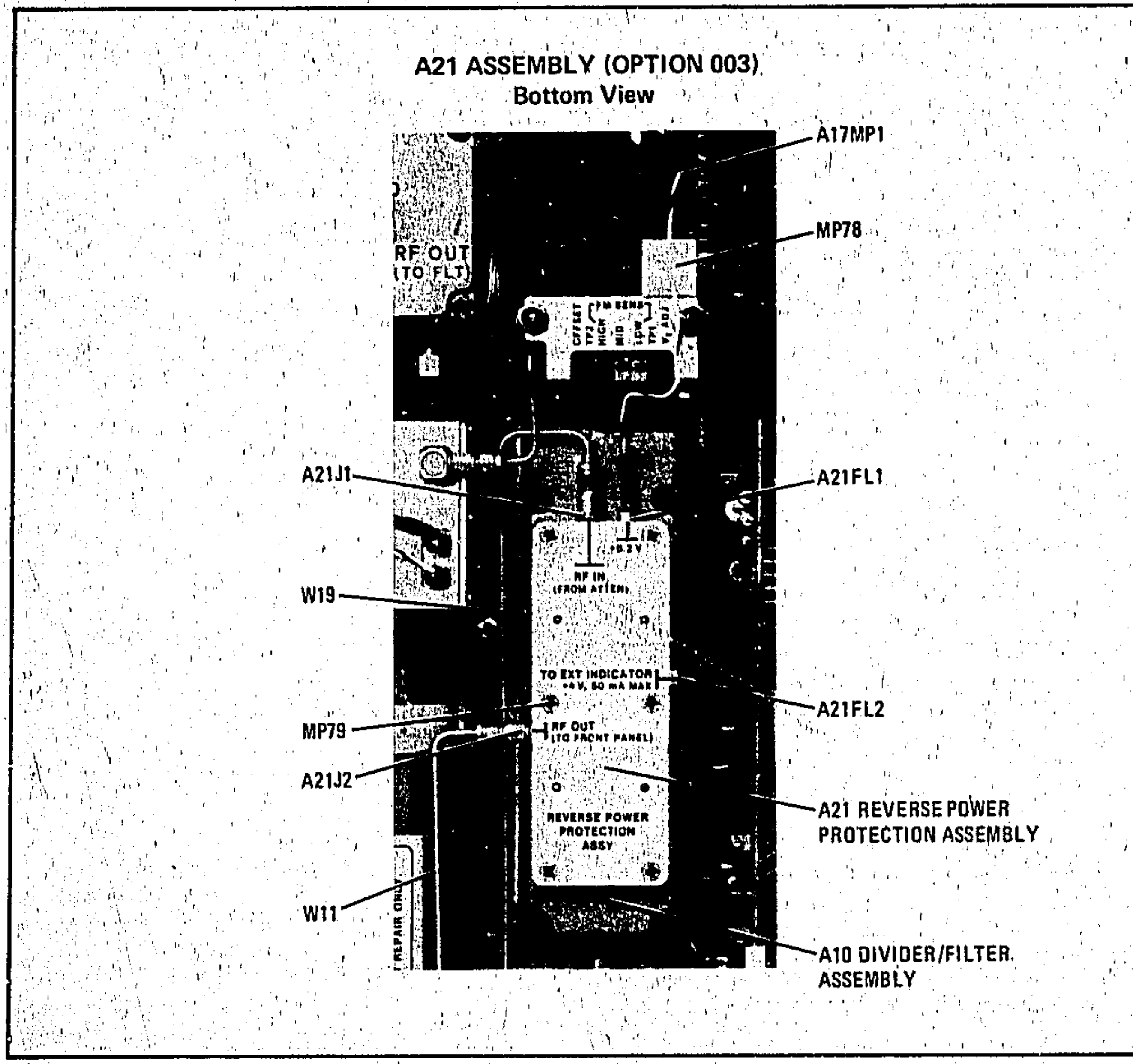


Figure 8-50. A21 Reverse Power Protection Assembly (Option 003) Bottom View

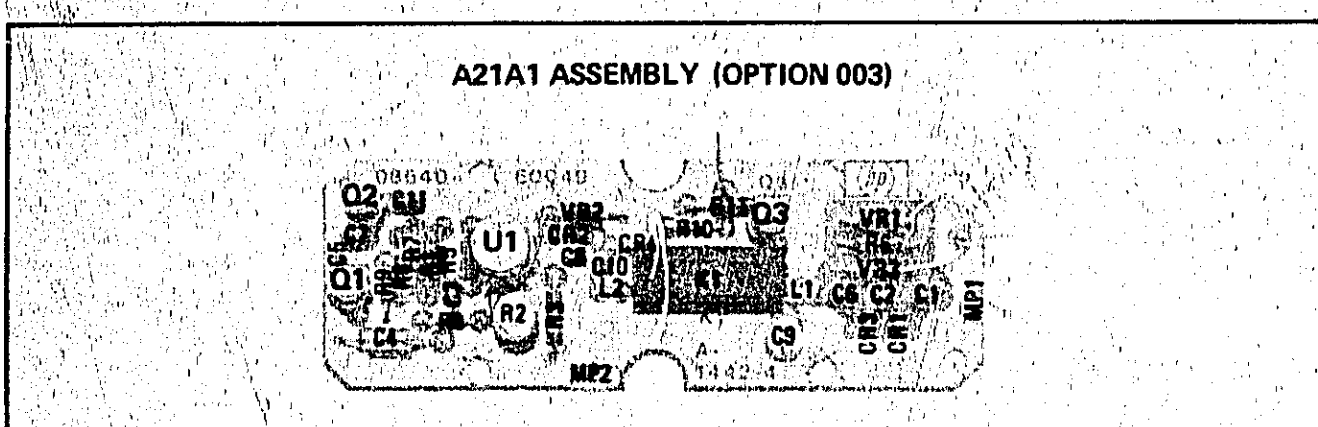
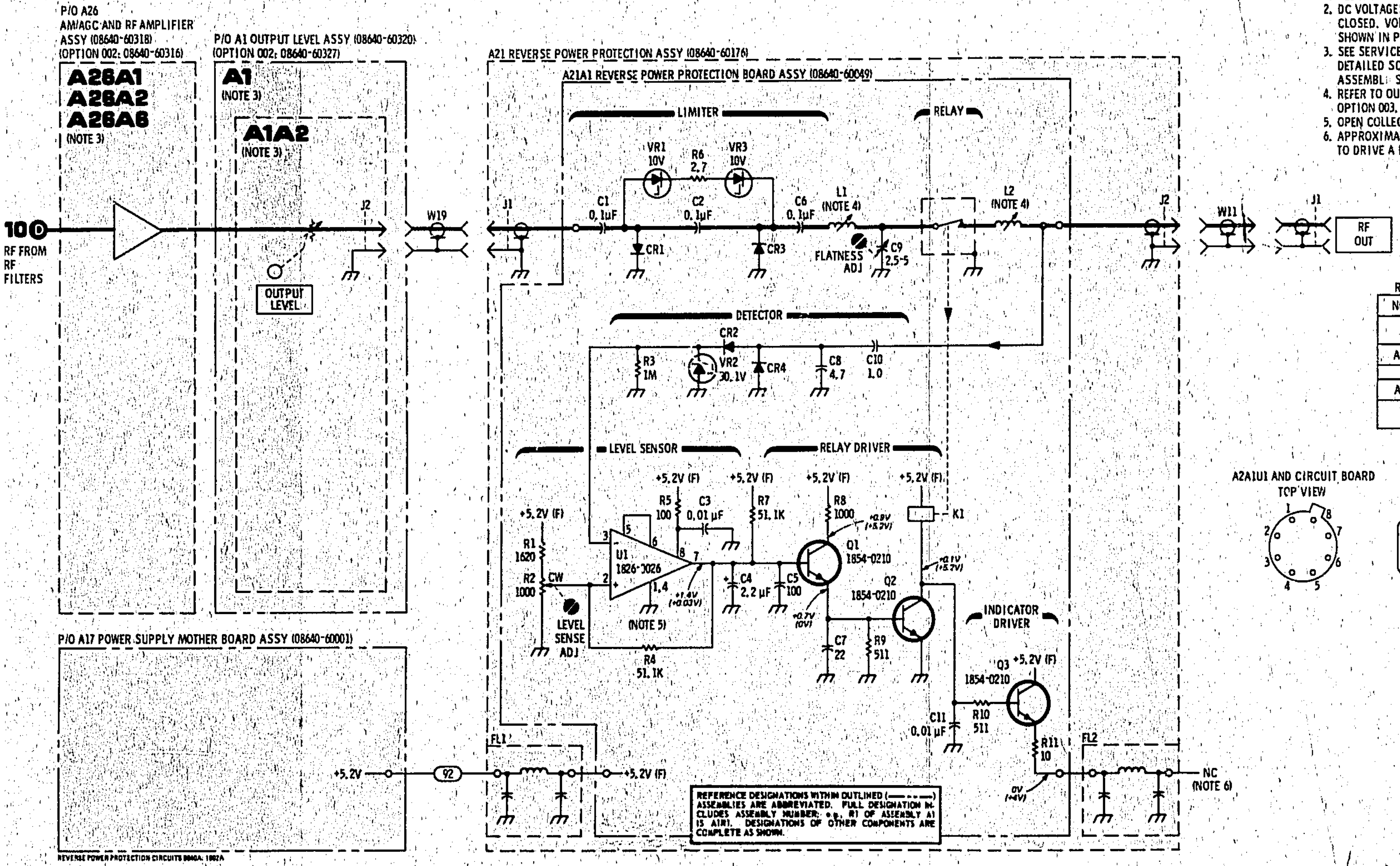


Figure 8-51. A21A1 Reverse Power Protection Board Assembly (Option 003) Component Locations

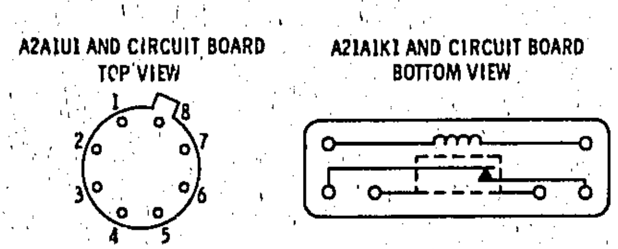
NOTES

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.
2. DC VOLTAGES ARE SHOWN FIRST FOR RELAY CLOSED. VOLTAGES FOR RELAY OPENED ARE SHOWN IN PARENTHESES.
3. SEE SERVICE SHEET 13 (13A) IN THE MANUAL FOR DETAILED SCHEMATIC DIAGRAMS OF THESE ASSEMBLIES.
4. REFER TO OUTPUT IMPEDANCE ADJUSTMENT, OPTION 003.
5. OPEN COLLECTOR OUTPUT.
6. APPROXIMATELY +4V AT 50 mA AVAILABLE TO DRIVE A PROTECTION INDICATOR CIRCUIT.



REFERENCE DESIGNATIONS

NO PREFIX	A21A1 ASSY
J1, W11, 19	C1-11 CR1-4 K1 L1, 2 Q1-3 R1-11 U1 VR1-3
A1A2 ASSY	
J2	
A21 ASSY	
FL 1, 2 J1, 2	



13B

A21 OPTION 003

Figure 8-52. Reverse Power Protection Assembly (Option 003) Schematic Diagram

SERVICE SHEET 14

PRINCIPLES OF OPERATION

AM Offset (A26A2)

The AM Offset Amplifier establishes the AGC reference for the output leveling system and superimposes the AM modulation signal on this reference. The modulation signal is coupled into the amplifier through slide switch A13S2C and MODULATION potentiometer R2. The amplifier input stage is the differential transistor pair Q1A and Q1B. Transistor Q2 is a constant current source for the emitters of Q1. Transistors Q3 and Q4 form a second differential amplifier stage. Transistor Q5 is a common emitter output stage. Resistors R16, R19, and R8 form a resistive feedback divider. The ac voltage gain (≈ +2) is adjusted by R19. Transistor Q6 is a constant source. The collector current of Q6 causes a 2V drop across R16 which offsets the amplifier output by +2 Vdc and establishes the AGC reference. Capacitors C5, C6, and C7 frequency compensate the amplifier. The amplifier output drives OUTPUT LEVEL vernier A1R1 (Service Sheet 16).

TROUBLESHOOTING

It is assumed that a problem has been isolated to the AM preamplifier as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter .... HP 3490A
Oscilloscope ....HP 180C/1801A/1820C

Initial Test Conditions

Top cover removed (see Service Sheet G for removal procedure), and A26A2 AM Offset and Pulse Switching Assembly extended for service (see Service Sheet F for procedures).

Initial Control Settings

Meter Function ....AM
AM ....INT
MODULATION.............................100%
MODULATION FREQUENCY............1 kHz

AM Preamplifier Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
AM PREAMPLIFIER (A26A2)	Initial conditions and settings	≈ 2 Vp-p at TP1 (AM IN)	Check input switching
		≈ 4 Vp-p and +2 Vdc at TP3 (AM OUT)	Check Q1-Q6 and associated circuitry

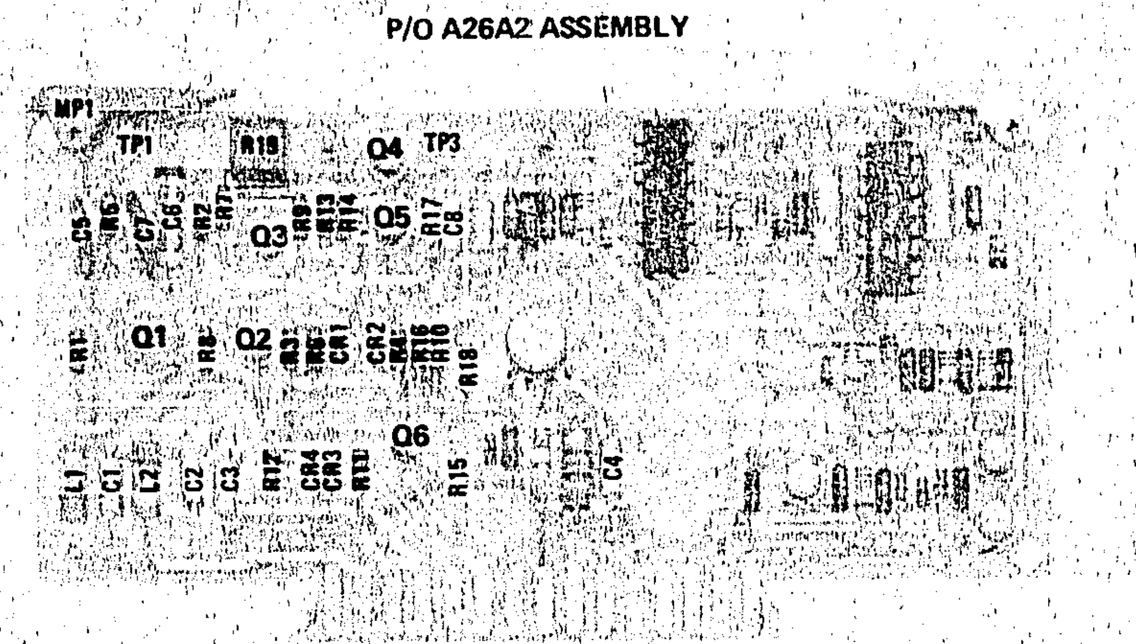
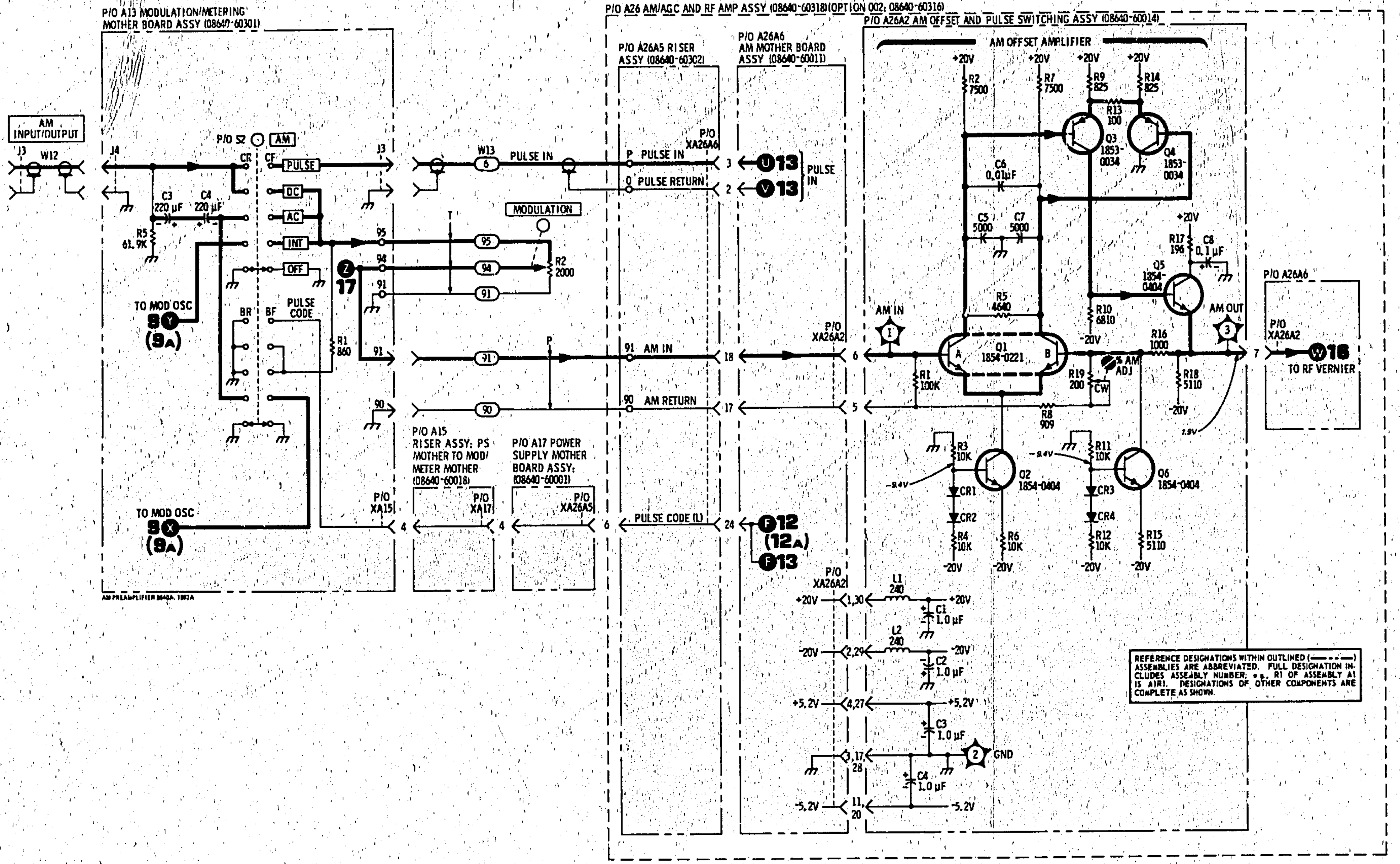


Figure 8-53. P/O A26A2 AM Offset and Pulse Switching Assembly Component Locations

A13

Component Locations for A13 Assembly are on Service Sheet 25.



NOTES:

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.

REFERENCE DESIGNATIONS

NO PREFIX	A26A2 ASSY
J3 R2 W12, 13	C1-8 CR1-4 L1,2 Q1-6 R1-19 TP1,3
A13 ASSY	A26A5 ASSY
C3,4 J3,4 R1,5 P/O S2 P/O XA15	P/O XA26A6
A15 ASSY	A26A6 ASSY
P/O XA17	P/O XA26A2
A17 ASSY	
P/O XA26A5	

NOT ASSIGNED: A26A2C9

14
A13, A26A2

Figure 8-54. AM Preamplifier Schematic Diagram

SERVICE SHEET 15

PRINCIPLES OF OPERATION

RF ON/OFF Switch

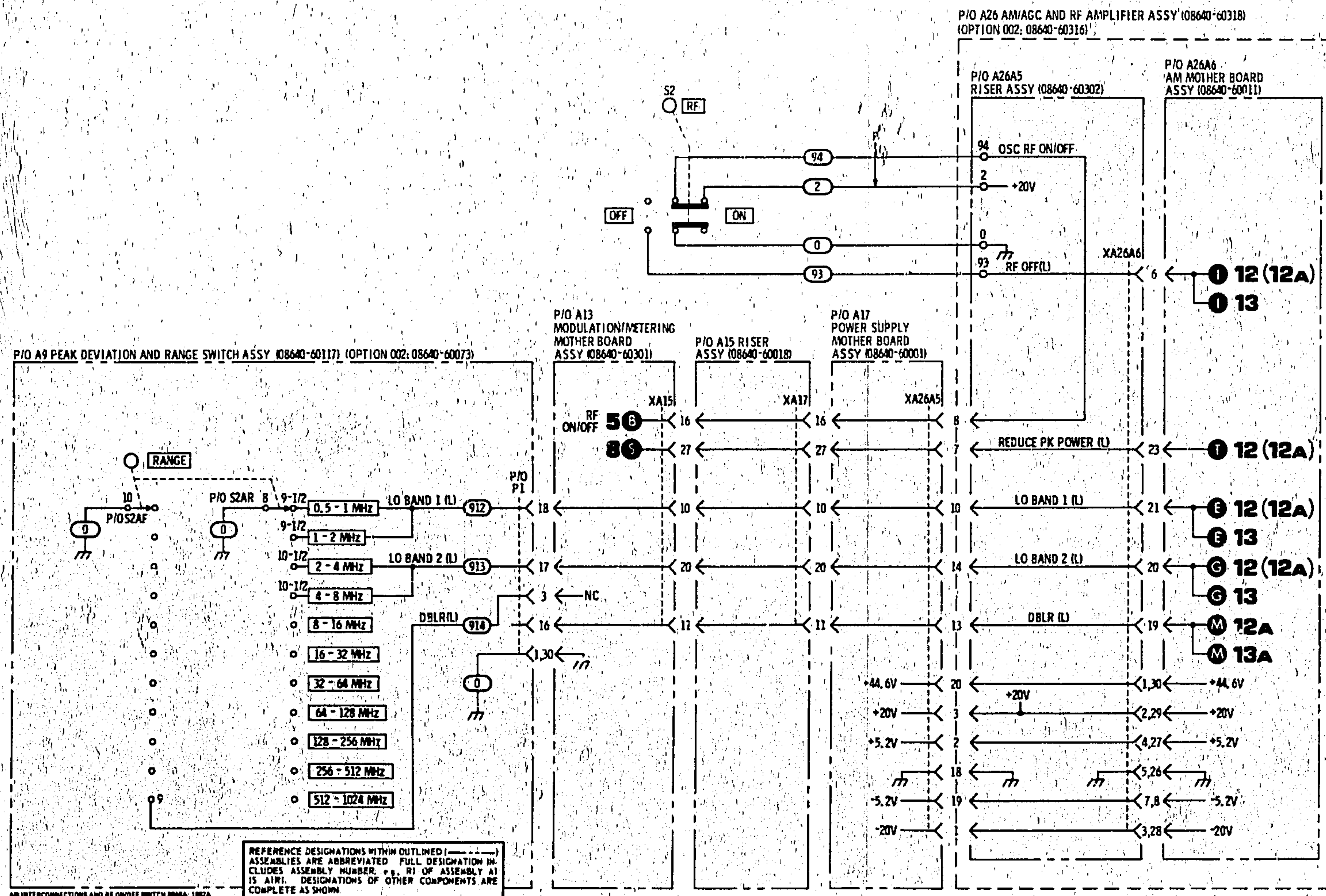
The RF ON/OFF switch S2 may be wired to turn both RF Oscillator and Modulator off, or to turn only the Modulator off. The RF ON/OFF function may easily be changed to either configuration by following the instructions on Service Sheet 5.

TROUBLESHOOTING

Troubleshoot by checking switches and connectors for proper contact.

A9

Component Locations for A9 Assembly are on Service Sheet 8.



NOTES

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.

REFERENCE DESIGNATIONS

NO PREFIX	A15 ASSY
S2	P/O XA17
A9 ASSY	A17 ASSY
P/O S2AF P/O S2AR P/O P1	P/O XA26A5
	A26A5 ASSY
A13 ASSY	P/O XA26A6
P/O XA15	

15
A9, A26

Figure 8-55. AM Interconnections and RF ON/OFF Switch Schematic Diagram

SERVICE SHEET 16

PRINCIPLES OF OPERATION

Vernier Attenuator (A1)

OUTPUT LEVEL vernier R1 attenuates the AGC reference voltage and the superimposed AM modulation signal and drives the AGC Amplifier. Resistor A1A1R1 limits the low resistance end of the potentiometer. Resistor A1A1R2 is switched into the AGC amplifier input line by S1A in all but the highest OUTPUT LEVEL range. With R2 switched out, the AGC reference is effectively increased by 10 dB (a factor of 3.16) and the RF output is increased by 10 dB.

Meter Attenuator and Odd Range Code (A1A1)

The output of Meter Amplifier A26A4U1A (Service Sheet 12 or 12A) is the RF LEVEL meter voltage. Resistor A1A1R3 attenuates the amplifier output by 1/3.5 in the highest or 16th OUTPUT LEVEL range. Resistor A1A1R4 attenuates the output by 1/1.1 on the other ranges. Switching is done on S1B. Switch S1C gives a closure to ground on all odd numbered ranges for use by the lamp logic circuits on A2 (Service Sheet 17).

TROUBLESHOOTING

Troubleshoot by checking switches, connector, and resistors for proper contact and resistance.

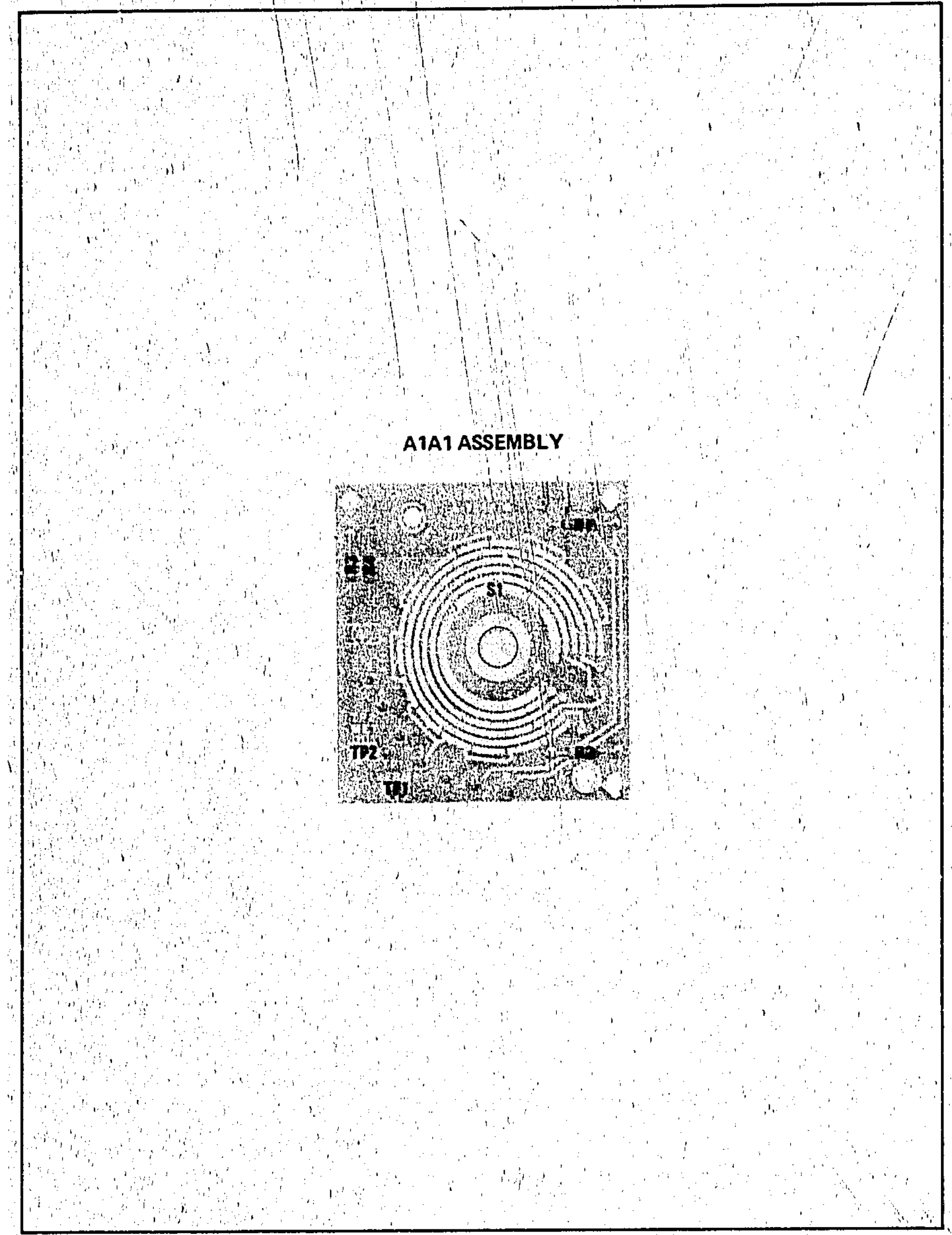
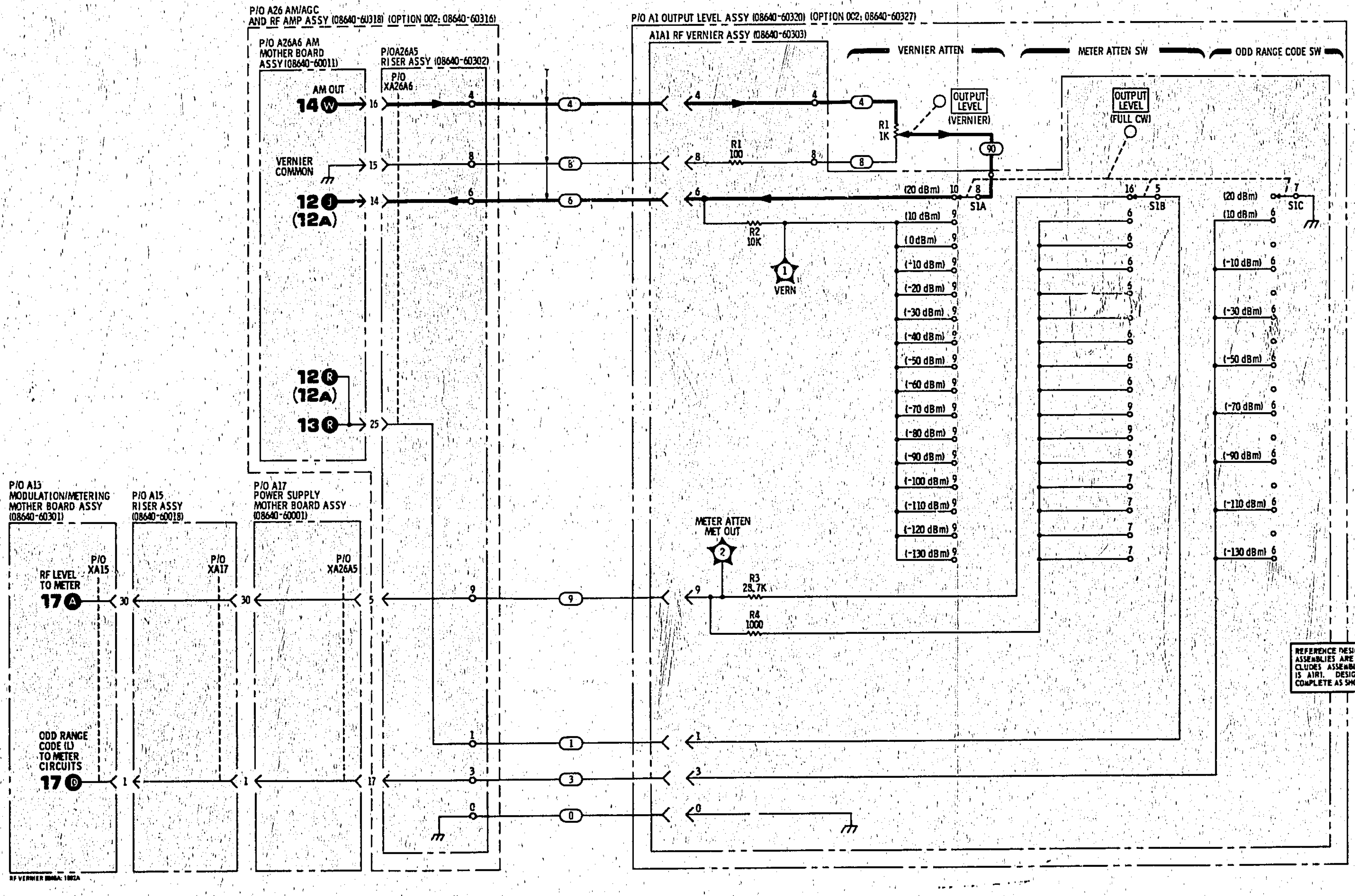


Figure 8-56. A1A1 RF Vernier Component Locations



NOTES:

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.

REFERENCE DESIGNATIONS

A1 ASSY	A13 ASSY
R1	P/O XA15
A1A1 ASSY	A15 ASSY
R1-4 S1 TP1,2	P/O XA17
	A17 ASSY
	P/O XA26A5

REFERENCE DESIGNATIONS WITHIN OUTLINED (— - • —) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

16

A1A1, A26

Figure 8-57. RF Vernier Schematic Diagram

SERVICE SHEET 17

PRINCIPLES OF OPERATION

General

Front panel meter M1 indicates one of three quantities selected by meter function switch A2S1. For each function, the metering circuitry performs the following:

1) AM percent modulation (X10%): The ac component of the modulation signal from MODULATION potentiometer R2 is peak detected and amplified. Logic circuitry selects the 0—10 meter scale lamp.

2) FM peak deviation (kHz or MHz): The ac component of the modulation signal from the Meter Attenuator section of the PEAK DEVIATION switch is peak detected and amplified. The scale lamp is selected by the PEAK DEVIATION switch.

3) RF output level (VOLTS or dBm): A positive dc voltage proportional to the detected AGC voltage of the A26A4 AGC Amplifier Assembly is amplified. The scale lamp is selected by the OUTPUT LEVEL switch and logic circuitry.

The meter has three linear scales (0—5, 0—10, and 0—3 or actually 0—3.16) with three lamps to indicate the appropriate scale. The lamps are located on the A6 Annunciator Assembly. The meter also has a log scale calibrated in dBm 50Ω for use in the LEVEL meter mode.

Positive Peak Detector (A2)

The Positive Peak Detector samples the ac peak of the incoming signal and stores the voltage on capacitor C7. The AM or FM input signals are ac coupled into the detector by capacitor C3 and resistor R9. Resistor R7 provides input bias current for U2 and presents a constant load impedance to the inputs.

U2 is a voltage comparator. When the input voltage at pin 3 exceeds the voltage at pin 2, the output rapidly switches low pulling on Q5. Q5 quickly charges C7 and brings the voltage at pin 2 up to that of pin 3. This condition is maintained until the voltage at pin 3 drops, at which time the output switches high and turns Q5 off. With Q5 off, C7 essentially holds at the value of the peak of the input signal. R10 and R22 slowly discharge C7 when the input signal is lowered or removed. R11 adds a small amount of gain to the detector.

Meter Drive Amplifier (A2)

Meter Drive Amplifier U1 converts the input voltage into a current which deflects the meter movement. U1 and Q4 are wired together as a voltage follower, i.e., the voltage at the emitter of Q4 equals the input of U1. The voltage developed across R27 and R28 generates a current which becomes the emitter current of Q4 (very little current is required by the inverting input of U1). The collector current of Q4, which is nearly equal to the emitter current, drives the meter. The meter sensitivity is adjusted by R28. CR1 protects Q4. A13R5 limits the maximum current that M1 can draw to prevent damage to the meter.

RF Vernier (A1A1)
◀ SERVICE SHEET 16

SERVICE SHEET 17 (Cont'd)

Lamp Drive Logic (A2)

Transistors Q1, Q2, and Q3 control the scale lamps (except for FM). When AM is selected, Q1 and Q2 are switched off by switch S1C. With Q1 off, Q3 switches on and lights A6DS6 (0—10 lamp). When FM is selected, the emitters of Q2 and Q3 are held open by S1B and have no control over the lighting of the scale lamps. In this case the lamps are controlled by the PEAK DEVIATION switch (Service Sheet 8). When LEVEL is selected, the 0—10 and 0—3 scale lamps are controlled by the ODD RANGE CODE line through S1C. The odd ranges correspond to OUTPUT LEVEL ranges of 1V $X10^{-n}$ (e.g., 1V, .1V, 0.01V, etc); the even ranges are 3V $X10^{-n}$ (e.g., 3V, .3V, .03V, etc.). For odd ranges, the ODD RANGE CODE line is low and the 0—10 lamp lights as for AM. For even ranges, the line is high (open) and Q1 and Q2 are switched on by R20. Q3 is switched off and Q2 turns on A6DS5 (0—3 lamp).

TROUBLESHOOTING

It is assumed that a problem has been isolated to the meter circuits as a result of using the troubleshooting block diagrams. Troubleshoot by using the test equipment listed below, performing the initial test conditions and control settings, and following the procedures outlined in the table.

Test Equipment

Digital Voltmeter . . . . HP 3490A
Oscilloscope . . . . HP 180C/1801A/1820C

Initial Test Conditions

Top cover, trim strip, and front panel window removed (see Service Sheet G for removal procedure). Use extender board to extend Meter Switch and Drive assembly (set instrument LINE power switch to OFF while removing or inserting circuit boards).

Initial Control Settings

Meter Function . . . . AM
AM . . . . INT
MODULATION FREQUENCY . . . . 1 kHz
FM . . . . INT
PEAK DEVIATION . . . . 5 kHz
OUTPUT LEVEL . . . . 0 dBm
(2 steps ccw from full cw)
RF ON/OFF . . . . ON

Meter Circuits Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication
POSITIVE PEAK DETECTOR (A2U2)	Initial conditions and settings. Adjust MODULATION for a 2Vp-p (1Vpk) signal at TP2 (AC IN)	1 Vdc at TP3 (DC OUT)	Check U2, Q5, C7, and associated circuitry
METER DRIVE AMPL (A2U1)	Initial conditions and settings. Adjust MODULATION for 1 Vdc at TP3 (DC OUT)	1 Vdc at TP4	Check U1, Q4, and associated circuitry.
		≈9 Vdc at Q4-c.	Check Q4, M1, and associated circuitry.
SCALE Annunciator	Initial conditions and settings except set Meter Function to FM	0—5 SCALE Annunciator lit.	Check DS4
	Set PEAK DEVIATION to 10 kHz	0—10 SCALE Annunciator lit.	Check DS6
	Set PEAK DEVIATION to 20 kHz	0—3 SCALE Annunciator lit.	Check DS5

A2 ASSEMBLY

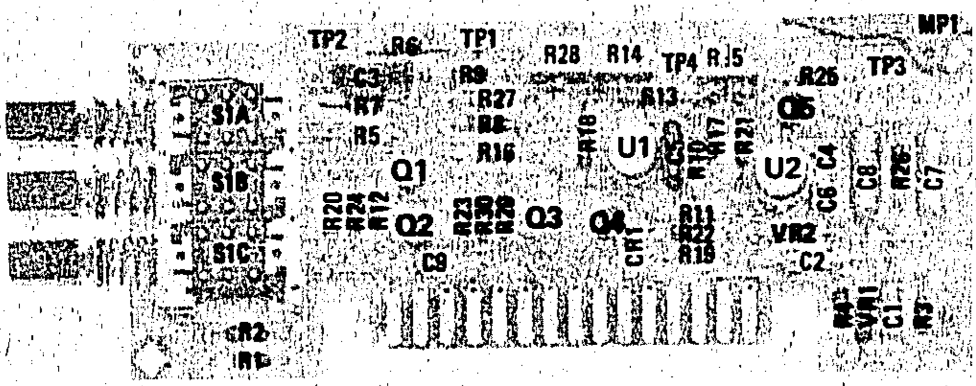


Figure 8-58. A2 Meter Switch and Drive Assembly Component Locations

P/O A6 ASSEMBLY

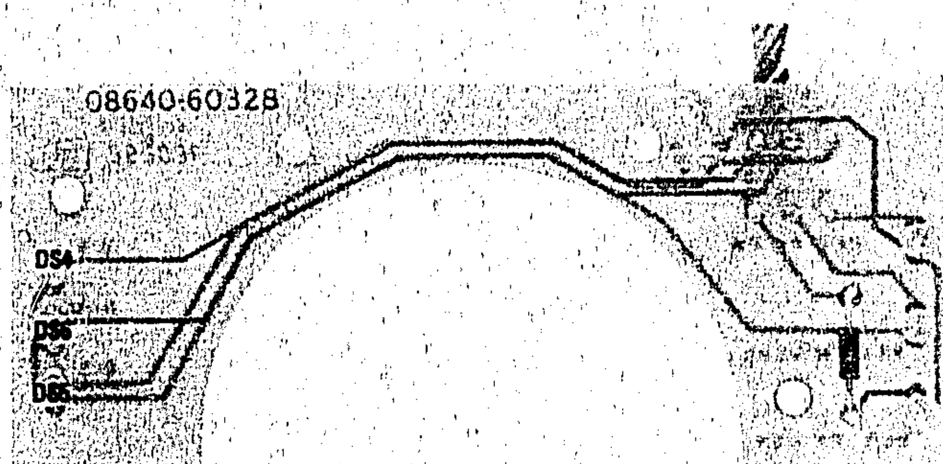
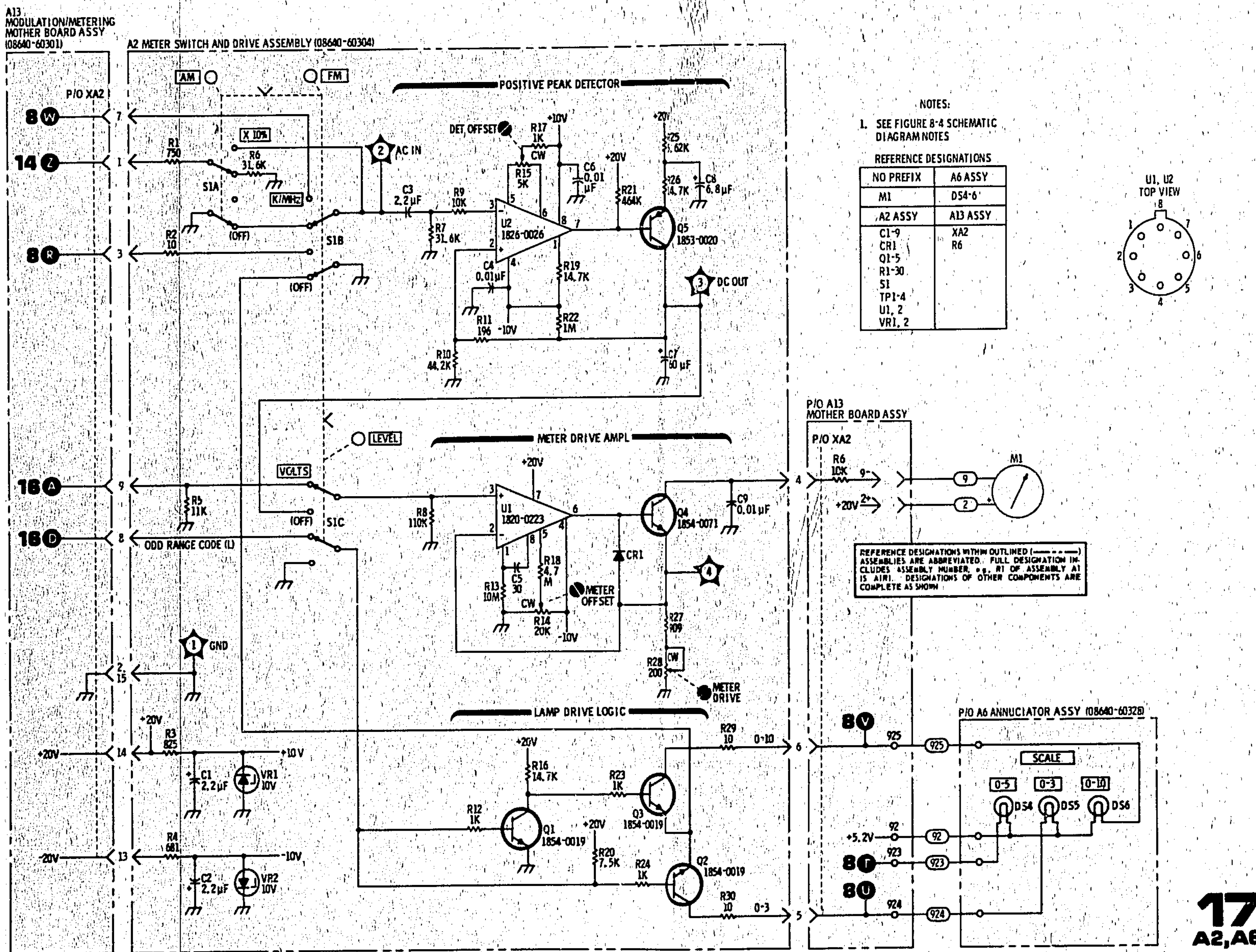


Figure 8-59. P/O A6 Annunciator Assembly Component Locations



NOTES:

1. SEE FIGURE 8-4 SCHEMATIC DIAGRAM NOTES

REFERENCE DESIGNATIONS

NO PREFIX	A6 ASSY
M1	DS4-6
A2 ASSY	A13 ASSY
C1-9 CR1 Q1-5 R1-30 S1 TP1-4 U1, 2 VR1, 2	XA2 R6

Figure 8-60. Meter Switch and Drive Schematic Diagram

SERVICE SHEET 22

PRINCIPLES OF OPERATION

General

The power supply assemblies provide five regulated dc supply voltages. The characteristics and locations of each regulator are as follows:

Supply Voltage	Voltage Regulation	Limiting Current	Assembly Number	Service Sheet No.
+44.6V	±10 mV	1A	A20	22
+20V	±10 mV	0.7A	A22	22
+5.2V	±10 mV	2.25A	A20	22
−5.2V	±10 mV *	1.75A	A18	23
−20V	±10 mV	0.7A	A22	22

*With a temperature coefficient of −4.2 mV/°C.

Input Voltage

Main ac power enters the A14 Line Power Assembly, which contains the primary line fuse, an RFI filter, and a printed circuit card switch which matches the transformer primary windings to the appropriate line voltage. Power transformer T1 has a separate secondary winding for each regulator. The A12 Rectifier Assembly contains five full-wave rectifiers.

+5.2V Regulator (A20)

The +5.2V Regulator is a linear series type with current foldback for over-current protection and a crowbar for over-voltage protection. The Voltage Regulator amplifier U1 compares the output voltage with the (internal) divided-down reference voltage and drives transistor Q2 which in turn drives the Series Regulator Transistor Q1 (chassis mounted) to regulate the current through it.

Current foldback is activated when the voltage drop across (and hence the current through) R25 and R26 exceeds the voltage drop across R19. The base-to-emitter junction between pins 1 and 10 of U1 (see note on schematic) is then forward biased which reduces the drive to the Series Regulator transistor. As shown in Figure 8-61, short-circuit current is quite low.

The output crowbar consisting of Q1, VR6, R23, and R24 protects against over-voltage outputs (due for example to a shorted series pass transistor). An output voltage greater than about 6.2V triggers Q1 which conducts and causes current foldback or blows F1. Light-emitting diode DS2 is on only if the output voltage is high enough to allow VR5 to conduct but not high enough to activate the crowbar. Diode CR3 protects the regulator against reverse polarity load voltages. Diode CR4 protects Q1 against reverse bias.

SERVICE SHEET 22 (Cont'd)

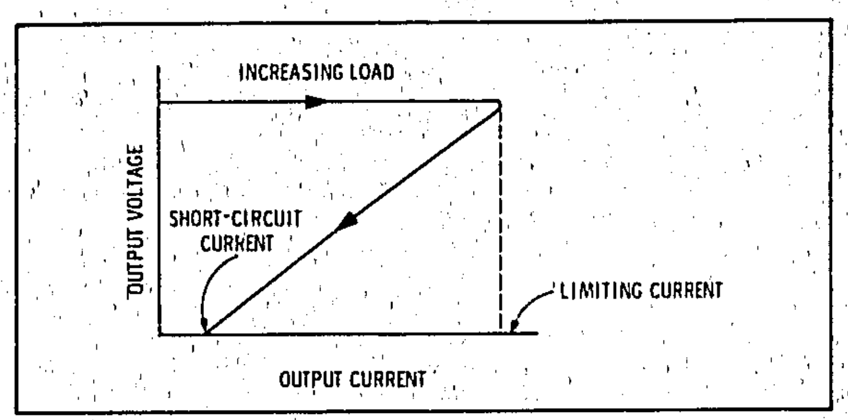


Figure 8-61. Current Foldback

+20V Regulator (A22)

The +20V Regulator functions similarly to the +5.2V Regulator, except that the output voltage is reduced by the voltage divider formed by R5, R6, and R7 and is referenced to the voltage across VR6. Also, the series pass transistor base-emitter junction is not in the current foldback circuit, resulting in a larger short-circuit output current.

−20V Regulator (A22)

The −20V Regulator functions identically to the +20V Regulator, except that the −20V output is taken from the point corresponding to the ground point on the +20V regulator, and the −20V ground return is connected to a point that corresponds to the +20V output.

+44.6V Regulator (A20)

The +44.6V Regulator functions similarly to the +5.2V Regulator, except that the output voltage is reduced by the voltage divider formed by R7, R8, And R9 and is applied to the non-inverting input of the comparison amplifier of U2 (pin 3). The reference voltage (from pin 4) is applied to the inverting input (pin 2). The Series Regulator transistor Q3 (chassis mounted) is in the regulator return line and is driven by Q4. The two transistors are in an inverted-Darlington configuration (which is common emitter instead of emitter follower as in the +5.2V Regulator). Components Q3, Q6, R1, and R2 form a constant current source which sinks the current from pin 6 of U2 and the base of Q4. Q5 provides foldback current limiting.

TROUBLESHOOTING

It is assumed that one of the light-emitting diodes is not lighted or that ripple, noise, or voltage from one of the power supplies is suspect. Troubleshoot by using the test equipment listed below, performing the initial test conditions, and following the procedures outlined in the text and the table.

SERVICE SHEET 22 (Cont'd)

Test Equipment

Digital Voltmeter . . . . HP 3490A
Oscilloscope . . . . HP 180C/1801A/1820C

Initial Test Conditions

Top cover removed (see Service Sheet G for removal procedure). Use extender board to extend desired assembly (set instrument LINE power switch to OFF while removing or inserting circuit boards).

Initial Control Settings

LINE . . . . ON

Rectifiers (A12)

If one or two rectifier diodes in one of the bridge rectifiers are defective, ripple and noise could increase without affecting the supply's average voltage or output current. Use the oscilloscope to measure ripple and noise; connect the probe from the test points given below to chassis ground.

Supply	Test Point	Typical Ripple and Noise
+44.6V	A20TP1	<0.7 Vp−p
+20V	A22TP1	<0.5 Vp−p
+5.2V	A20TP6	<1 Vp−p
−20V	A22TP6	<0.3 Vp−p
−5.2V	A18TP1	<0.8 Vp−p

If one of the supplies is out of specification, check the rectifier diodes, filter capacitors, and associated components. Also check the Series Regulator transistor.

If noise on a supply appears to be excessive, check the reference (either internal or external) and its associated filter capacitor and the regulator amplifier. Noise may either be of the broadband type (i.e., white noise) or it may consist of random jumps in level on the order of 1 mV (i.e., popcorn noise).

Regulator Circuits (A20 and A22)

The first step in solving a power supply problem is to ensure that the problem is caused by the power supply. Minimum load resistances are given in the table for each supply. However, depending upon the ohmmeter and resistance range used, measured resistance can vary from a few ohms to several kilohms. So unless the load is actually shorted to ground, measuring load resistance doesn't always isolate the problem.

SERVICE SHEET 22 (Cont'd)

Another way to isolate a power supply problem is to disconnect the supply from the load and check the supply voltage. The quickest way to do this is to unsolder and lift pins on the extender board. However, under some failure conditions, the regulator integrated circuit can regulate correctly with the load removed from the power supply and yet cannot regulate correctly when the supply has its correct load.

To isolate a power supply problem to a specific circuit, use the data given in the table.

WARNINGS

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, if inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

SERVICE SHEET 22 (Cont'd)

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.

Any interruptions of the protective (grounding) conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited.

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

NOTE

The voltmeter input must float (i.e., both connections must be ungrounded) when checking voltages with extender board pins open.

Power Supply Troubleshooting (1 of 2)

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
−20V REGULATOR	Remove A22 assembly. Measure resistance from A17XA22-1 to chassis ground.	>30Ω	Check supply load circuits for short
	Open pins 5 and 26 on extender board. Extend A22 assembly and check voltage from A22 board pin 5 to A20TP9.	−20 ± 0.1V	Check A22U1 and supply load circuits
	Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.	Correct operation and resistance	Replace faulty component
+20V REGULATOR	Remove A22 assembly. Measure resistance from A17XA22-7 to chassis ground.	>26Ω	Check supply load circuits for short
	Open pins 7 and 24 on extender board. Extend A22 assy and check voltage from A22TP5 to TP4.	+20 ± 0.1V	Check A22U2 and supply load circuits.
	Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.	Correct operation and resistance	Replace faulty component
+5.2V REGULATOR	Remove A20 assy. Measure resistance from A17XA20-4, 7 to chassis ground.	>3Ω	Check supply load circuits for short

SERVICE SHEET 22 (Cont'd)

Power Supply Troubleshooting (2 of 2)

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
+5.2V REGULATOR (Cont'd)	Open pins 4, 27, 7, and 24 on extender board. Extend A20 assy and check voltage from A20 board pin 1 to A20TP10.	+5.2 ± 0.15V	Check A20U1 and supply load circuits
	Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.	Correct operation and resistance	Replace faulty component
+44.6V REGULATOR	Remove A20 assy. Measure resistance from A17XA20-15 to chassis ground.	>45Ω	Check supply load circuits for short
	Open pins 13 and 18 on extender board. Extend A20 assy and check voltage from A20 board pin 13 to A20TP4.	+44.6 ± 0.1V	Check A20U2 and supply load circuits
	Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.	Correct operation and resistance	Replace faulty component

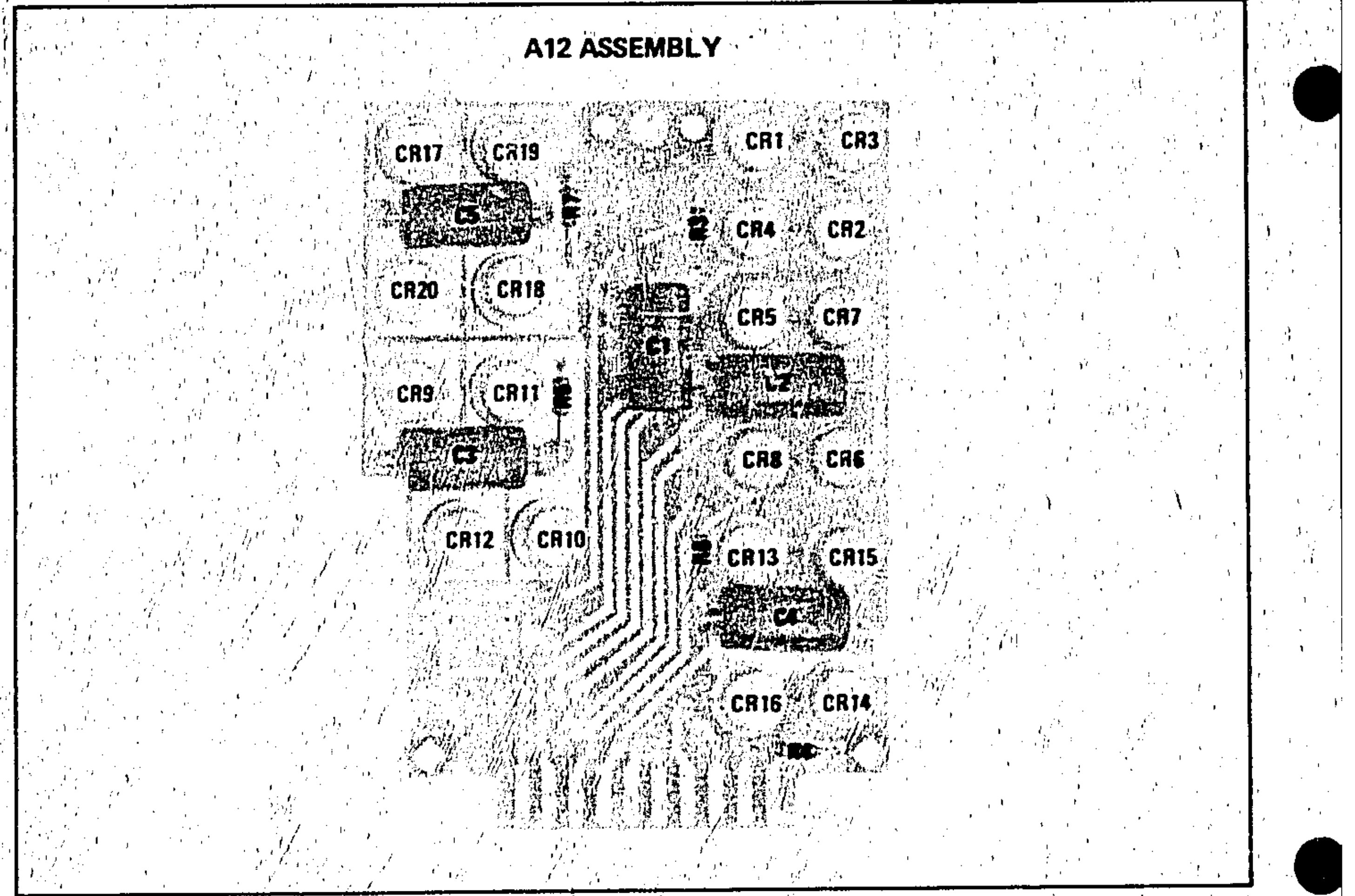


Figure 8-62. A12 Rectifier Assembly Component Locations

Meter Switch and Drive Circuits (A2)
SERVICE SHEET 17

A20 ASSEMBLY

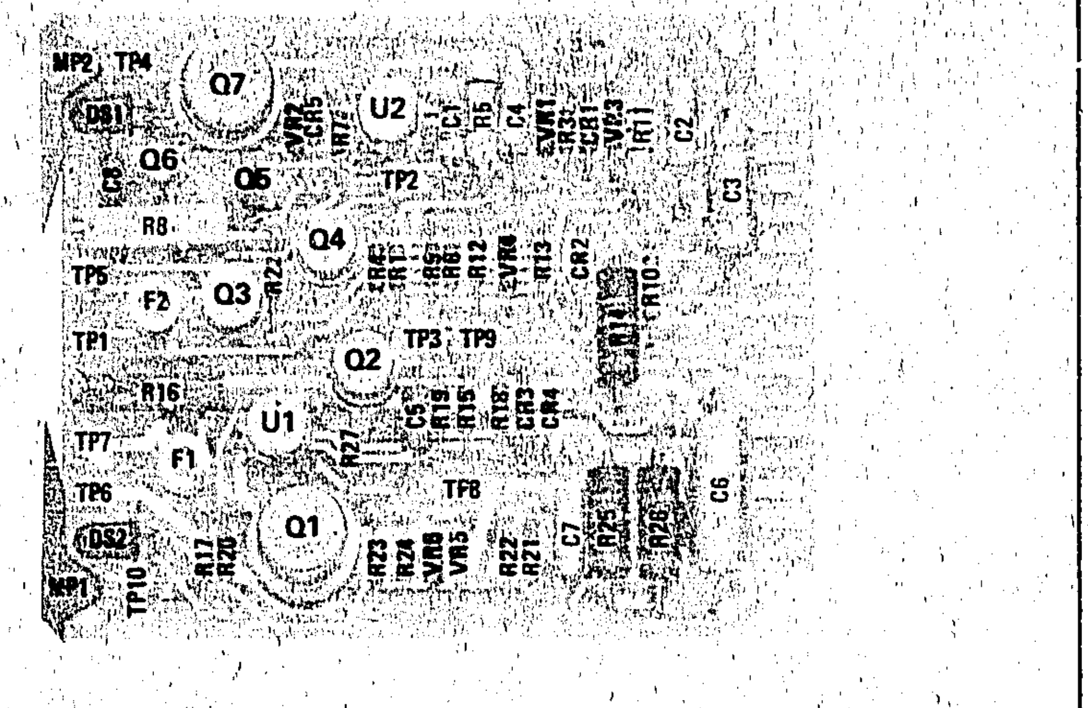


Figure 8-63. A20 +5.2V and +44.6V Regulator Assembly Component Locations

A22 ASSEMBLY

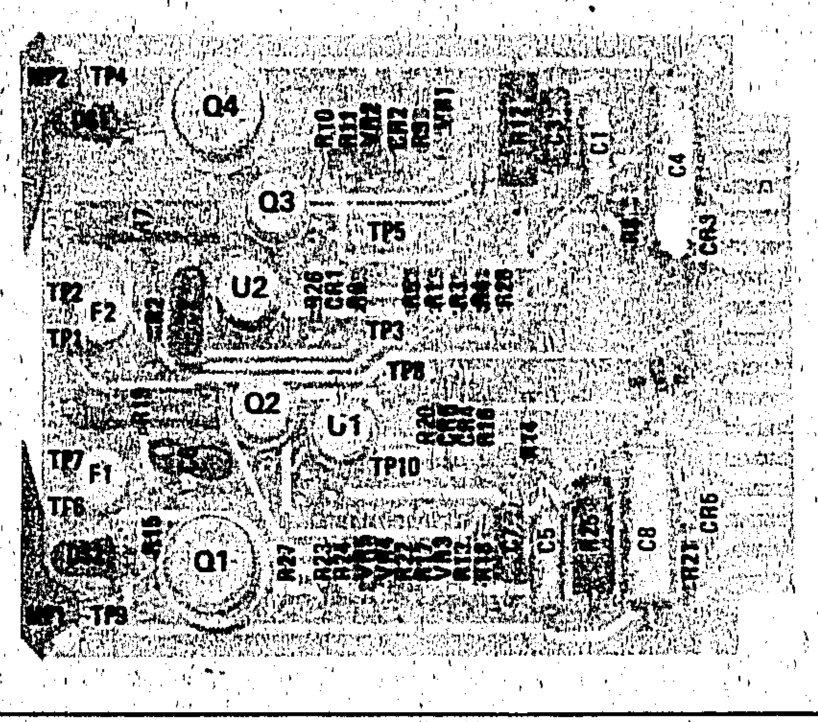
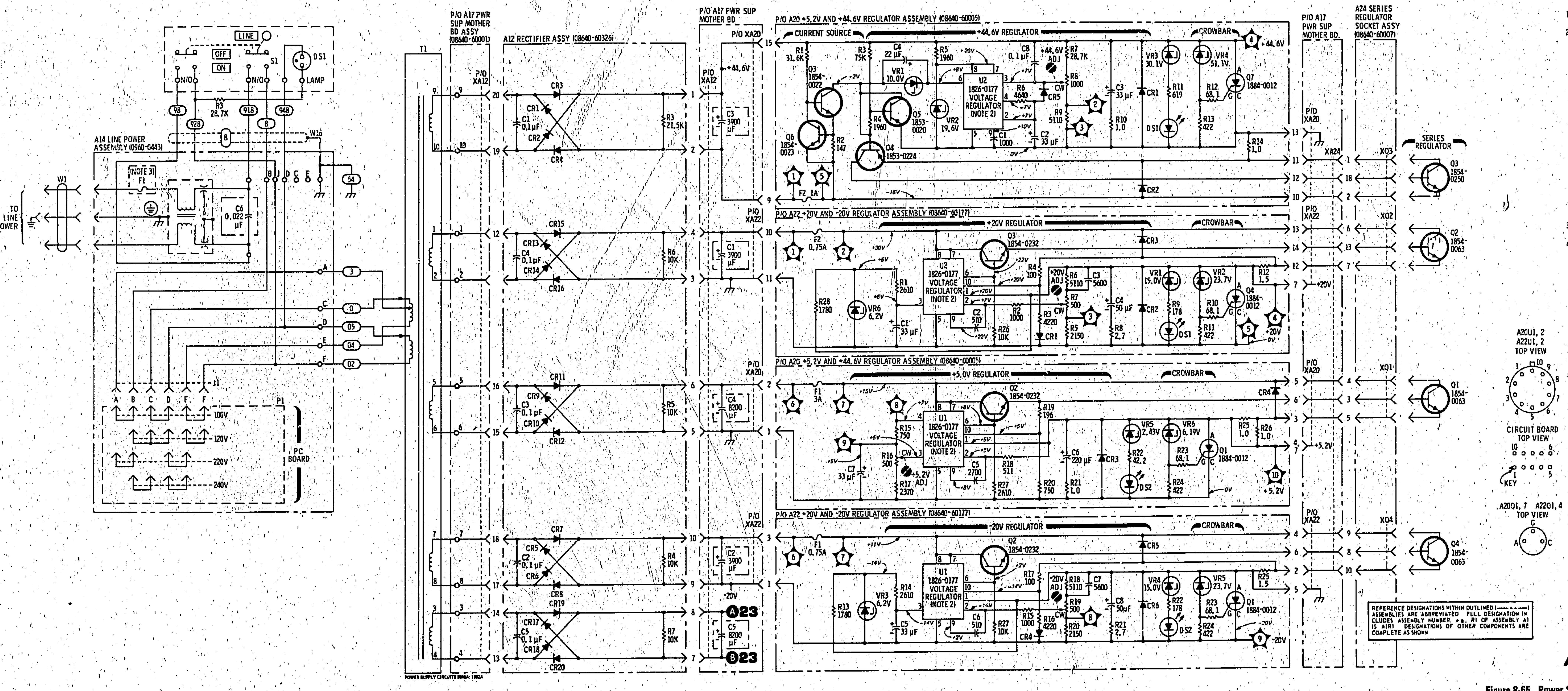
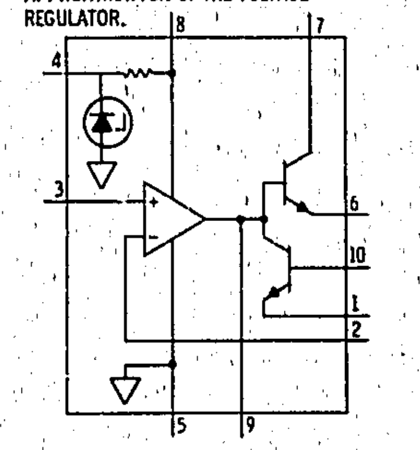


Figure 8-64. A22 +20V and −20V Regulator Assembly Component Locations



NOTES

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.
2. SHOWN BELOW IS AN ELECTRICAL APPROXIMATION OF THE VOLTAGE REGULATOR.



3. VALUE OF F1 IS 2 AMP FOR 100/120V AND 1 AMP FOR 220/240V.
4. VOLTAGES SHOWN ARE APPROXIMATE AND MAY VARY AS LINE VOLTAGE VARIES; TOLERANCE IS APPROXIMATELY ±10%.

REFERENCE DESIGNATIONS

NO PREFIX	A20 ASSY
C1-6 DS1 F1 Q1-4 R3 S1 T1 W1, 16	C1-8 CR1-5 DS1,2 F1,2 Q1-7 R1-27 TP1-10 U1,2 VR1-6
A12 ASSY	**A22 ASSY**
C1-5 CR1-20 R3-7	C1-8 CR1-6 DS1,2 F1,2 Q1-4 R1-28 TP1-9 U1,2 VR1-6
A14 ASSY	
J1 P1	
A17 ASSY	**A24 ASSY**
XA12,20 XA22,24	XQ1-4

NOT ASSIGNED: A12Q1, A12R1, A12R2, A12VR1.

22

A12, A14, A20, A22

Figure 8-65. Power Supply Circuits Schematic Diagram

SERVICE SHEET 23

PRINCIPLES OF OPERATION

−5.2V Regulator (A18)

The −5.2V Regulator functions similarly to the +5.2V Regulator described on Service Sheet 22, except that the −5.2V output is taken from the point corresponding to the ground point on the +5.2V Regulator, and the −5.2V ground return is connected to a point that corresponds to the +5.2V output. In addition, diodes CR2 and CR3 give the output voltage a small negative temperature coefficient.

Fan Motor and Fan Driver (A18)

The fan motor, A16B1, is composed of a cylindrical, permanent-magnet rotor and a four-section stator winding. Figure 8-66 is a simplified schematic of the motor and drive circuitry. Stator windings La, Lb, Lc and Ld are energized sequentially by darlington pairs Q5 and Q6, Q9 and Q10, Q7 and Q8, and Q11 and Q12, respectively. Two Hall generators, Ea and Eb, are located on the stator, 90° apart. In the presence of a magnetic field, each Hall generator will produce two out-of-phase voltages at its two output

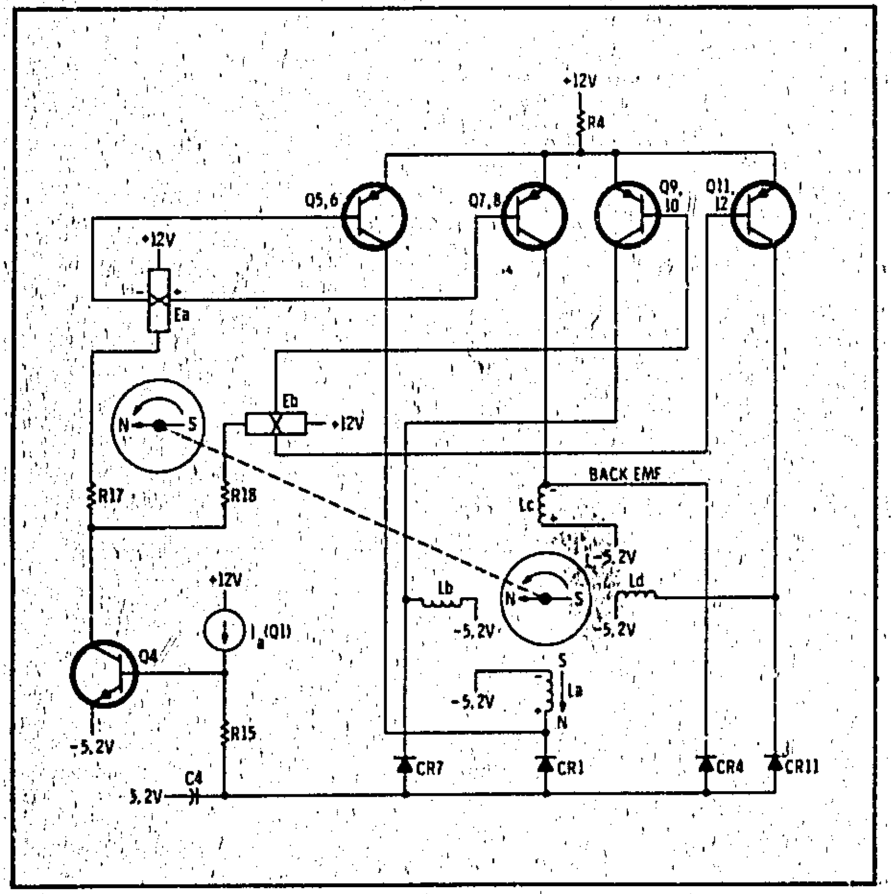


Figure 8-66. Simplified Schematic Diagram of Fan Motor and Driver Circuitry

SERVICE SHEET 23 (Cont'd)

terminals. The magnitude of each voltage is proportional to the strength of the field and the amount of bias current. The phase is determined by the polarity of the field. The Hall generators sense the position of the rotor and turn on the appropriate drive transistors. In Figure 8-66, La is being energized by Q5, 6 which causes the rotor to rotate toward it.

A back EMF which is proportional to rotor speed is induced in the unenergized stator windings. Diodes CR1, CR4, CR7, and CR11 rectify this EMF and charge C4 to a negative voltage. Current source Q1 discharges C4 at a constant rate. The voltage across C4 plus the constant voltage drop across R15 is the base voltage of Q4. If rotor speed decreases, the voltage across C4 becomes less negative, the base of Q4 becomes more positive and Q4 more heavily biases the Hall generators. The drive transistors turn on harder and rotor speed increases.

TROUBLESHOOTING

It is assumed that the light-emitting diode is unlit or that ripple, noise, or voltage from the −5.2V power supply is suspect, or that the fan is operating erratically or not at all. Troubleshoot by using the test equipment listed below, performing the initial test conditions, and following the procedures outlined in the text and the table.

Test Equipment

Digital Voltmeter .... HP 3490A
Oscilloscope .... HP 180C/1801A/1820C

Initial Test Conditions

Top cover removed (see Service Sheet G for removal procedure). Use extender board to extend desired assembly (set instrument LINE power switch to OFF while removing or inserting circuit boards).

Initial Control Settings

LINE .... ON

Regulator Circuits (A18)

The first step in solving a power supply problem is to ensure that the problem is caused by the power supply. Minimum load resistances are given below for the supply. However, depending upon the ohmmeter and resistance range used, measured resistance can vary from a few ohms to several kilohms. So unless the load is actually shorted to ground, measuring load resistance doesn't isolate the problem.

SERVICE SHEET 23 (Cont'd)

Another way to isolate a power supply problem is to disconnect the supply from the load and check the supply voltage. The quickest way to do this is to unsolder and lift pins on the extender board. However under some failure conditions, the regulator integrated circuit can regulate correctly with the load removed from the power supply and yet cannot regulate correctly when the supply has its correct load.

To isolate a power supply problem to a specific circuit, use the data given in the table.

NOTE

The voltmeter input must float (i.e., both connectors must be ungrounded) when checking voltages with extender board pins open.

Fan Driver and Speed Regulator (A18)

If one or two of the fan's windings are open or are not being supplied with the correct voltage, the fan may not start in all positions. However, once started, it may run correctly. Use the data given in the table to isolate a problem to a specific circuit. Also check that the fan blade does not hit against the rear vent. If it does, loosen the setscrew and slide the blade forward.

Power Supply Circuits (A12, A14, A20, A22)
SERVICE SHEET 22

SERVICE SHEET 23 (Cont'd)

Regulator and Fan Driver Troubleshooting

Component or Circuit	Test Conditions and Control Settings	Normal Indication	If Indication is Abnormal
−5.2V REGULATOR	Remove A18 assy. Measure resistance from A17XA18-6, 14 to chassis ground.	>3Ω	Check supply load circuits for short
	Open pins 15 and 16 on extender board. Extend A18 assy and check voltage from A18 board pin 15 to A18TP5.	−5.2 ± 0.1V	Check A18U1 and supply load circuits
	Check diodes and transistors for correct operation with voltage applied. Check components for correct resistance.	Correct operation and resistance	Replace faulty component
FAN DRIVER	Measure voltage applied to each winding of motor	As shown on schematic (approximately sinusoidal)	Check appropriate components
	Measure period of voltages applied to windings of motor	As shown on schematic	Check speed regulator circuits

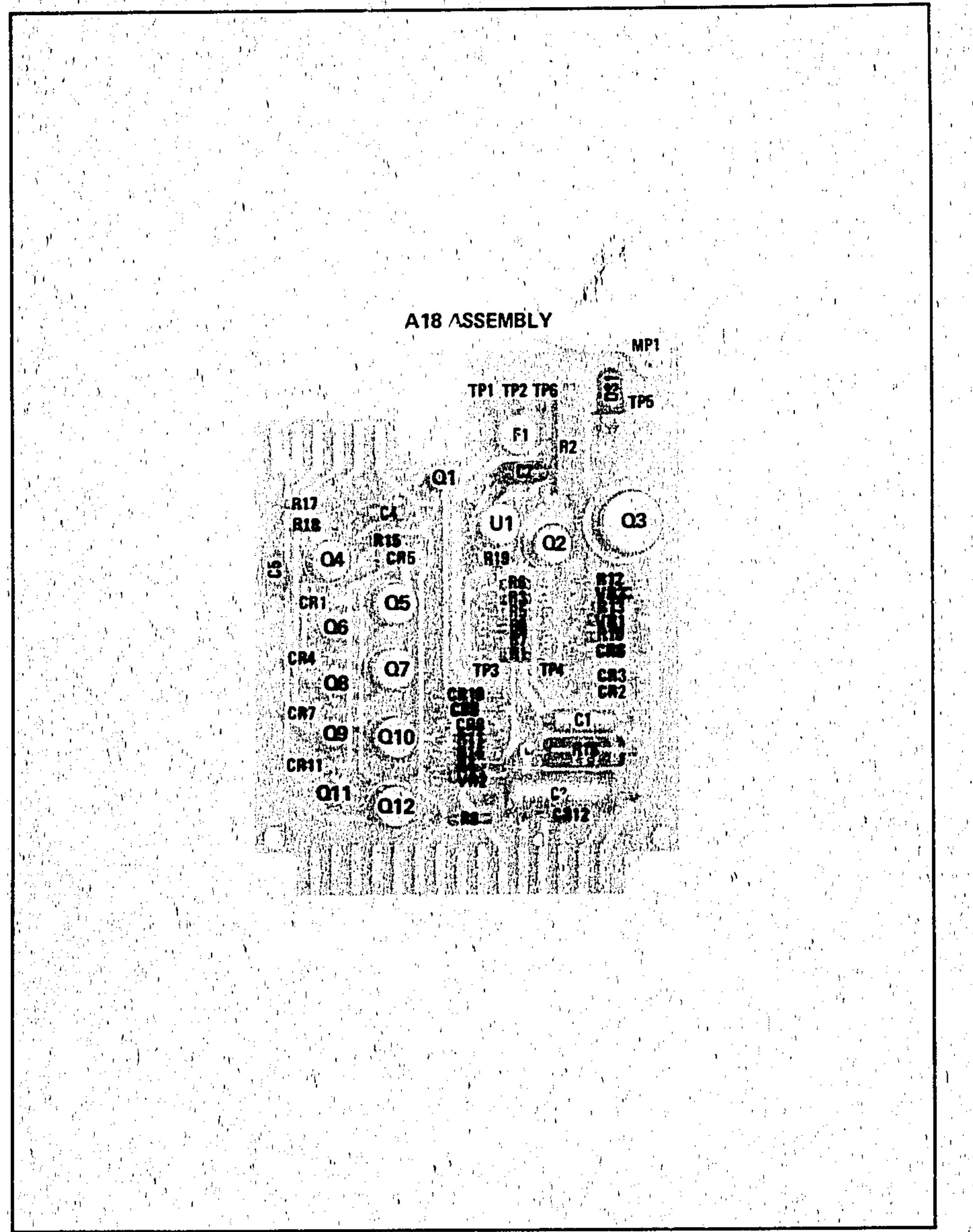


Figure 8-67. A18 –5.2V Regulator and Fan Driver Assembly Component Locations

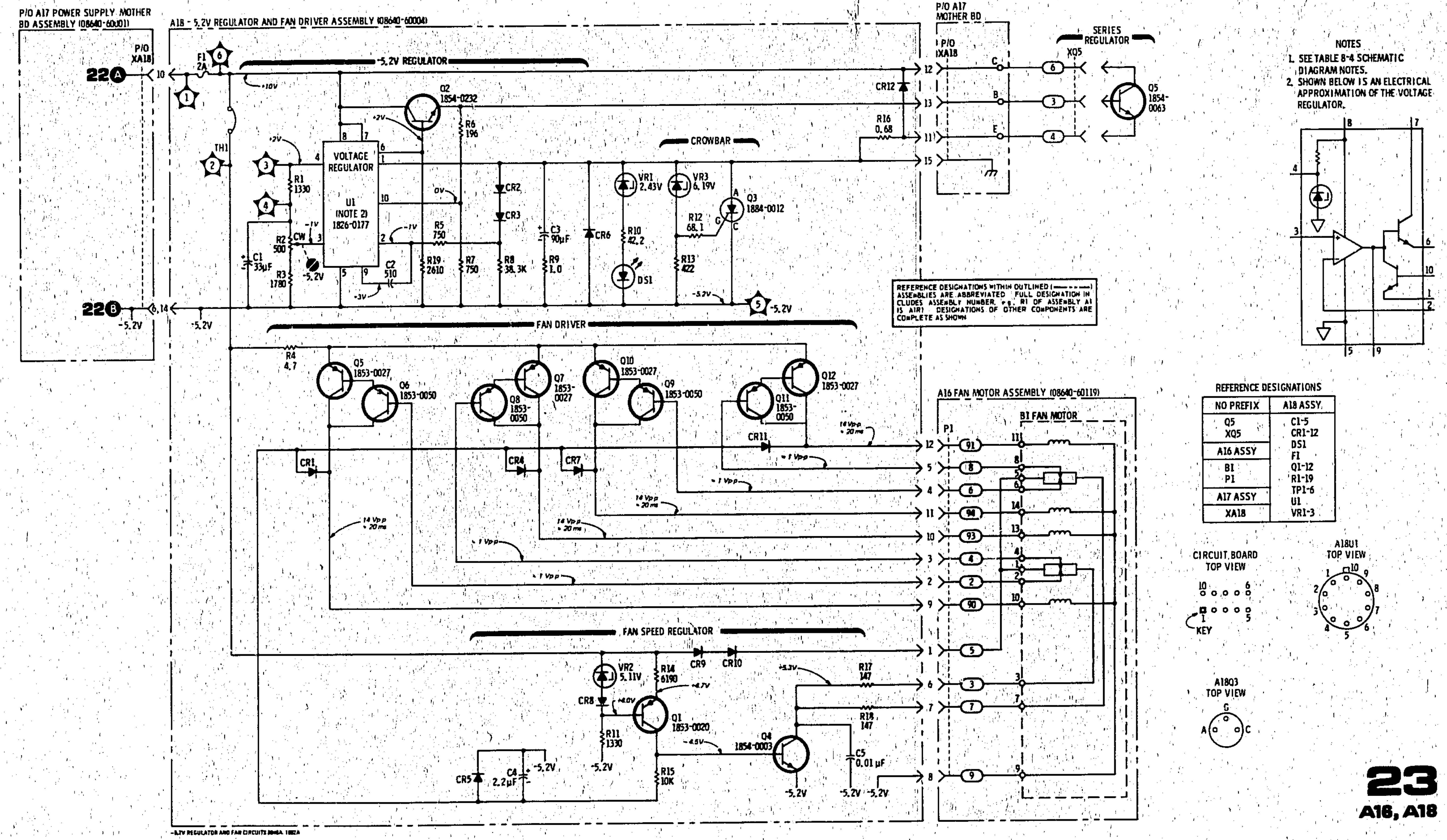


Figure 8-68. –5.2V Regulator and Fan Driver Circuits Schematic Diagram

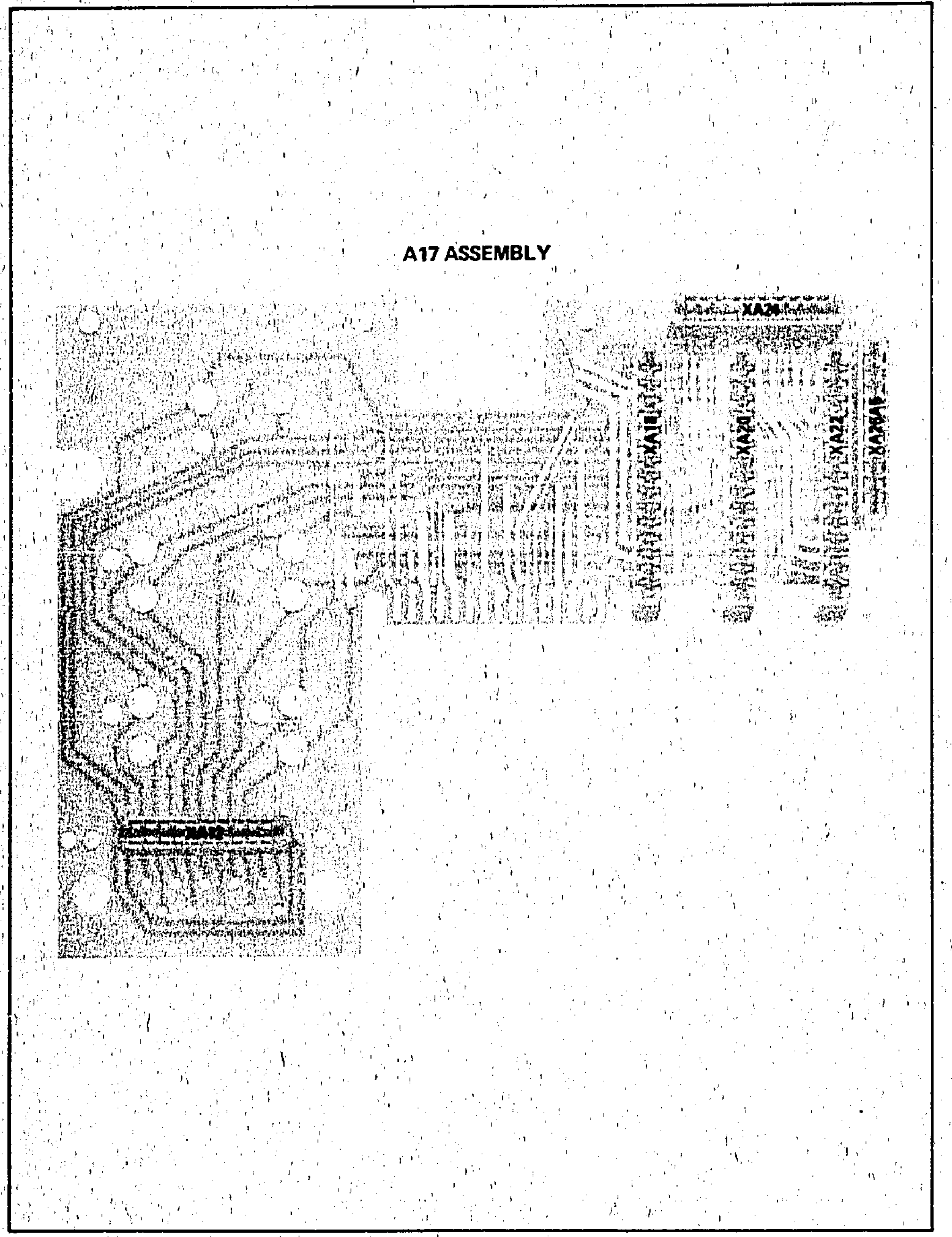
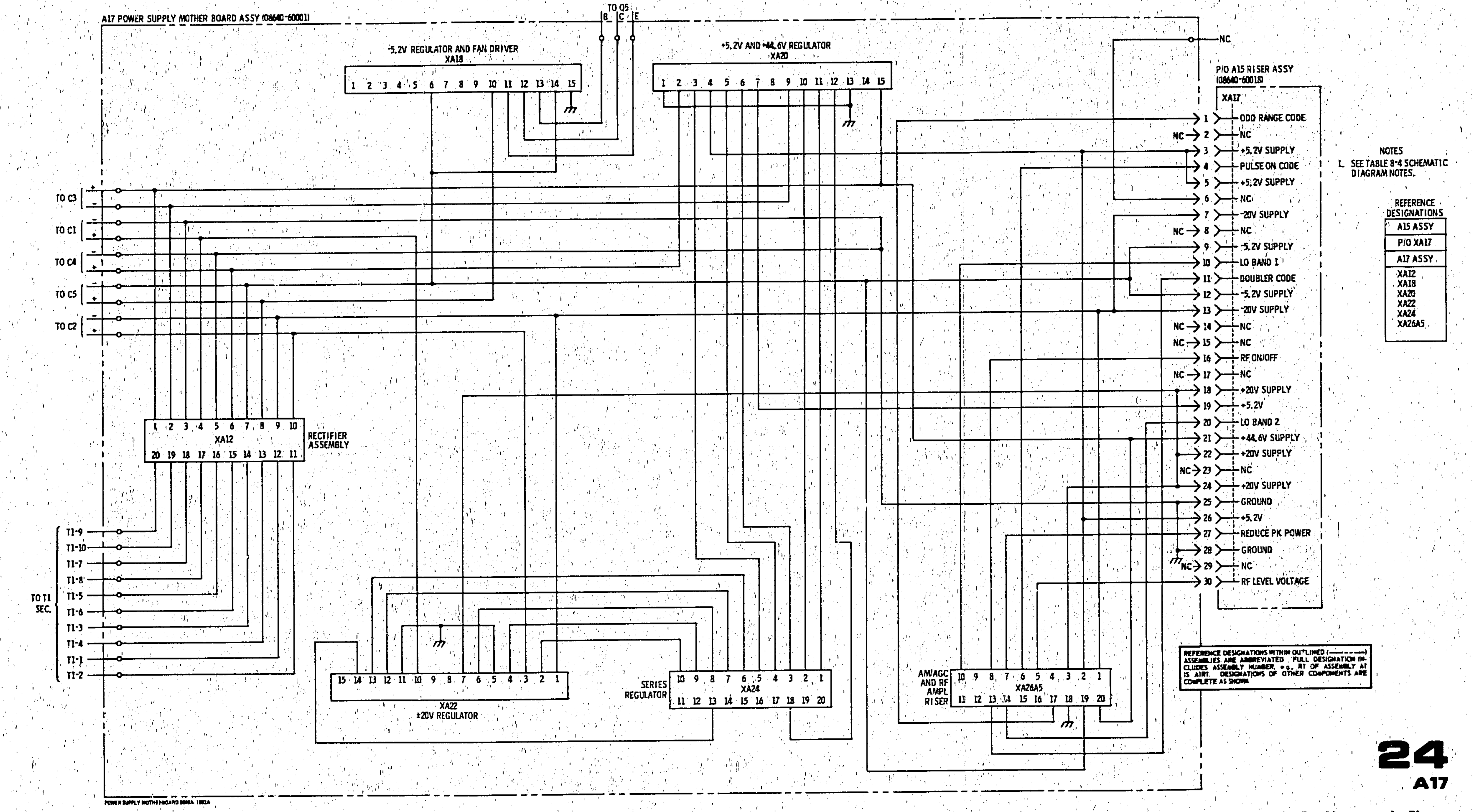


Figure 8-69. A17 Power Supply Mother Board Assembly Component Locations



24
A17

Figure 8-70. Power Supply Mother Board Interconnection Diagram

A13 ASSEMBLY
Top View

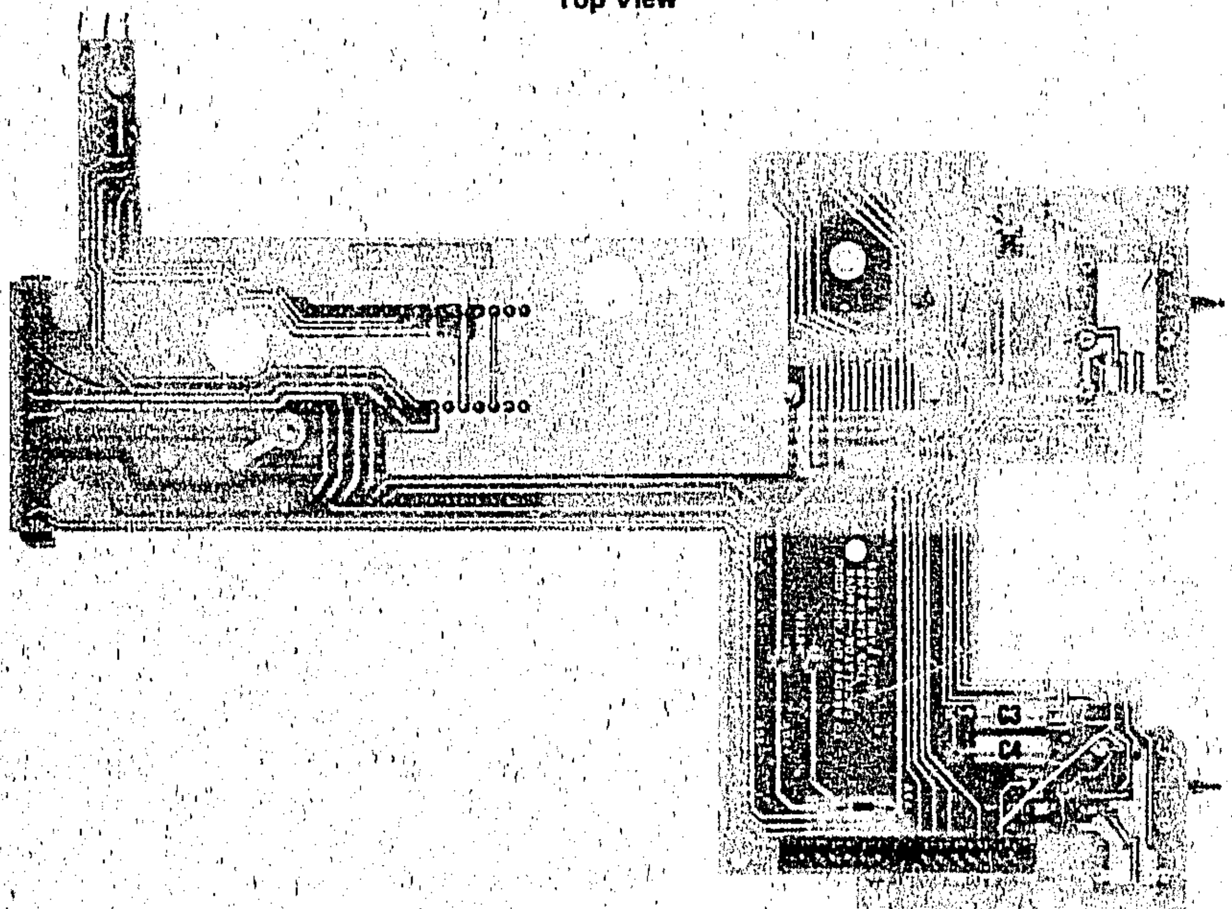


Figure 8-71. A13 Modulation/Metering Mother Board Assembly Component Locations (1 of 2)

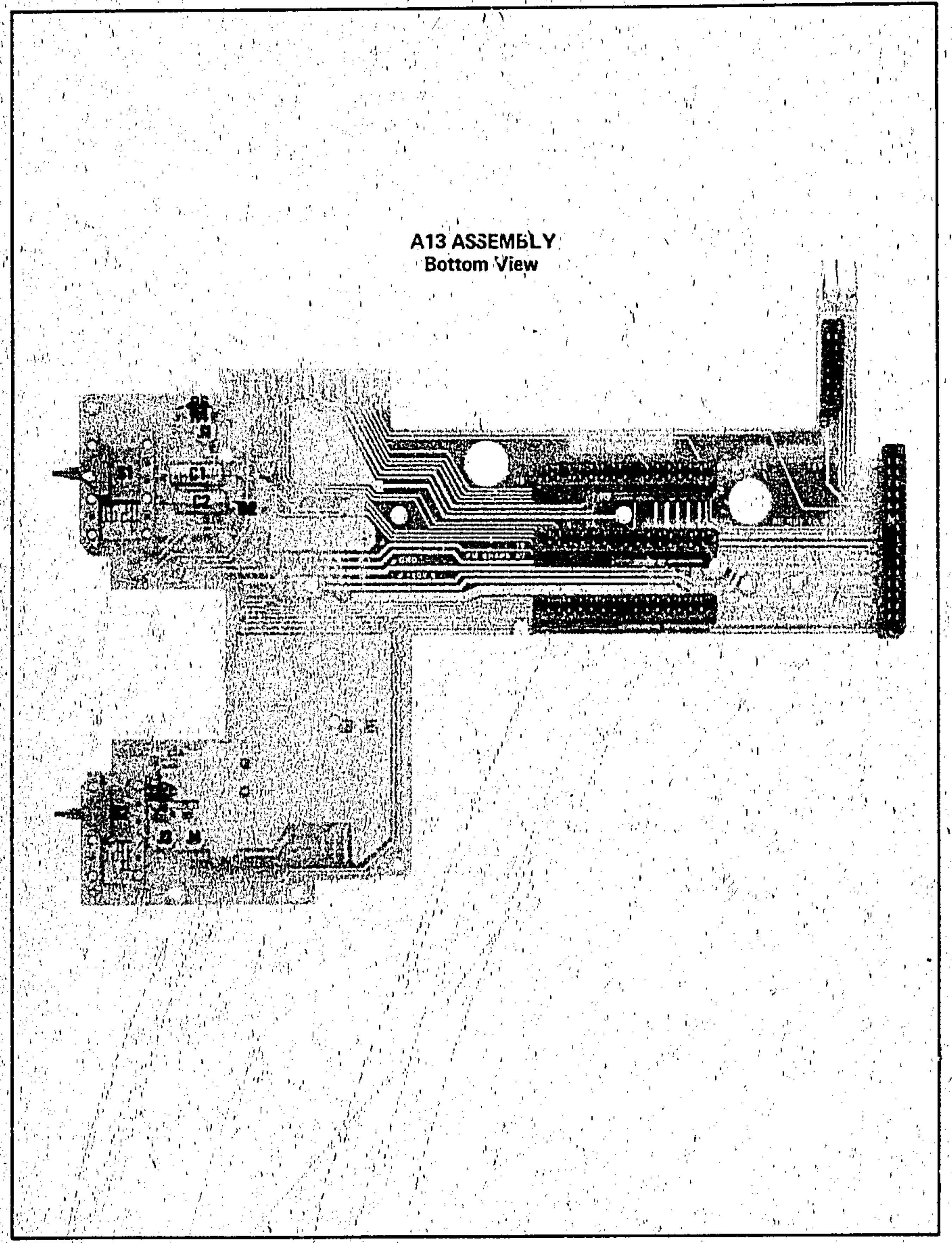


Figure 8-71. A13 Modulation/Metering Mother Board Assembly Component Locations (2 of 2)

Figure 8-72. Modulation/Metering Mother Board Interconnection Diagram

SERVICE SHEET A

A1 Assembly Removal Procedure

1. Place instrument upside down and remove bottom cover (Service Sheet G).

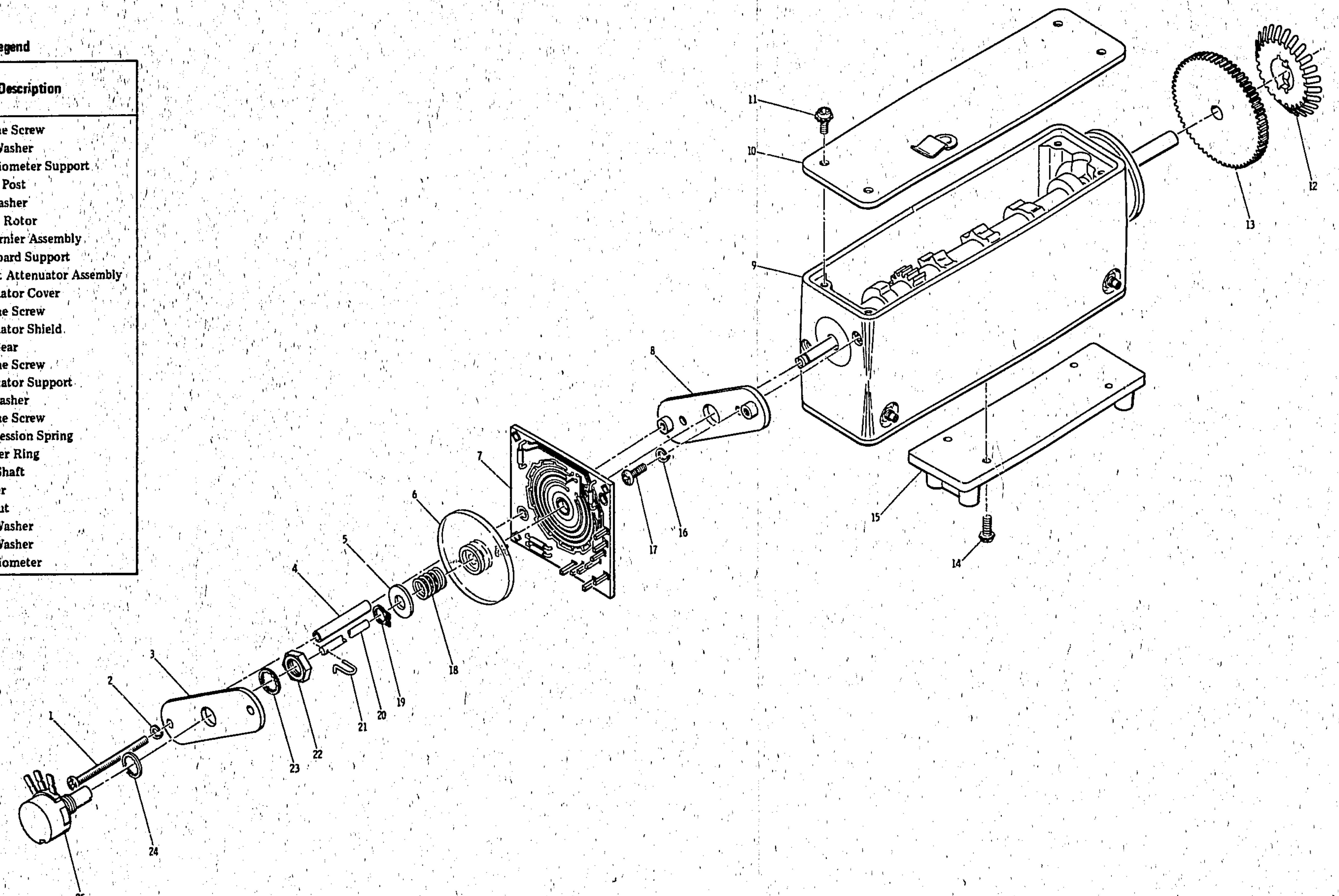
CAUTION

While working with and around the semi-rigid coaxial cables in the generator, do NOT bend the cables more than necessary. Do NOT torque the RF connectors to more than 5 inch-pounds.

2. Remove two OUTPUT LEVEL knobs from front panel. The knobs are secured to concentric shafts with allen screws in the knobs.
3. Disconnect two semi-rigid coaxial cables from bottom of the A1A2 Output Attenuator Assembly (cable W10 at A1A2J1 and cable W11 at A1A2J2).
4. Disconnect 7 push-on wire connections from A1A1 RF Vernier Assembly (located at rear of A1 Output Level Assembly).
5. Remove front side plate cover (item 14 in Figure 6-2) from right-hand side frame by removing two flat-head screws.
6. Remove four pan-head screws (with lock-washers) that secure Attenuator to mounting plate (it is not necessary to remove the mounting plate). Remove assembly by sliding it to the rear and up; use care to avoid damage to gear or shield at front of assembly.
7. Reinstall assembly by reversing the procedure in steps one through seven.

A1 Output Level Assembly Legend

Item Number	Reference Designator	Description
1	A1MP13	Machine Screw
2	A1MP16	Lock Washer
3	A1MP1	Potentiometer Support
4	A1MP2	Spacer Post
5	A1MP5	Flat Washer
6	A1MP7	Switch Rotor
7	A1A1	RF Vernier Assembly
8	A1MP8	P.C. Board Support
9	A1A2	Output Attenuator Assembly
10	A1MP18	Attenuator Cover
11	A1MP15	Machine Screw
12	MP55	Attenuator Shield
13	MP80	Spur Gear
14	A1MP15	Machine Screw
15	A1MP9	Attenuator Support
16	A1MP17	Lockwasher
17	A1MP14	Machine Screw
18	A1MP6	Compression Spring
19	A1MP4	Retainer Ring
20	A1MP10	Inner Shaft
21	A1MP3	Coupler
22	A1MP12	Hex Nut
23	A1MP11	Lock Washer
24	A1MP11	Lock Washer
25	A1R1	Potentiometer



A

Figure 8-73. A1 Output Level Assembly Illustrated Parts Breakdown

SERVICE SHEET B

A3 Removal Procedure

1. Place instrument upside down and remove bottom cover (Service Sheet G).

CAUTION

While working with and around the semi-rigid coaxial cables in the generator, do not bend the cables more than necessary. Do not torque the RF connectors to more than 5 inch-pounds.

2. Set Frequency to 230 MHz.
3. Remove front panel FREQUENCY TUNE and FINE TUNE control knobs.
4. On rear of oscillator assembly, disconnect coaxial connector W3 at A3A1J1 (32).
5. Remove two 8-32 nuts (36) that secure connector board assembly A3A4 to chassis. Lift out connector board assembly from mating connector.
6. Remove four 8-32 screws (52) securing oscillator to center plate of chassis.

CAUTION

Do not twist oscillator assembly while removing or inserting in chassis. Doing so may loosen the front section of the oscillator causing excessive RF leakage and poor frequency calibration.

7. Exert firm pressure on assembly toward the front panel to compress the RFI gaskets and raise assembly about 1/4 inch to clear mounting studs. Ease the assembly back and upwards to clear the tuning shafts. This completes removal.

NOTE

When re-installing RF Oscillator Assembly, loosen collar (6) on fine tune shaft. After installation, press collar and RFI gasket (3) firmly against front panel and secure collar setscrew.

A3A1A2 Removal Procedure

1. Remove eight 4-40 screws (46) securing cover plate to buffer housing.
2. Unsolder three leads connecting buffer board and two feed-through filters (31 and 35) and RF connector (32).
3. Remove two 6-32 screws (49) securing the buffer board to the housing.
4. Lift out buffer board, ensuring that attached probe does not bind in cavity opening.

SERVICE SHEET B (Cont'd)

NOTE

The buffer board has two adjustment slots for attaching to the housing. Refer to the adjustment procedure in Section V, paragraph 5-38, when reinstalling the buffer board.

A3Q1 Replacement Procedure

1. Unscrew transistor cap (21).
2. Remove transistor (20).
3. Clip new transistor leads as shown in Figure 8-74.
4. Re-insert transistor as shown in Figure 8-75. Replace transistor cap (21) including the two RFI plugs (22 and 23).
5. Connect power meter and sensor (HP 435A/8482A) to the Divider/Filter Buffer Amplifier output, A3A1J1 (32). Measure output power while tuning oscillator across band — it should always be within +0.5 to +4.5 dBm. If not, perform adjustment in paragraph 5-38.

A1 Assembly Removal and Disassembly
SERVICE SHEET A

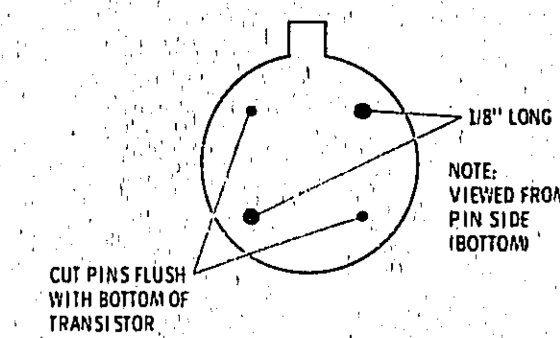


Figure 8-74. RF Oscillator Transistor Preparation

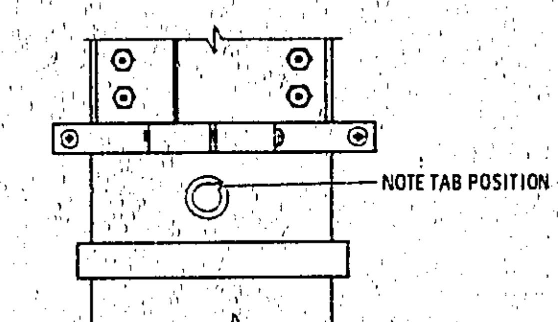


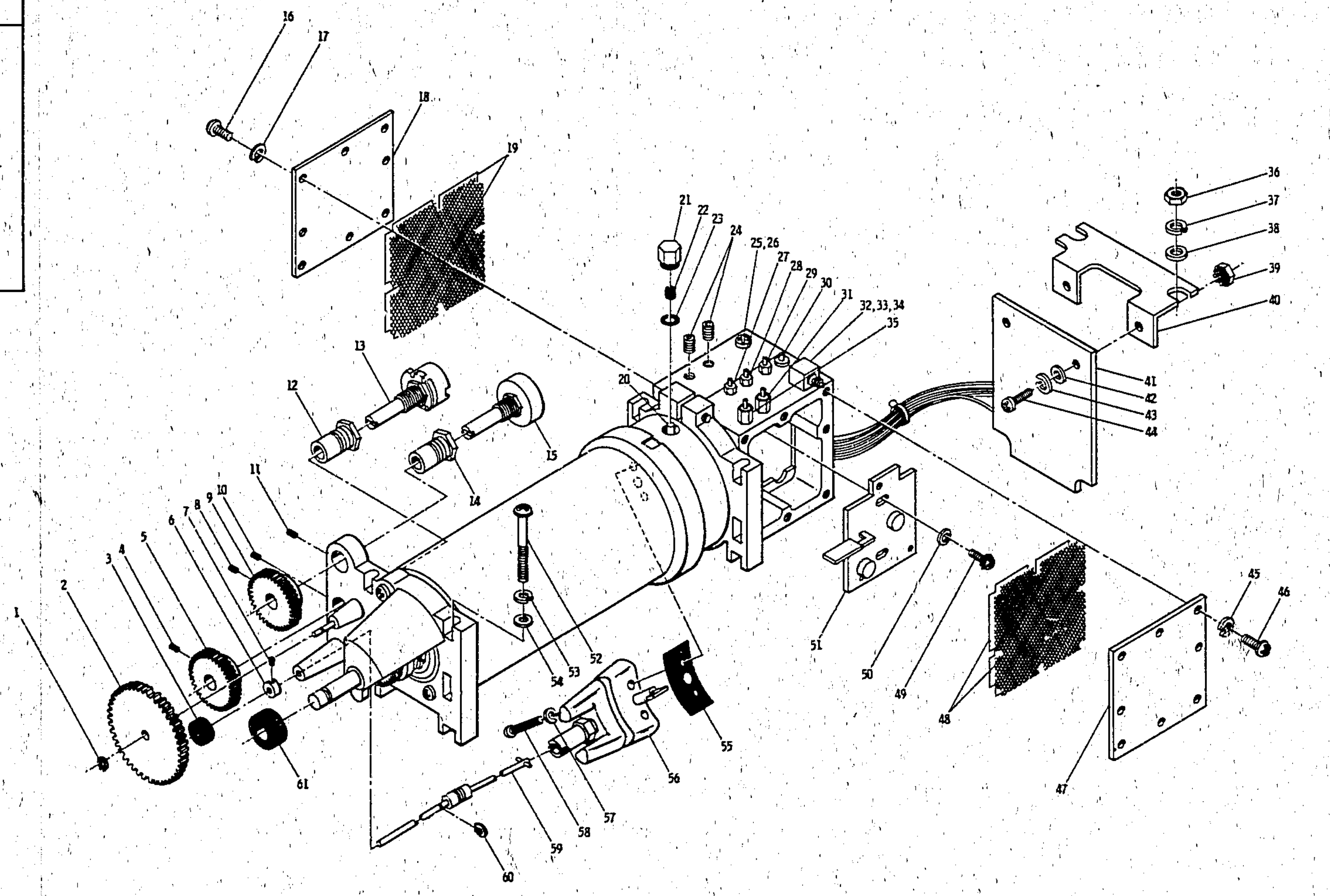
Figure 8-75. RF Oscillator Transistor Orientation

A3 RF Oscillator Assembly Legend (1 of 2)

Item Number	Reference Designation	Description
1	A3MP1	Retainer Ring
2	A3MP3	Spur Gear
3	MP59	RFI Gasket
4	A3MP17	Setscrew
5	A3MP4	Spur Gear
6	MP60	Retaining Collar
7	MP74	Setscrew
8	A3MP19	Setscrew
9	A3MP16	Spur Gear
10	A3MP19	Setscrew
11	A3MP19	Setscrew
12	A3MP6	Potentiometer Bushing
13	A3R2	Potentiometer, FM Gain Compensation
14	A3MP8	Potentiometer
15	A3R1	Potentiometer, Frequency Tune
16	A3A1MP13	Machine Screw
17	A3A1MP14	Lockwasher
18	A3A1MP5	Buffer Board Cover
19	A3A1MP4	RFI Plug
20	A3Q1	Transistor
21	A3MP9	Transistor Cap
22	A3MP7	RFI Plug
23	A3MP13	RFI Plug
24	A3A1MP1	Setscrew
25	A3A1MP3	Hex Nut
26	A3A1MP2	Machine Screw
27	A3A1FL4	Feedthru Capacitor
28	A3A1FL3	Feedthru Capacitor
29	A3A1C1	Feedthru Capacitor
30	A3A1MP17	Feedthru Terminal
31	A3A1FL5	Feedthru Capacitor
32	A3A1J1	RF Connector
33	A3A1MP12	Lockwasher
34	A3A1MP11	Hex Nut
35	A3A1FL6	Feedthru Capacitor
36	MP96	Hex Nut
37	MP95	Lockwasher
38	MP94	Flatwasher
39	A3A4MP5	Hex Nut
40	A3A4MP1	P.C. Board Support
41	A3A4	Connector Board Assembly
42	A3A4MP4	Lockwasher
43	A3A4MP3	Flatwasher
44	A3A4MP2	Machine Screw
45	A3A1MP15	Lockwasher
46	A3A1MP16	Machine Screw
47	A3A1MP5	Buffer Board Cover
48	A3A1MP6	RFI Gasket
49	A3A1MP7	Machine Screw
50	A3A1MP8	Lockwasher

A3 RF Oscillator Assembly Legend (2 of 2)

Item Number	Reference Designation	Description
51	A3A1A2	RF Divider/Filter Buffer Amplifier Assembly
52	A3MP22	Machine Screw
53	A3MP24	Lockwasher
54	A3MP23	Flatwasher
55	A3MP5	RFI Gasket
56	A3MP10	Oscillator Fine Tune Assembly
57	A3MP12	Lockwasher
58	A3MP11	Machine Screw
59	A3MP25	Fine Tune Shaft
60	A3MP26	Retaining Ring
61	MP58	RFI Gasket



B

Figure 8-76. A3 RF Oscillator Illustrated Parts Breakdown

SERVICE SHEET C

A8 Assembly Removal and Dial Cord Replacement Procedure

A8 Dial Removal Procedure

1. Remove instrument top and bottom covers, top trim strip, and front panel window. (See Service Sheet G.)

2. Remove four long screws (19) that secure dial assembly. References are to Figure 8-79.

3. Remove dial assembly.

NOTE

If both dial cords are to be replaced, begin with the frequency tune (cursor) drive cord first then proceed to installation of the range drum dial cord.

Replacing the Frequency Tune (Cursor) Drive Dial Cord

4. Remove nylon fillister head screw holding dial cord to frequency tune drive hub (see View A). Using a 0.035 allen wrench, remove nylon setscrew (26) in cursor, and unstring dial cord from cursor and dial cord retainer (43). Discard old dial cord.

5. Cut 40 inches of dial cord (HP 8300-0012) to be used for the frequency (cursor) drive.

6. Thread dial cord through dial cord retainer and tie a figure-eight knot in end of cable as shown in Detail A.

7. With knotted end of cord toward the center of the hub, insert dial cord retainer into the untapped hole in the frequency tune drive hub as shown in View A. Press dial cord knot into the hub and pull the cord tight by hand.

8. Thread frequency dial cord around the appropriate frequency pulleys M1, M2, M3, M4, M5, and M6 as shown in Figure 8-77. Rotate hub (40) clockwise (as viewed from rear of assembly) 3¼ turns. Feed cord under those windings and through the long slit in the hub. Secure the end of the cord with a nylon fillister head screw and tighten until the head of the screw is below the surface of the hub. Cut off excess dial cord.

9. Rotate frequency tune drive hub one-half additional turn for a total of 3-3/4 turns. At the extreme right hand side of the cursor track, attach cursor (25) to dial cable with a nylon setscrew (26). A 0.035 inch allen wrench is required.

SERVICE SHEET C (Cont'd)

NOTE

If a new nylon setscrew is used, the two tabs on the top must be clipped off so that the top of the setscrew, when tightened, is recessed below the surface of the cursor. This allows the cursor to clear the front casting of the instrument on final installation.

10. Refer to paragraph 5-46, Section V, for installation and adjustments.

Replacing the Range Drum Dial Cord

11. Remove two screws (17) in the back of dial cover (18) and three screws (20) in top of the cover. Remove cover.

12. Remove nylon fillister head screws (44) in detent hub (47) and in range drum drive hub (41). Unstring old dial cord from retainer (43) and discard.

13. Cut a 36-inch length of dial cord (HP 8300-0012) to be used for the range drum drive.

14. Thread dial cord through dial cord retainer and tie a figure-eight knot in end of cable as shown in View A.

15. With knotted end toward center of hub, insert dial cord retainer into the untapped hole in the range drum drive hub as shown in View A. Press dial cord knot into hub and pull cord tight by hand.

16. Rotate dial scale to show the 0.5 to 1.0 MHz scale. While holding drum drive hub as shown in Figure 8-78, thread dial cord once around hub, then around pulleys N1 and N2. Make two full turns counterclockwise around the detent hub and press dial cord into the slot (see View B). Continue one full turn counterclockwise and over pulleys N3 and N4. Wrap the cord two and one-half turns counterclockwise around the range drum drive hub, threading the cord under the lines running to pulleys N1 and N4 each time. Feed cord under all windings through the long slot in the hub. Secure the end of the cord with a nylon fillister head screw (44) and tighten until the head of the screw is below the surface of the hub. Cut off excess dial cable.

NOTE

The range dial cord should be somewhat slack since it will be tightened when the nylon screw is inserted into detent hub. Even when this screw is inserted and tightened there should be some slack in the cable.

SERVICE SHEET C (Cont'd)

17. Install sheet metal cover (18) making sure the two spiral pins that support the two pulleys on back of assembly protrude through two holes in back of the cover. Reinstall two screws (17) in back of cover and three screws (20) in top of cover.

18. Install nylon fillister head screw (44) in detent hub to secure dial cord. Tighten this screw securely.

19. Check position of the range drum dial. The scale should be positioned so the extreme bottom of the scale is just covered by the dial bezel (27). If necessary, loosen the two setscrews (1) in detent hub and rotate drum to proper position. Retighten setscrews.

20. Refer to paragraph 5-46, Section V, for installation and adjustments.

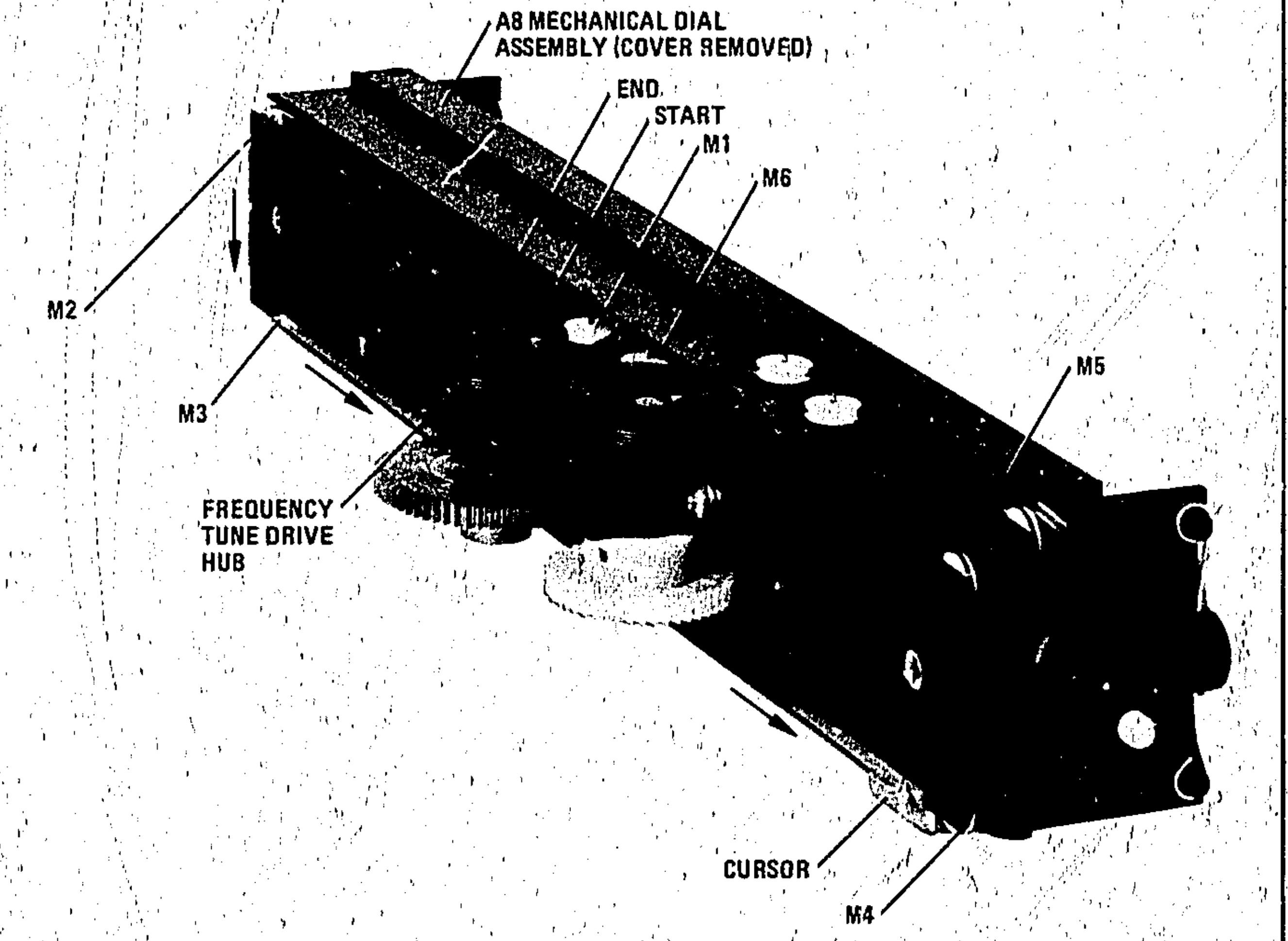


Figure 8-77. Frequency Tune Dial Cord Winding

A3 Assembly Removal and Disassembly
SERVICE SHEET B

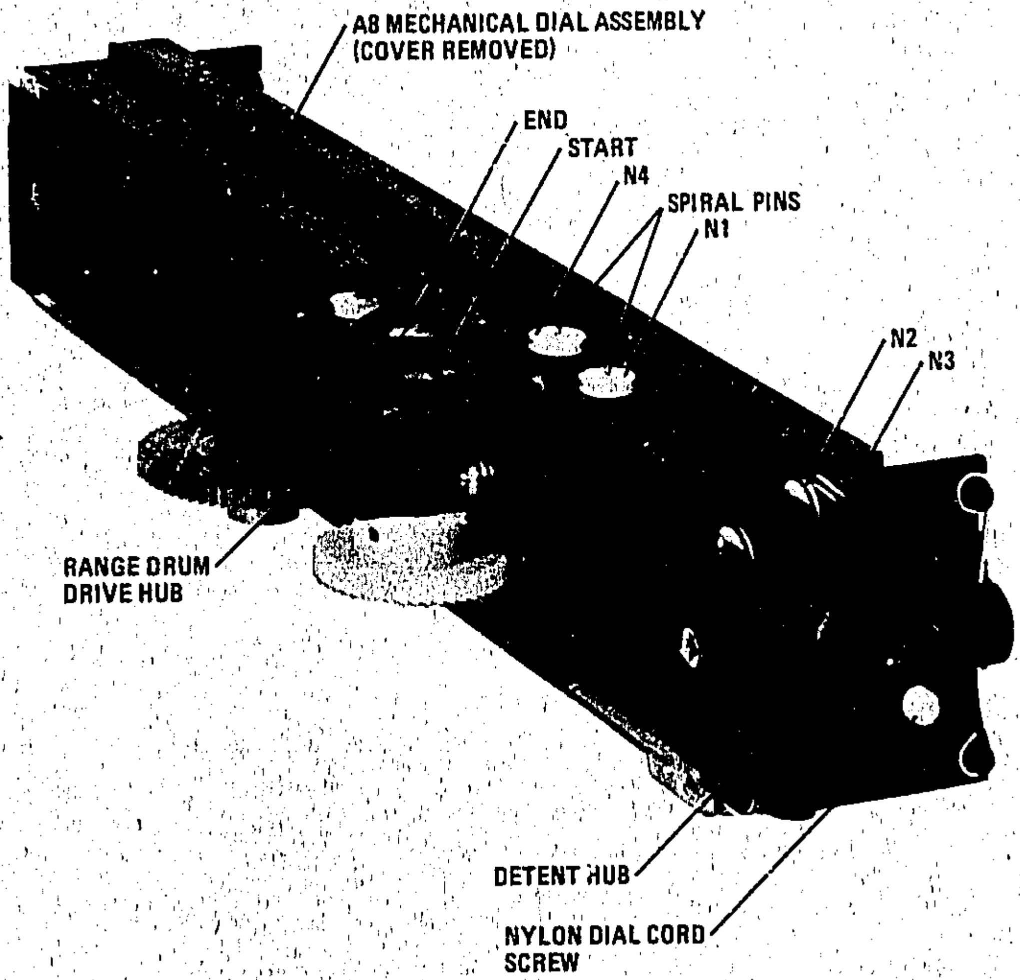


Figure 8-78. Range Drum Dial Cord Winding

A8 Mechanical Dial Assembly Legend

Item Number	Reference Designator	Description
1	A8MP36	Setscrew
2	A8MP37	Bushing Spacer
3	A8MP8	Cord Pulley M5
4	A8MP8	Cord Pulley N2
5	A8MP4	Spiral Pin
6	A8MP8	Cord Pulley N3
7	A8MP13	Left Drum Support
8	A8MP3	Detent Spring
9	A8MP1	Ball Bearing
10	A8MP26	Thrust Washer
11	A8MP12	Drum End Cap
12	A8MP8	Cord Pulley N1
13	A8MP10	Cursor Track
14	A8MP8	Cord Pulley N4
15	A8MP9	Dial Drum
16	A8MP7	Frequency Scale
17	A8MP31	Machine Screw
18	A8MP6	Dial Cover
19	A8MP34	Machine Screw
20	A8MP32	Machine Screw
21	A8MP8	Cord Pulley M3
22	A8MP14	Right Drum Support
23	A8MP8	Cord Pulley M1
24	A8MP5	Mechanical Dial Cord
25	A8MP15	Cursor
26	A8MP30	Nylon Setscrew
27	A8MP19	Dial Bezel
28	A8MP33	Machine Screw
29	A8MP8	Cord Pulley M1
30	A8MP8	Cord Pulley M6
31	A8MP17	Flat Washer
32	A8MP35	Flat Washer
33	A8MP23	Setscrew
34	A8MP11	Cursor Drive Gear
35	A8MP25	Flat Washer
36	A8MP22	Lock Washer
37	A8MP20	Machine Screw
38	A8MP2	Range Drum Drive Gear
39	A8MP17	Flat Washer
40	A8MP16	Frequency Tune (Cursor) Drive Hub
41	A8MP16	Range Drum Drive Hub
42	A8MP24	Setscrew
43	A8MP28	Dial Cord Retainer
44	A8MP29	Nylon Screw
45	A8MP21	Machine Screw
46	A8MP8	Cable Pulley M4
47	A8MP18	Range Drum Detent Hub

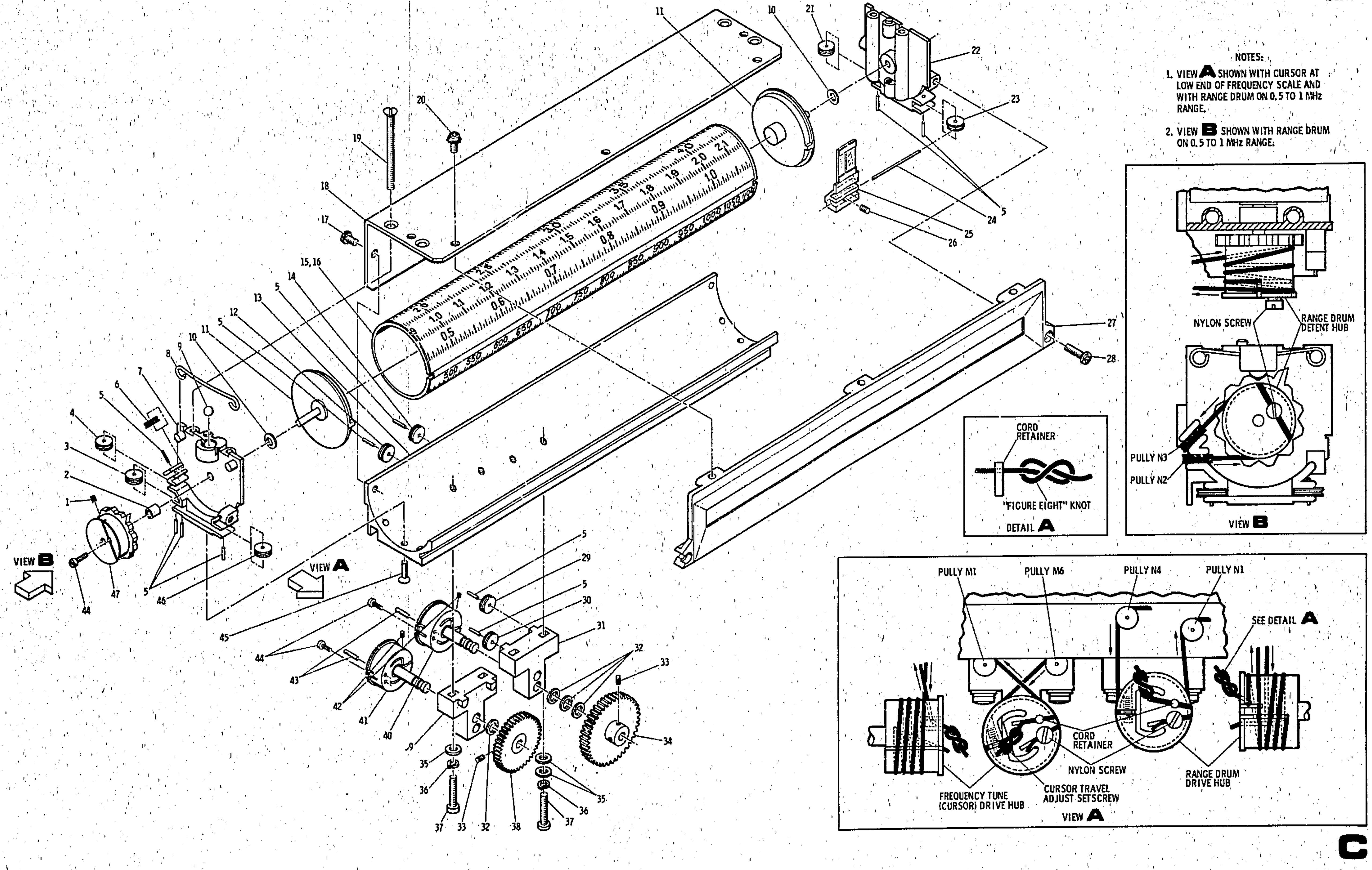


Figure 8-79. A8 Mechanical Dial Assembly Illustrated Parts Breakdown

SERVICE SHEET D

A9 Assembly Removal Procedure

1. Set PEAK DEVIATION and RANGE switches fully counterclockwise.
2. Remove PEAK DEVIATION and RANGE switch knobs. The knobs are secured to their shafts with allen screws in the knobs.
3. Place instrument upside down and remove bottom cover (see Service Sheet G).
4. Loosen coupling between RANGE switch shaft and A10 Divider/Filter Assembly.
5. Disconnect cable A9W1 from A7J1 on the FM Shaping Assembly.
6. Remove two nuts and lockwashers that secure A9 Assembly to front panel (located at switch bushings).
7. Remove connector A9P1 from jack on A13 Assembly. Lift out A9 Assembly.
8. Reinstall assembly by setting both switch shafts fully counterclockwise and reversing the procedure in steps one through seven.

NOTES

The detents of the A8 Assembly, the A9 Assembly and A10 Assembly must align and correspond to the same positions. Check that the actual RF output frequency agrees with the dial indication on all ranges.

Adjust the coupler longitudinally for minimum binding and tighten the setscrews very securely.

If the adjustable shaft has been loosened or if the A9 Assembly has been disassembled, proper alignment of S3 with respect to the rest of the assembly may be necessary. Refer to the procedure below for alignment.

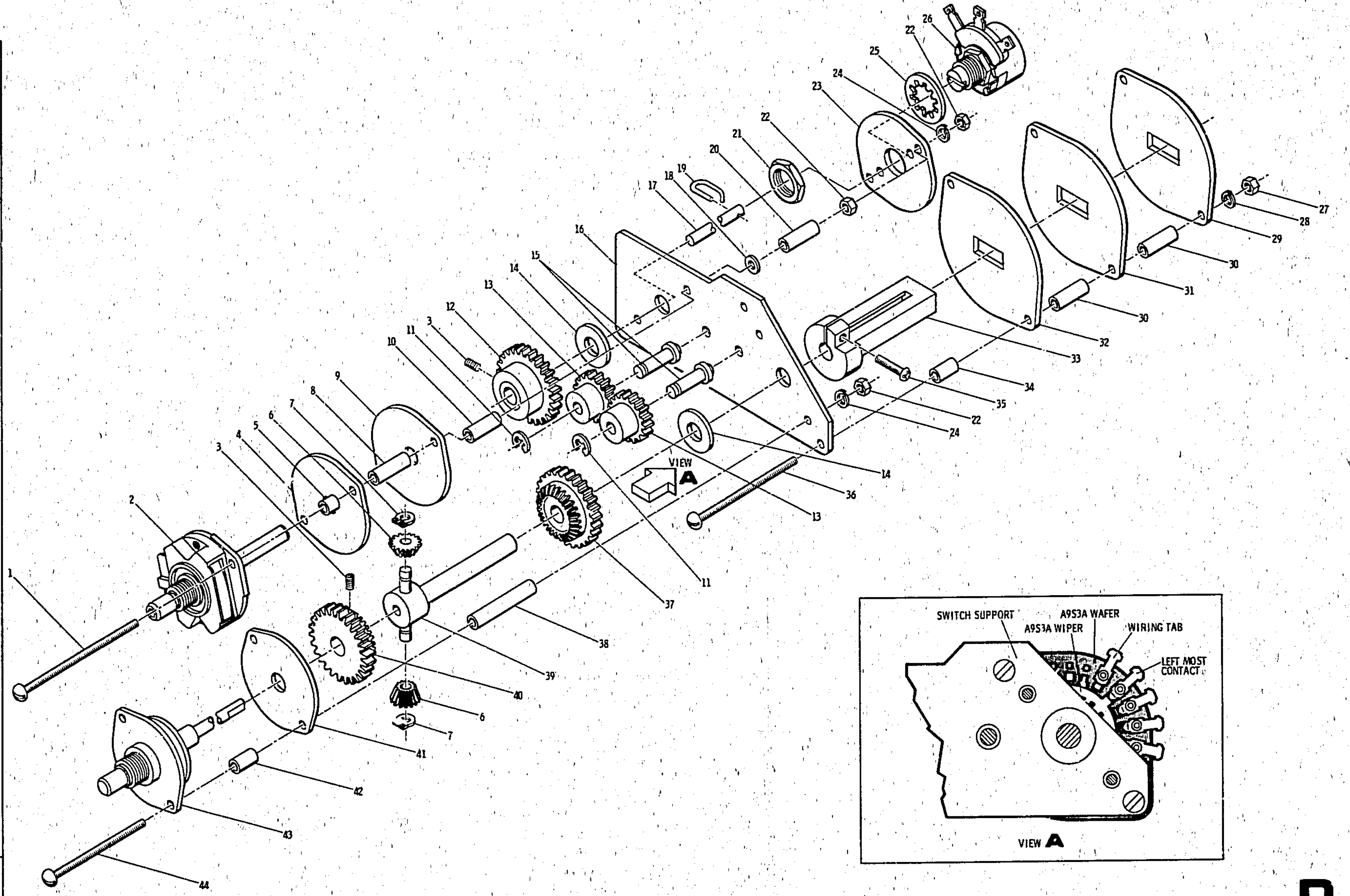
A9 Assembly Alignment Procedure

1. Turn both detents of the A9 Assembly fully ccw.
2. Loosen the screw (35) in the adjustable shaft (33), and while viewing the switch as shown in Figure 8-80, Detail A, rotate the shaft to align the single wiper tab on S3A front with the leftmost contact (connected to a single 94 wire).
3. Hold the adjustable shaft in position while tightening the screw (35) to fix its position.

A9 Peak Deviation and Range Switch Assembly Legend

Item Number	Reference Designator	Description
1	A9MP11	Machine Screw
2	(Note 1)	Peak Deviation Switch Detent
3	A9MP30	Setscrew
4	A9S1A	(Note 1)
5	A9MP12	Spacer
6	A9MP3	Planet Gear
7	A9MP1	Retainer Ring
8	A9MP13	Spacer
9	A9S1B	(Note 1)
10	A9MP14	Spacer
11	A9MP31	Retainer Ring (P/O A9MP8)
12	A9MP2	Spur Gear
13	A9MP32	Spur Gear (P/O A9MP8)
14	A9MP6	Flat Washer
15	A9MP33	Gear Support (P/O A9MP8)
16	A9MP8	Switch Support (Includes A9MP31, A9MP32, and A9MP33)
17	(Note 1)	Peak Deviation Vernier Shaft
18	A9MP15	Flat Washer
19	A9MP7	Coupler
20	A9MP16	Spacer
21	A9MP18	Hex Nut
22	A9MP17	Hex Nut
23	A9MP19	Potentiometer Support
24	A9MP21	Lockwasher
25	A9MP20	Lockwasher
26	A9R1	Potentiometer
27	A9MP22	Hex Nut
28	A9MP23	Lockwasher
29	A9S3C	(Note 1)
30	A9MP24	Spacer
31	A9S3B	(Note 1)
32	A3S3A	(Note 1)
33	A9MP9	Adjustable Shaft
34	A9MP25	Spacer
35	A9MP29	Machine Screw
36	A9MP26	Machine Screw
37	A9MP5	Combination Gear
38	A9MP27	Spacer
39	A9MP10	Switch Shaft
40	A9MP4	Combination Gear
41	A9S2A	(Note 1)
42	A9MP28	Spacer
43	(Note 1)	Range Switch Detent
44	A9MP11	Machine Screw

Note 1. Order by description from manufacturer number 76854, Table 6-4.



D

Figure 8-80. A9 Peak Deviation and Range Switch Assembly Illustrated Parts Breakdown

SERVICE SHEET E

A10 Assembly Removal and Disassembly Procedure

A10 Casting Cover Removal

1. Place instrument right side up and remove top cover (see Service Sheet G).
2. Remove fourteen pan-head screws (with lockwashers) that secure casting cover to casting (screws marked with asterisk —*— on cover).

NOTE

Note the location of the screws. The long screws vary in length.

3. Lift cover from casting.

A10A2 Removal

4. Remove twelve pan-head screws (with lockwashers) that secure A10A2 Assembly to casting. Remove A10A2 RF Divider Assembly and A10A3 Riser Assembly by lifting at the riser.

NOTES

The A10A2 Assembly can be extended for service by removing the A10A3 Riser Assembly from A10A2 and installing A10A2 in the riser socket (A10A1XA10A3A and B). Remove riser evenly to avoid cracking the connector.

When replacing transistors on A10A2, assure that the cans will not contact the casting top cover.

A10A1 Access

5. Remove four pan-head screws (with lockwashers) that secure casting center section to casting.
6. Remove three power supply circuit boards (A18, A20, and A22) that are between A10 Assembly and rear panel.
7. Remove casting center section.

NOTE

The A10A1 Assembly can be checked and adjusted by installing the A10A2 Assembly in the riser socket (A10A1XA10A3A and B) and reinstalling the power supply circuit boards (A18, A20 and A22).

A10A1 Removal

8. Turn instrument upside down and remove bottom cover (see Service Sheet G).

SERVICE SHEET E (Cont'd)

CAUTION

While working with and around the semi-rigid coaxial cables in the generator, do NOT bend the cables more than necessary. Do NOT torque the RF connectors to more than 5 inch-pounds.

9. Remove FM circuit boards (A5 and A7) and the A3A4 Connector Board Assembly (see Service Sheet F).
10. Disconnect four semi-rigid coaxial cables from bottom of A10 Assembly (cable W3 at A10A1J3, cable W7 at A10A1J2, cable W6 at A10A1J1, and cable W8 at A10A1J4). A10A1J2 and J3 are located in area occupied by FM circuit boards. A10A1J1 and J4 are located in front of A26 Assembly.
11. Remove four hex nuts and lockwashers that secure coaxial connectors A10A1J1 through J4.
12. Turn instrument right side up. Unsolder three feedthroughs at rear center of A10A1 Assembly (located to right of two toroid inductors and to left of relay.

CAUTION

Be sure the terminals have been completely desoldered.

13. Remove the ten pan-head screws (with lockwashers) that secure A10A1 Assembly to casting. Remove A10A1.

NOTE

If necessary, the bottom casting cover can be removed by removing four pan-head screws (with lockwashers).

Reassembly

14. Reassemble A10 Assembly by reversing the procedures in steps one through 13.

A11 Assembly Removal Procedure

A11 Removal (Standard)

1. Remove bottom cover from instrument (see Service Sheet G).
2. Set MODULATION FREQUENCY to 400 Hz. Remove MODULATION FREQUENCY knob. The knob is secured to the shaft with allen screws.
3. Remove A11 Assembly by gently lifting the board extractor at rear of board and sliding assembly to the rear and out of chassis.
4. To connect A11 Assembly for service, place assembly on extender board and install in chassis. Reinstall MODULATION FREQUENCY knob with 400 Hz position toward top of instrument.

A11 Removal (Option 001)

1. Remove top and bottom covers from instrument (see Service Sheet G).
2. Set MODULATION FREQUENCY knob to 400 Hz (fixed). Remove MODULATION FREQUENCY knob, vernier knob, cursor disc and gear. The knobs are secured to the shafts with allen screws in the knobs.

CAUTION

When removing cursor disc and gear, gently slide it off the shaft to avoid damage to the disc.

3. Remove pan-head screw (with washer and lock washer) that secures A11 Assembly to A13 Mother Board Assembly. The screw is accessible from top of instrument.
4. Remove A11 Assembly by gently lifting the board extractor at rear of board and sliding assembly to rear and out of chassis.
5. To connect A11 Assembly for service, place assembly on extender board and install in chassis. Reinstall cursor disc and gear, MODULATION FREQUENCY knob and vernier knob. 400 Hz position should be toward top of instrument.

A11 Reinstallation

6. Reinstall A11 Assembly by reversing the procedures in steps one through four or five.

NOTE

Check variable frequency accuracy to assure that the vernier disc is in the proper position.

A9 Assembly Removal and Disassembly
SERVICE SHEET D

A10 Divider/Filter Assembly Legend

Item Number	Reference Designator	Description
1	A10MP14	Machine Screw
2	A10MP11	Lock Washer
3	A10A1MP7	Cam Housing Bushing
4	A10A1MP9	Cam Follower
5	A10MP12	Machine Screw
6	A10A1MP2	Detent Roller
7	A10A1MP3	Detent Spring
8	A10A1MP1	Detent Pin
9	A10A1MP8	Cam Cover
10	A10A1MP4	Cam Shaft
11	A10A1MP13	Setscrew
12	A10MP17	Hex Nut
13	A10MP16	Lock Washer
14	A10A1MP12	Clamp Support
15	A10A1FL1-3	Feed Thru Filter
16	A10A1MP10	Slider Clamp
17	A10MP12	Machine Screw
18	A10MP8	Spring Shield No. 4
19	A10MP12	Machine Screw
20	A10A3	Riser Assembly
21	A10A3XA10A2A	P.C. Edge Connector
22	A10A3XA10A2B	P.C. Edge Connector
23	A10MP1	Yellow P.C. Board Guide
24	A10MP2	Green P.C. Board Guide
25	A10MP3	Blue P.C. Board Guide
26	A10MP9	D/F Top Cover Casting
27	A10MP11	Lockwasher
28	A10MP18	Machine Screw
29	A10MP18	Machine Screw
30	A10MP11	Lock Washer
31	A10MP15	Machine Screw
32	A10MP11	Lock Washer
33	A10MP14	Machine Screw
34	A10MP11	Lock Washer
35	A10A1MP11	Machine Screw
36	A10MP4	RFI Braid
37	A10MP13	Machine Screw
38	A10MP11	Lock Washer
39	A10A2	RF Divider Assembly
40	A10MP10	D/F Center Casting
41	A10MP5	Spring Shield No. 1
42	A10MP12	Machine Screw
43	A10MP7	Spring Shield No. 3
44	A10MP12	Machine Screw
45	A10MP6	Spring Shield No. 2
46	A10A1MP11	Machine Screw
47	A10A1	RF Filter Assembly
48	A10MP4	RFI Braid
49	A10A1MP6	D/F Bottom Cover Casting
50	A10A1MP5	Cam Follower Shaft

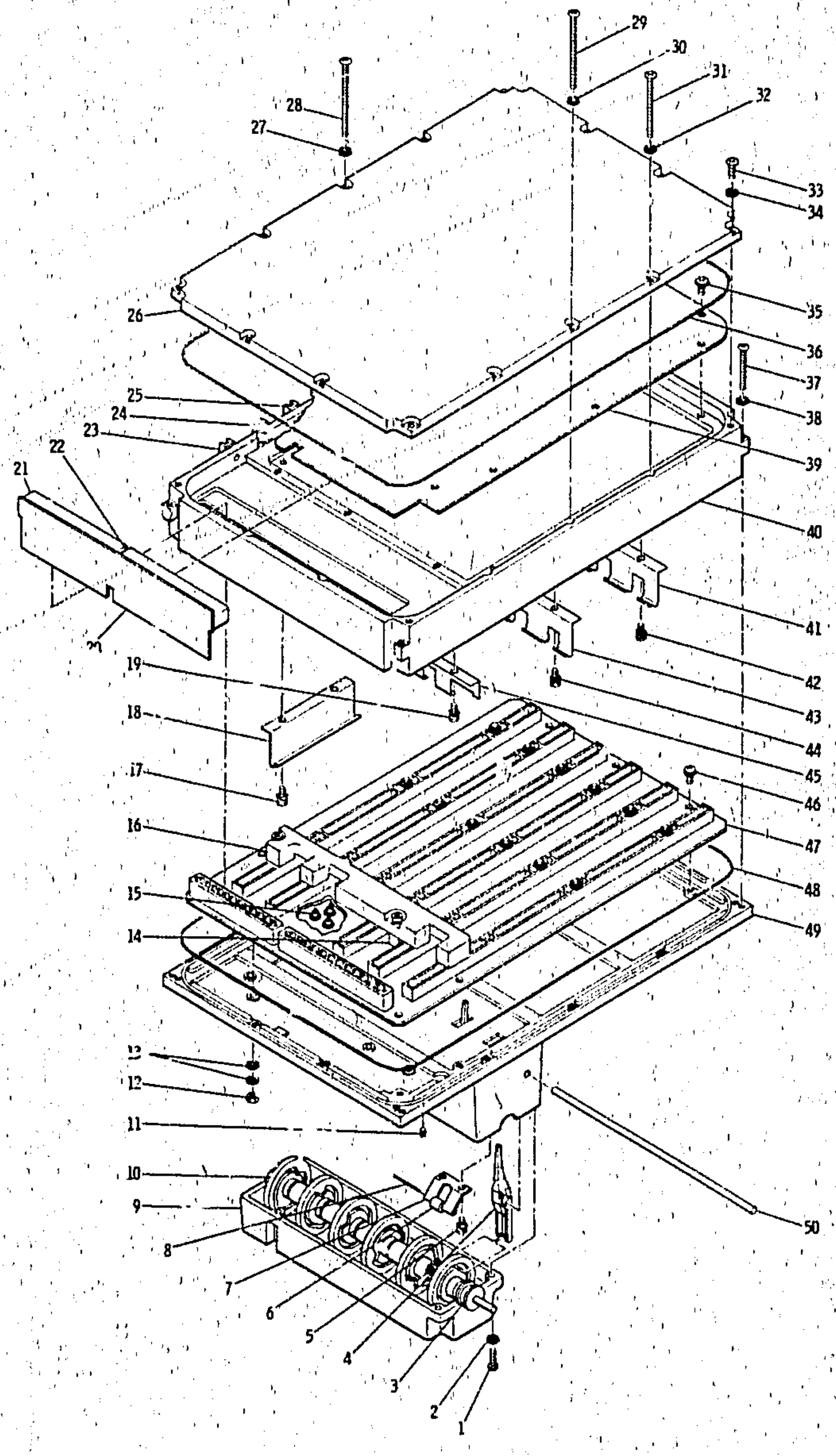


Figure 8-81. A10 Divider/Filter Assembly Illustrated Parts Breakdown

A11 Variable Frequency Modulation Oscillator Assembly (Option 001) Legend

Item Number	Reference Designator	Description
1	A11MP18	Flat Washer
2	A11A1MP3	Spur Gear
3	A11A1MP5	Setscrew
4	A11MP16	Flat Washer
5	A11A1S1	Rotary Switch
6	A11A1MP5	Setscrew
7	A11MP3	Spur Gear
8	A11MP17	Variable Audio Oscillator Insulator
9	A11MP8	Machine Screw
10	A11MP4	Audio Oscillator Cover
11	A11MP12	Nylon Glide
12	A11MP11	Hex Nut
13	MP93	Flat Washer
14	MP92	Lock Washer
15	MP91	Machine Screw
16	A11C1	Variable Capacitor
17	P/O A11	Variable Audio Oscillator Assembly
18	A11MP7	Bushing Spacer
19	A11MP10	Lock Washer
20	A11MP5	Audio Oscillator Cover Support
21	A11MP9	Machine Screw
22	A11MP10	Lock Washer
23	A11MP5	Audio Oscillator Cover Support
24	A11MP8	Machine Screw
25	A11MP6	Audio Oscillator Back Cover
26	A11MP8	Machine Screw
27	A11A1MP6	Setscrew
28	A11A1MP2	Spur Gear
29	A11MP19	Flat Washer
30	A11A1MP1	Gear Sprocket Housing
31	A11MP15	Lock Washer
32	A11MP14	Hex Nut
33	A11A1MP4	Audio Oscillator Shaft
34	A11MP18	Flat Washer
35	A11A1MP5	Setscrew
36	A11A1MP3	Spur Gear

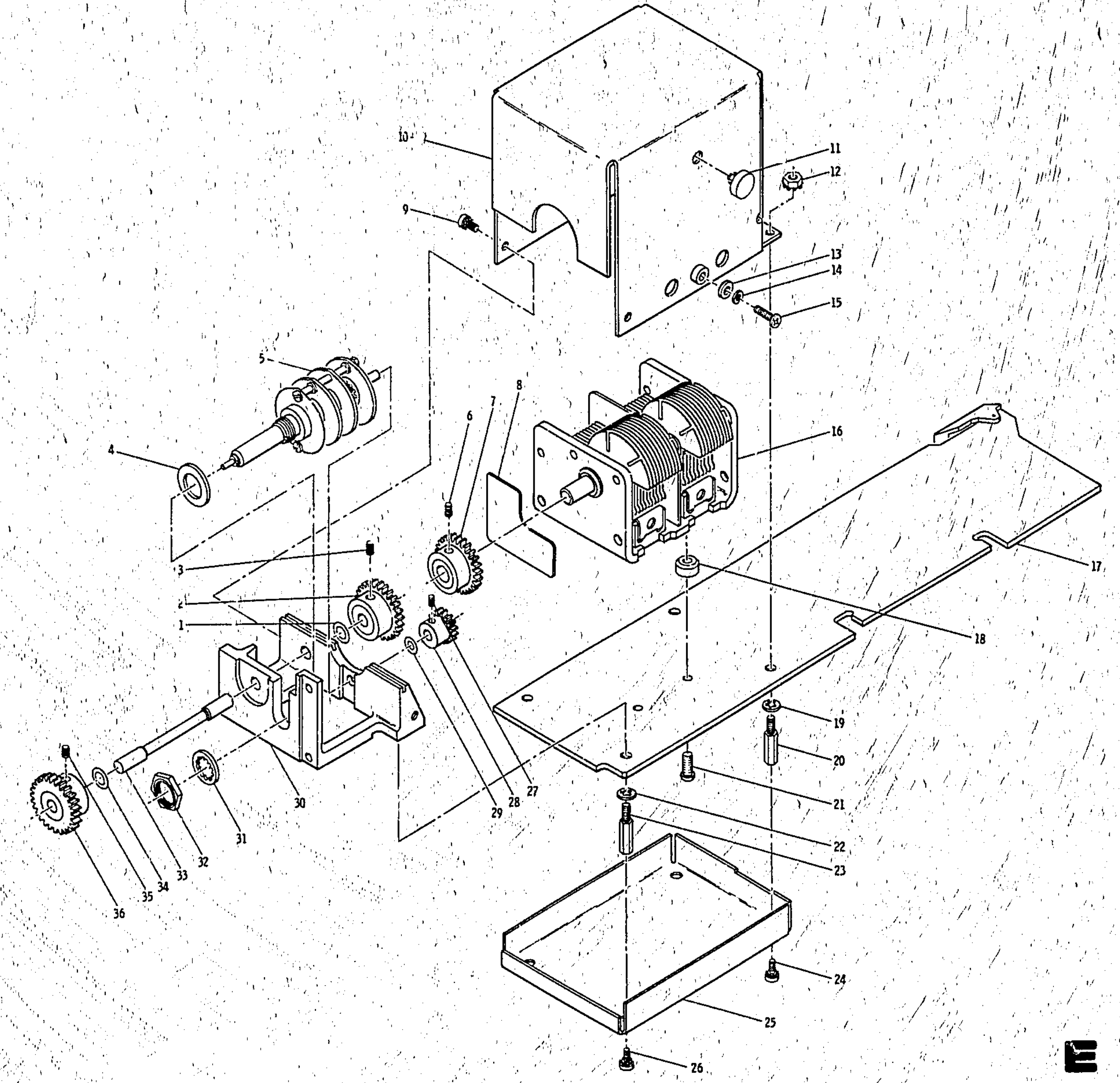


Figure 8-82. A11 Variable-Frequency Modulation Oscillator (Option 001) Illustrated Parts Breakdown

SERVICE SHEET F

A26 Assembly Removal and Disassembly Procedure

A26A2 and A26A4 Access

1. Place instrument right side up and remove top cover (see Service Sheet G).
2. To service either A26A2 or A26A4, gently lift board's extractors and reinstall it on extender board.
3. Reassemble by reversing procedures in steps one and two.

A26A1 and A26A3 Access

1. Place instrument upside down and remove bottom cover (see Service Sheet G).

CAUTION

While working with and around the semi-rigid coaxial cables in the generator, do NOT bend the cables more than necessary. Do NOT torque the RF connectors to more than 5 inch-pounds.

2. Remove ten pan-head screws (with lockwashers) that secure casting bottom cover to the casting.

WARNING

The RFI gasket on casting cover may have sharp edges and may cause personal injury if not handled with care.

3. Lift cover from casting, noting the orientation of the RFI gasket under the cover.

NOTE

Do not attempt to replace components on the A26A1 and A26A3 assemblies without removing them.

A26A1 and A26A3 Removal

4. Remove two pan-head screws (with washers) that secure microcircuit amplifier A26U1 or U2 to casting.
5. Remove A26U1 or U2.
6. Remove four pan-head screws (with lockwashers) that secure heat sink to the casting.
7. Remove pan-head screws (with lockwashers) that secure the circuit board to the casting. (For Option 002, remove 4 pan-head screws that secure the circuit board to A26A1MP1.)
8. Disconnect two coaxial cables from casting connectors and remove nuts and washers that secure cable connectors to casting.
9. To replace components mounted on the circuit board, tilt the board up while sliding it to the rear.
10. To replace or remove the circuit board, label the wires soldered to the board before unsoldering them.
11. Reassemble by reversing procedures in steps one through 10.

A26 Assembly Removal

1. Place instrument upside down and remove bottom cover (see Service Sheet G).

CAUTION

While working with and around the semi-rigid coaxial cables in the generator, do not bend the cables more than necessary. Do NOT torque the RF connectors to more than 5 inch-pounds.

2. Disconnect 4 semi-rigid coaxial cables (W6, W7, W8, and W10) from the front of the A26 Assembly.
3. Place instrument right side up and remove A26A2 and A26A4 assemblies by gently lifting their P.C. board extractors.
4. Remove six allen-head screws (with lock washers) from the inside of the A26 casting.
5. Disconnect A16P1, and remove A18, A20, and A22 Regulator Assemblies by gently lifting their board extractors.
6. Slide A26 casting toward top of instrument until A26A5 Riser Assembly no longer mates with its connector (A17XA26A5).
7. Remove the two pan-head screws holding the A26A5 Riser Assembly to the A26 casting module. Disconnect Riser by pulling it gently away from the casting.
8. Slide the A26 Assembly toward the top of the instrument until it is removed.
9. Reinstall the A26 Assembly by reversing the procedures in steps one through eight.

A26 AM/AGC and RF Amplifier Assembly Legend (1 of 2)

Item Number	Reference Designator	Description
1	A26MP34	Machine Screw
2	A26MP48	Machine Screw
3	A26MP25	Machine Screw
4	A26MP27	Machine Screw
5	A26MP28	Lock Washer
6	A26MP29	Flat Washer
7	A26U2	Amplifier
8	A26MP34	Machine Screw
9	A26MP33	Heat Sink
10	A26MP43	Machine Screw
11	A26A3	Modulator Assembly
12	A26W3	Coaxial Cable
13	A26MP25	Machine Screw
14	A26MP45	Machine Screw
15	A26MP6	Modulator Filter Cover
16	A26MP3	RFI Gasket
17	A26MP24	Machine Screw
18	A26MP9	Bottom Module Cover
19	A26MP4	RFI Gasket
20	A26MP16	Machine Screw
21	A26MP15	Coaxial Cap
22	A26MP17	Hex Nut
23	A26MP18	Lock Washer
24	A26MP8	Casting
25	A26MP19	Machine Screw
26	A26A5	Riser Assembly
27	A26MP20	PC Edge Connector
28	A26MP11	Brown P.C. Board Guide
29	A26MP47	Lock Washer
30	A26J1	RF Connector
31	A26W4	Coaxial Cable
32	A26A4	AGC Amplifier Assembly
(32)	A26A4	AGC Amplifier Assembly (Option 002)
33	A26MP22	P.C. Edge Connector
34	A26A2	AM Offset and Pulse Switching Assembly
35	A26MP21	Machine Screw
36	A26A6	AM Mother Board Assembly
37	A26MP13	Green P.C. Board Guide
38	A26MP12	Yellow P.C. Board Guide
39	A26MP41	Hex Nut
40	A26MP42	Lock Washer
41	A26MP39	Hex Nut
42	A26MP40	Lock Washer
43	A26MP46	Machine Screw
44	A26MP5	Access Cover
45	A26MP1	RFI Gasket
46	A26MP37	Hex Nut
47	A26MP38	Lock Washer
48	A26MP35	Hex Nut
49	A26MP36	Lock Washer

A26 AM/AGC and RF Amplifier Assembly Legend (2 of 2)

Item Number	Reference Designator	Description
50	A26MP2	RFI Gasket
51	A26MP10	Amplifier Filter Cover
(51)	A26A1MP1	Amplifier Filter Cover (Option 002)
52	A26MP44	Machine Screw
53	A26W1	Coaxial Cable
(53)	A26A1J1	RF Connector (Option 002)
54	A26W2	Coaxial Cable
(54)	A26A1W2	Coaxial Cable (Option 002)
55	A26A1	Power Amplifier & AGC Detector Assy
(55)	A26A1	Output Amplifier, Doubler, and AGC Detector Assy. (Option 002)
56	A26MP33	Heat Sink
57	A26U1	Amplifier
(57)	A26U1	Amplifier (Option 002)
58	A26MP32	Flat Washer
59	A26MP31	Lock Washer
60	A26MP30	Machine Screw
61	A26L6	Inductor
62	A26L3	Inductor
63	A26C12	Feed Thru Capacitor
64	A26L4	Inductor
65	A26C6	Feed Thru Capacitor
66	A26C8	Feed Thru Capacitor
67	A26L8	Inductor
68	A26L7	Inductor
69	A26C16	Feed Thru Capacitor
70	A26C14	Feed Thru Capacitor
71	A26C10	Feed Thru Capacitor
72	A26C17	Feed Thru Capacitor
73	A26C1	Feed Thru Capacitor
74	A26C3	Feed Thru Capacitor
75	A26L2	Inductor
76	A26L1	Inductor
77	A26R1	Resistor
78	A26C4	Feed Thru Capacitor
79	A26C2	Feed Thru Capacitor
80	A26L5	Inductor
81	A26C18	Feed Thru Capacitor
82	A26C9	Feed Thru Capacitor
83	A26C13	Feed Thru Capacitor
84	A26C15	Feed Thru Capacitor
85	A26C7	Feed Thru Capacitor
86	A26C5	Feed Thru Capacitor
87	A26C11	Feed Thru Capacitor

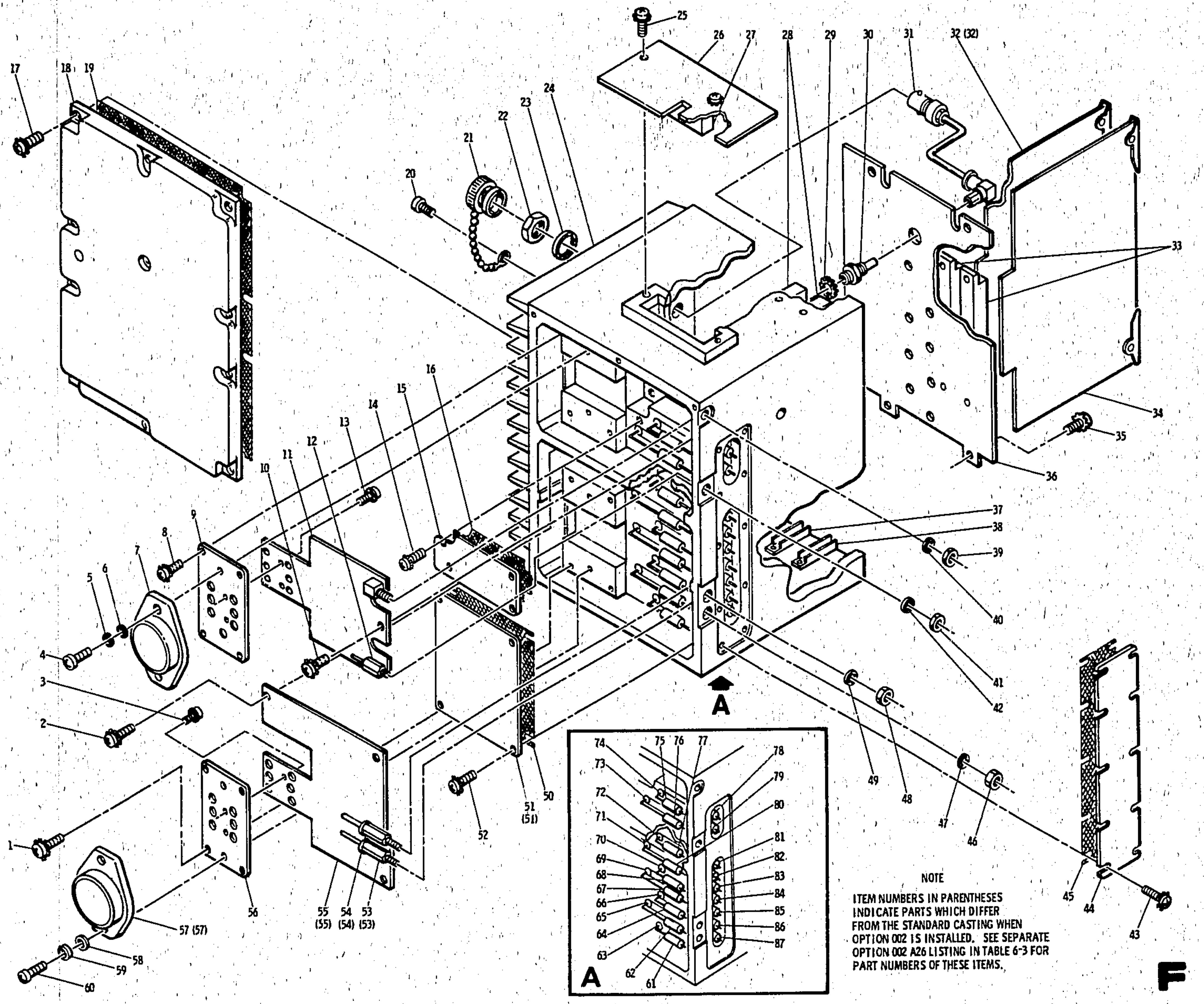


Figure 8-83. A26 AM/AGC and RF Amplifier Assembly Illustrated Parts Breakdown

SERVICE SHEET G

General Removal Procedures

Top and Bottom Cover Removal

CAUTION

Before attempting to disassemble or remove any part of the generator, remove line power from the instrument by disconnecting the instrument's line power cable from the line power outlet.

1. Remove top cover by removing four screws. Slide cover to the rear approximately two inches to disengage it from flanges at the instrument's front and rear. Lift it off.
2. Remove bottom cover by removing four screws. Slide cover to the rear approximately two inches to disengage it from flanges at the instrument's front and rear. Lift it off.

Circuit Board Removal

3. Remove any plug-in circuit board by gently lifting the board's extractors (the extractors are color-keyed to the guides at the board's edges).

M1 Removal

1. Remove top cover.
2. Remove trim strip (extrusion) that overlaps panel meter by removing two flat-head screws. Remove plastic front panel window by lifting it up and out.
3. Remove A6 Annunciator Assembly by removing two flat-head screws on front face of meter bezel and moving A6 Assembly to the rear.
4. To remove meter, disconnect two wires at rear of meter (white wire from negative post, red wire from positive post).
5. Push top edge of meter to the rear and lift meter from chassis.

NOTE

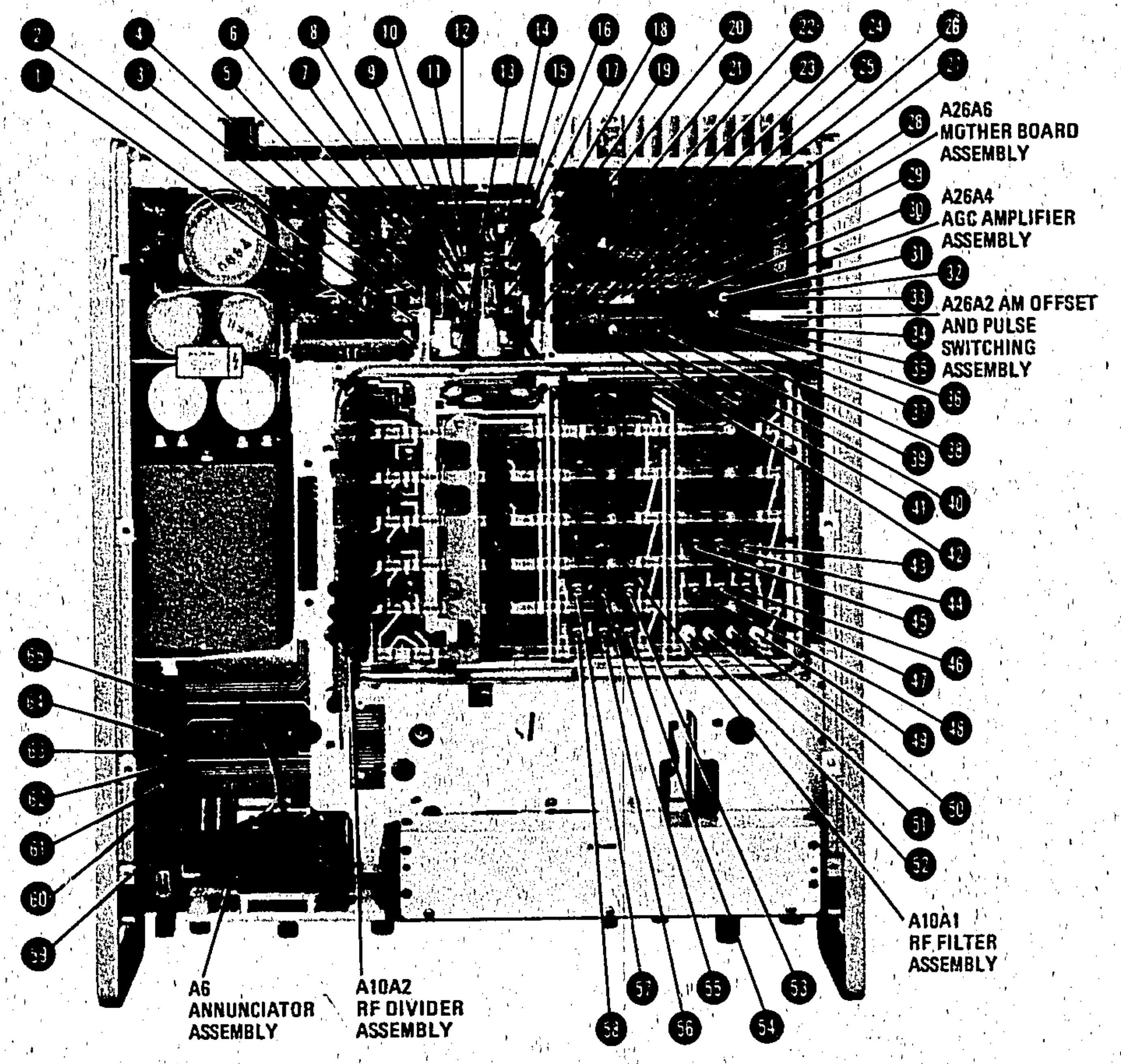
If necessary, loosen A11 Modulation Oscillator to provide clearance for meter (see Service Sheet E).

6. To install meter, reverse procedure given in steps one through six. To install Annunciator Assembly, reverse procedure given in steps one through four.

A2R14	62	METER OFFSET
A2R15	64	DET OFFSET
A2R28	61	METER DRIVE
A2TP1	60	GND
A2TP2	59	AC IN
A2TP3	65	DC OUT
A2TP4	63	
A10A1C81	52	
A10A1C82	51	
A10A1C83	50	
A10A1C84	49	
A10A1L31	45	
A10A1L32	44	
A10A1L33	43	
A10A1L37	57	
A10A1L38	55	
A10A1L39	53	
A10A1L40	48	
A10A1L41	47	
A10A1L42	46	
A10A1L43	58	
A10A1L44	56	
A10A1L45	54	

A18R2	2	−5.2 ADJ
A18TP1	5	F1
A18TP2	3	TH1
A18TP5	1	−5.2V
A18TP6	4	F1
A20R8	6	+44.6V ADJ
A20R16	9	+5.2V ADJ
A20TP1	8	F2
A20TP4	13	+44.6V
A20TP5	7	F2
A20TP6	11	F1
A20TP7	10	F1
A20TP10	12	+5.2V
A22R7	20	+20V ADJ
A22R19	17	−20V ADJ
A22TP1	18	F2
A22TP2	19	F2
A22TP4	21	+20V
A22TP6	15	F1
A22TP7	16	F1
A22TP9	14	−20V

A26A2R19	41	%AM
A26A2TP1	42	AM IN
A26A2TP2	40	GND
A26A2TP3	39	AM OUT
A26A2TP4	38	PUL IN
A26A2TP5	37	DET PUL
A26A2TP6	36	MOD PUL
A26A2TP7	35	MET
A26A2TP8	34	BW
A26A4R1	23	LVL
A26A4R2	22	DBLR LVL
A26A4R12	24	MET
A26A4R54	31	DBLR OFFSET
A26A4TP1	25	MET
A26A4TP2	26	DET
A26A4TP3	27	OVLD
A26A4TP4	28	VERN
A26A4TP5	29	GND
A26A4TP6	30	CQ1
A26A4TP7	32	DRIVER
A26A4TP8	33	MOD



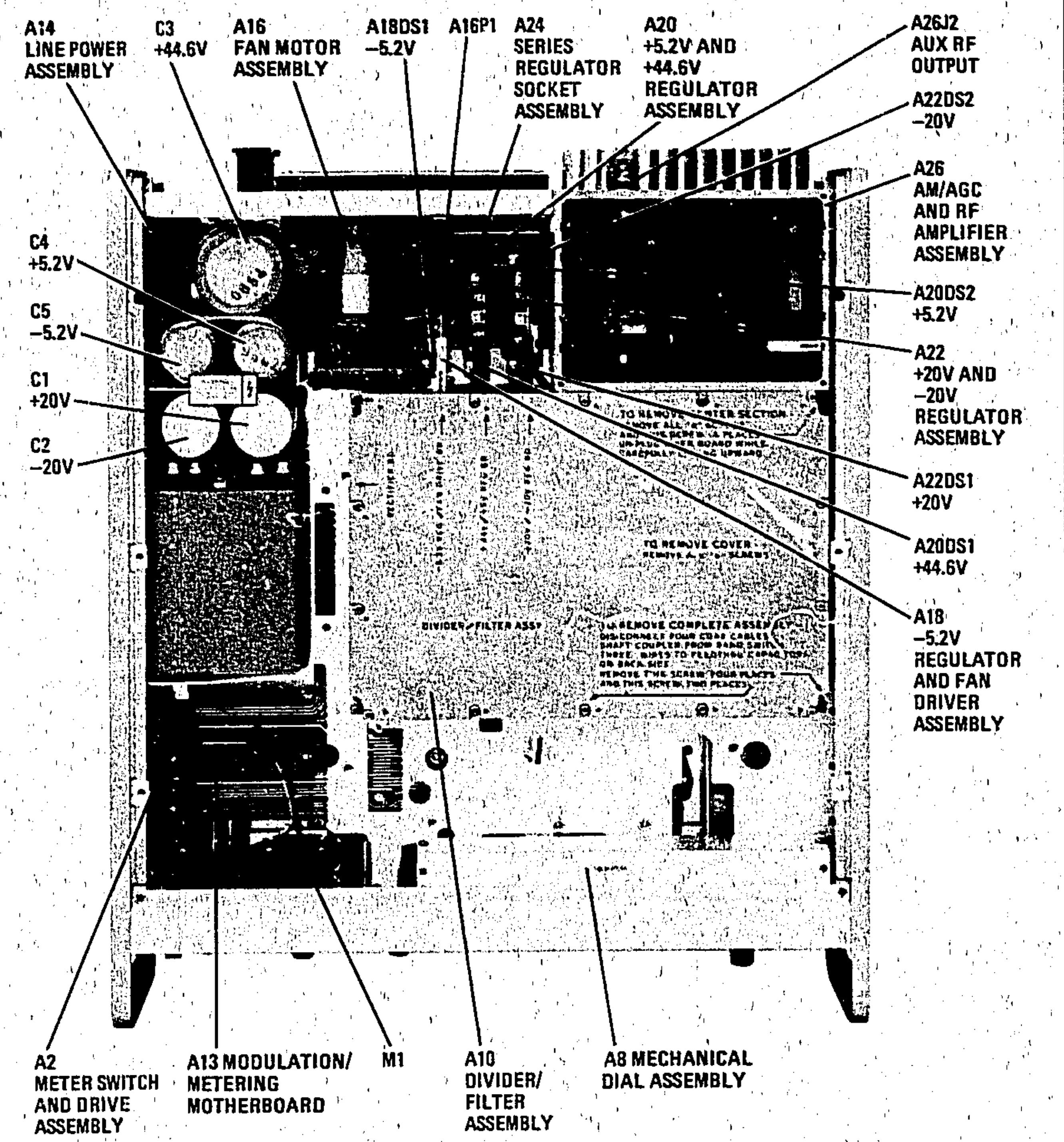


Figure 8-84. Top Internal Views (Options 001, 002, and 003 Shown)

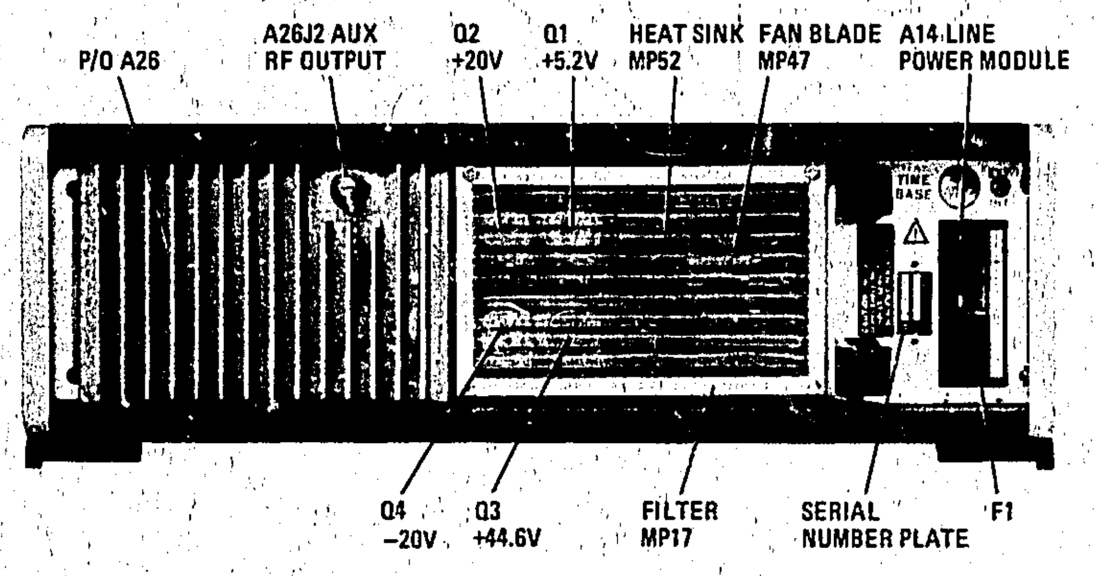


Figure 8-85. Rear Panel View

A1R1	40	
A1A1TP1	38	VERN
A1A1TP2	39	MET OUT
A3R1	37	FREQUENCY TUNE
A3R2	36	FREQ TUNE
A3A4R1	6	V_T ADJ
A3A4R2	4	LOW FM SENS
A3A4R3	3	MID FM SENS
A3A4R4	2	HI FM SENS
A3A4TP1	5	V_T
A3A4TP2	1	
A5R9	33	AMPLIFIER OFFSET
A5R23	31	BUFFER ADJ
A5TP1	7	GND
A5TP2	35	OUTPUT
A5TP3	34	+INPUT
A5TP4	32	−INPUT
A5TP5	30	FM BUFFER IN
A5TP6	28	BUFFER OUT
A7R12	20	POSITIVE SHAPING
A7R19	9	VARACTOR BIAS
A7R41	15	NEGATIVE SHAPING
A7TP1	8	GND
A7TP2	13	VARACTOR ANODE
A7TP3	19	VARACTOR CATHODE
A7TP4	23	+0.20 OVERLOAD

A9R1	27	PEAK DEVIATION VERNIER
A11C2	25	TRIMMER ADJ
A11C3	24	TRIMMER ADJ
A11C9	26	
A11R28	18	OSCILLATOR LEVEL
A11R35	17	AM-FM DRIVE ADJ
A11R40	11	AUDIO OUTPUT LEVEL
A11TP1	10	
A11TP2	12	
A11TP3	14	FM OUT
A11TP4	16	OSC OUT
A11TP5	21	AM OUT
A11TP6	22	GND
A13R3	29	FM CAL
A26U1	45	
A26U2	50	
A26W3	49	
A26A1C9	44	
A26A1J1	42	
A26A1R34	47	DET ADJ
A26A1TP1	48	DET
A26A1TP2	46	PK DET
A26A1W1	43	
A26A1W2	41	
A26A3J1	51	

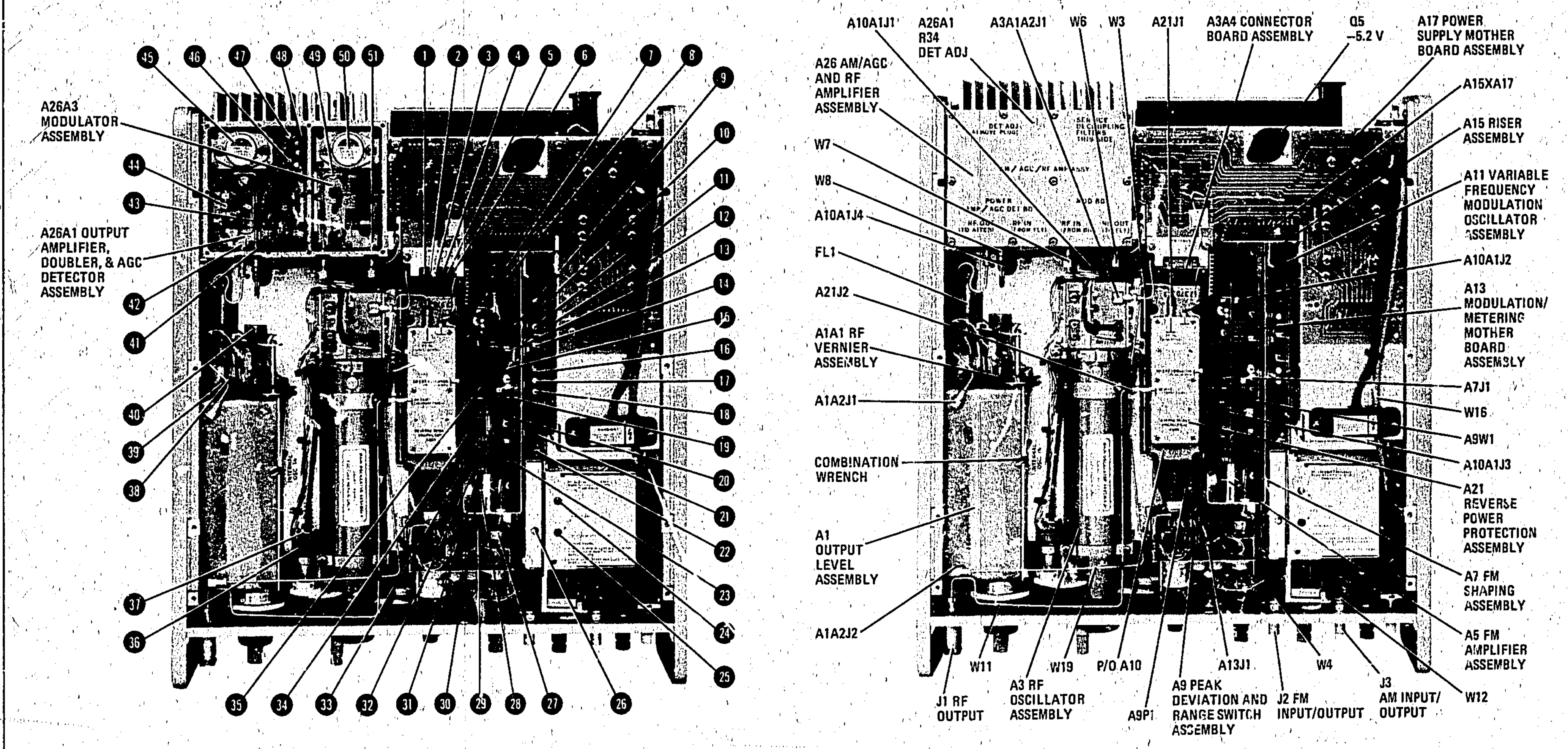


Figure 8-86. Bottom Internal Views (Options 001, 002, and 003 Shown)

MANUAL CHANGES

MANUAL CHANGES

MANUAL IDENTIFICATION

Model Number: 8640A

Date Printed: October 1976

Part Number: 08640-90114

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
1641U	1
1641U00516	1-2
1742U	1-3
1742U00716	1-4
1750U	1-5
1811U	1-6
1827U	1-7
1847U	1-8

Serial Prefix or Number	Make Manual Changes
1916U	1-9
1916U00866	1-10
1933U	1-11
2002U	1-12
2011U	1-13
2011U01006	1-14
2124U	1-15
2130U	1-16**

* NEW ITEM

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 the 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.

11 Aug 1981

HEWLETT PACKARD

Printed in U K.

ERRATA

Title Page:
Under SERIAL NUMBERS, change the first sentence to read:
"This manual applies directly to instruments with serial numbers prefixed 1602A, 1603A and 1624U."

Page 1-12, Table 1-1:
Under Pulse Modulation, add the following footnote to Pulse Repetition Rate:
"Pulse performance degrades below 500Hz repetition rates."

Page 1-13, Table 1-1:
Under GENERAL CHARACTERISTICS, change the Power Requirements specification to read:
"Power Requirements: 100 or 120 volts (+5%, -10%) from 48 to 440Hz or 220 or 240 volts (+5%, -10%) from 48 to 66Hz. 175VA max (Option 002:190VA max). 2.29m (7.5ft) power cable furnished with mains plug to match destination requirements."

Page 2-1, Paragraph 2-7:
Change the first sentence to read:
"The Model 8640A requires a power source of 100 or 120 volts (+5%, -10%) from 48 to 440Hz or 220 or 240 volts (+5%, -10%) from 48 to 66Hz, single phase."

Page 2-1, Figure 2-1:
Add the following warning after the third sentence:

WARNING

TO AVOID THE POSSIBILITY OF HAZARDOUS ELECTRICAL SHOCK, DO NOT OPERATE THIS INSTRUMENT AT LINE VOLTAGES GREATER THAN 126.5V ac WITH LINE FREQUENCIES GREATER THAN 66Hz. (LEAKAGE CURRENTS AT THESE LINE SETTINGS MAY EXCEED 3.5mA.)

Page 4-45, Paragraph 4-31:
Under SPECIFICATION, add the following footnote to Pulse Repetition Rate:
"Pulse performance degrades below 500Hz repetition rates."

Page 4-46, Paragraph 4-31:
In Step 2 under PROCEDURE, change the repetition rate to 500Hz.

Page 4-47, Paragraph 4-31:
In the table under step 6, change the first three Pulse Rate (Hz) entries to 500Hz.

Page 5-3, Table 5-1:
Add the following to Table 5-1:

COMPONENT	SERVICE SHEET	RANGE OF VALUES	BASIS OF SELECTION
A10A2C55	11	2.2pF	See Para 5-21h
A10A2R49-51	11	-------	See Para 5-21i

Page 5-3, Paragraph 5-21:
Add the following:

h. If A10A2U11 has been replaced, use an RF Spectrum Analyzer to check for low frequency spurious signals while tuned to 520MHz. The spurs will occur at approximately 80dBc between 5 and 30MHz. To supress the spur, add A10A2C55, 2.2pF, from A10A2U11 pin 8 to ground.

NOTE

A low-pass or notch filter at the input of the Spectrum Analyzer will prevent overdriving the input mixer with the signal generator fundamental.

i. A10A2R49-51 Selection. If A26U2 has been replaced, the second harmonic level at the RF OUPUT may rise out of specification on the low end of the 0.5 to 8MHz ranges with low vernier settings. If the second harmonic level is out of specification, increase the output attenuation pad formed by R49-51. To determine proper attenuation, insert a 1dB step attenuator in place of W7, between A10A1J2 and A26W3, RF IN (FROM DIV). Increase attenuation until harmonics are just within specified limits. Add the value of attenuation on the step attenuator to that presently installed on the A10A2 assembly and replace R49-51 with the new values from the table below. Total attenuation greater than 6dB is not recommended. Check harmonics, AUX RF OUTPUT and maximum RF OUTPUT power.

ATTENUATION	RESISTANCE		
	R49	R50	R51
2dB	12.1	422	422
3dB	17.8	287	287
4dB	23.7	237	237
5dB	31.6	178	178
6dB	38.3	147	147

NOTE

The attenuation should be no higher than necessary to bring a range's second harmonic within specification. Excessive attenuation may reduce the maximum RF OUTPUT level below +19dBm.

Page 5-28, Paragraph 5-40:
In Step 5, change A5TP2 to A5TP6.
Add the following as the first sentence in Step 8:
"Set FM to AC."

Page 6-5, Table 6-3:
A1A1R1. For recommended replacement, see Change 7.

Page 6-10 and 6-11, Table 6-3:
Change the part number for the A7 FM Shaping Assembly to 08640-60339
Replace appropriate A7 assembly listings with the following:

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7R13	0698-3155	2	RESISTOR 4.64K 1% .125W F TC=0+-100	16299	C4-1/8-TO-4641-F
A7R21	0698-3437	1	RESISTOR 133 1% .125W F TC=0+-100	16299	C4-1/8-TO-133R-F
A7R22	0757-0417	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-TO-562R-F
A7R23	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1961-F
A7R24	0757-0279	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-TO-3161-F
A7R25	0698-3154	1	RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-TO-4221-F
A7R26	0757-0438	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5111-F
A7R27	0757-0290	2	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-TO-6191-F
A7R28	0757-0439	4	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6811-F
A7R30	0698-4037	7	RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-TO-46R4-F
A7R31	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-TO-46R4-F
A7R32	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-TO-46R4-F
A7R33	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-TO-46R4-F
A7R34	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-TO-46R4-F
A7R35	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-TO-46R4-F
A7R36	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-TO-46R4-F
A7R37	0757-0180	1	RESISTOR 31.6 1% .125W F TC=0+-100	24546	C5-1/8-TO-31R6-F
A7R40	0757-0439	4	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C5-1/8-TO-6811-F
A7R45	0698-3156	1	RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-TO-1472-F
A7R46	0757-0441	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-TO-8251-F
A7R47	0757-0440	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-TO-7501-F
A7R48	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5111-F
A7R49	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-TO-6191-F
A7R50	0757-0200	2	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5621-F
A7R51	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5111-F
A7R52	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	16299	C4-1/8-TO-4641-F
A7R53	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-TO-5621-F
A7R54	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-TO-6811-F
A7R57	0757-0402	1	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-TO-111-F
A7R58	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-TO-101-F
A7R59	0757-0400	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-TO-90R9-F
A7R60	0757-0399	1	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-TO-82R5-F
A7R61	0757-0398	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-TO-75R0-F
A7R62	0757-0397	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-TO-68R1-F
A7R63	0757-0276	1	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-TO-61R9-F
A7R64	0757-0395	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-TO-56R2-F
A7R65	0757-0394	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-TO-51R1-F

Pages 6-13 and 6-14, Table 6-3:
Change the following A10A1 listings:
Change C17 to 0160-4456, CAPACITOR FXD 750pF +/-1% 300VDC MICA.
Change C48 to 0160-3395, CAPACITOR FXD 800pF +/-1% 300VDC MICA.
Change C52 to 0160-4456, CAPACITOR FXD 750pF +/-1% 300VDC MICA.
Change C57, C59, C60 to 0160-4457, CAPACITOR FXD 51pF 5% 300VDC MICA.
Change C63 to 0160-2538, CAPACITOR FXD 400pF +/-1% 300VDC MICA.
Change C65 to 0160-2542, CAPACITOR FXD 480pF +/-1% 300VDC MICA.

Page 6-15, Table 6-3:
Change A10A1MP2 to 00355-20034 with the same description.
Change A10A1L51 to L54 inclusive,to 9100-4078,CD3,FILTER TOROID.

Page 6-16, Table 6-3:
Change A10A2C221 to NOT ASSIGNED.
Change A10A2C22 to 0180-1743, CAPACITOR FXD .1uF +/-10% 35VDC TA.
Add A10A2C55, 0160-3872, CAPACITOR FXD 2.2pF +/-.25pF 200VDC CER.

Page 6-18, Table 6-3:
Change A10A2T1 to T5 to 08640-60355, TRANSFORMER RF (CODE BLUE).

Page 6-19, Table 6-3:
Change A11 Part Number to 08640-60020.
Change A11A1 to 08640-60116, FREQUENCY SELECT SWITCH ASSEMBLY.

Page 6-20, Table 6-3:
Delete Part Number for A11A1.(see below)
Add A11A1 08640-60185, VARIABLE SWITCH ASSEMBLY (DOES NOT INCLUDE A11A1MP1 to 6).
A11Q1. For recommended replacement, see Change 5.

Page 6-23, Table 6-3:
Under A13S1 and A13S2, change 5040-3440 to 5020-3440.

Page 6-24, Table 6-3:
A18Q6, Q8, Q9 and Q11. For recommended replacements, see Change 5.

Page 6-27, Table 6-3:
A21A1C1, C2 and C6. For recommended replacements, See Change 4.

Page 6-31, Table 6-3:
Change A26A1C4 to 0160-2209, CAPACITOR FXD 360pF +/-5% 300VDC MICA.

Page 6-33, Table 6-3:
Under A26, delete the note "(DOES NOT INCLUDE A26U1, U2)".

Page 6-34, Table 6-3:
Change A26A4C13 to 0180-2206, CAPACITOR FXD 60uF +/-10% 6VDC TA.

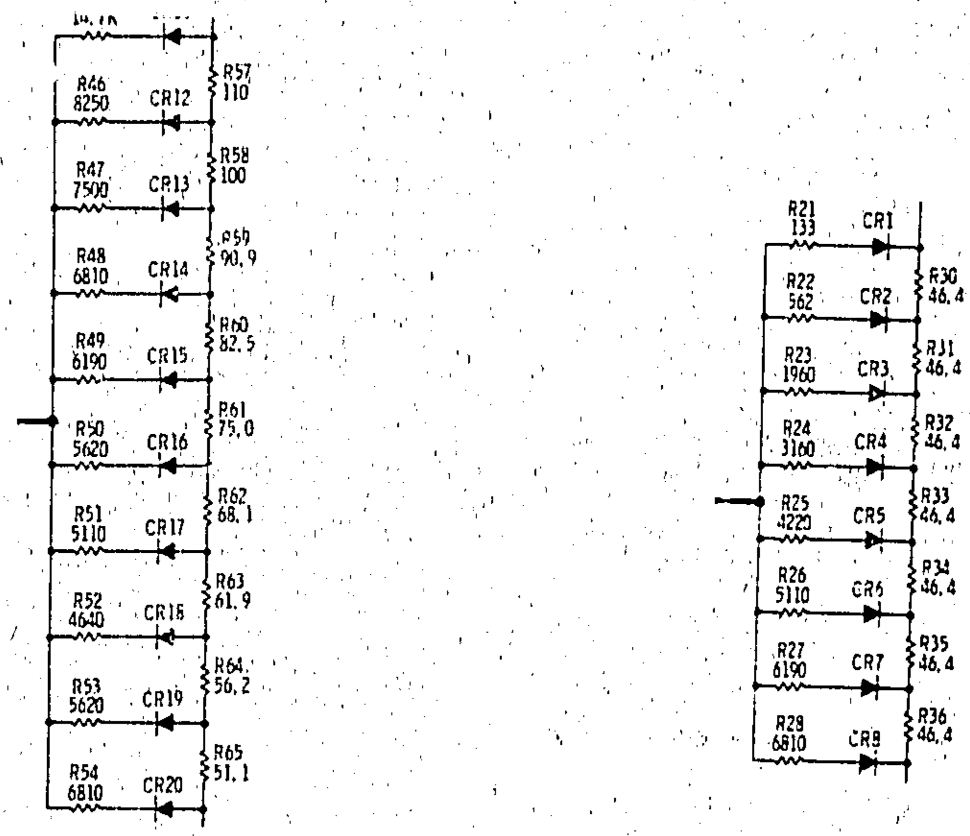
Page 6-36, Table 6-3:
Delete A26A1C31.
Change A26A1R9 to 0698-7212, RESISTOR FXD 100

Page 6-37, Table 6-3:
Under A26, delete the note "(DOES NOT INCLUDE A26U1, U2)".
Change A26A4C13 to 0180-2206, CAPACITOR FXD 60uF +/-10% 6VDC TA.

Page 6-41, Table 6-3:
Add MP98, 7120-7032, LABEL SAFETY.

Page 6-42, Table 6-3:
T1. For recommended replacement, see Change 6.

Service Sheet 7, (Schematic):
Change the part number for the A7 FM Shaping Assembly to 08640-60339.
Change A7R13 to 4.64k.
Change A7R40 to 6.81k.
Replace the appropriate portions of the schematic with the following partial schematic.



P/O Figure 8-21. FM Shaping Circuits and Varactor Bias Schematic

Diagram (2 parts).

Service Sheet 9A (Schematic):
Delete the part number for A11A1 Frequency Select Switch Assembly.

Service Sheet 10 (Component Locations):
Add designator C3 between K1 and C9.

Service Sheet 10 (Schematic):
Change A10A1 part number to 08640-60204.

Service Sheet 11 (Schematic):
Add A10A2C55, 2.2pF and an asterisk (indicating factory selected value) from U11 pin 8 to ground.
Add an asterisk (indicating factory selected value) to A10A2R49, R50 and R51.

Service Sheet 12 (Schematic):
Change A26A4C13 to 60uF.

Service Sheet 12A (Schematic):
Change A26A4C13 to 60uF.

Service Sheet 13 (Schematic):
Change A26A1C4 to 360pF.

Service Sheet 13A (Schematic):
Delete A26A1C21.
Change A26A1R9 to 100.

Service Sheet 22 (Schematic):
Add the following T1 pin numbers to the A14 to T1 wire connections:

Colour Code	T1 pin no.
0	6
3	5
02	4
04	7
05	3

Service Sheet B (legend):
Change Item Number 13 to 15.
Change Item Number 15 to 13.

CHANGE 1

Page 6-23, Table 6-3:
Change A13R2 to 0757-0442, RESISTOR FXD 10k 1% .125W.
Change A13R3 to 2100-2497, RESISTOR TRMR 2k 10% C TOP ADJ 1 TURN.

Page 6-36, Table 6-3:
Add A26A1C21, 0160-2497, CAPACITOR FXD 0.68pF +/-.25pF 50VDC CER.

Page 6-37, Table 6-3:
Change A26A1R9 to 0698-7211, RESISTOR FXD 90.9 2% .05W.

Service Sheet 6 (Schematic):
Change A13R2 to 10k.
Change A13R3 to 2k.

Service Sheet 13A (Schematic):
Change A26A1R9 to 90.9.
Add A26A1C21, 0.68pF, from the junction of R9 and CR5 to ground.

CHANGE 2

Page 6-25, Table 6-3:
Change A18R10 to 0757-0276, RESISTOR FXD 61.9 1% .125W.

Page 6-26, Table 6-3:
Change A20R11 to 0757-0819, RESISTOR FXD 909 1% .125W.
Change A20R22 to 0757-0276, RESISTOR FXD 61.9 1% .125W.

Page 6-28, Table 6-3:
Change A22R9, R22 to 0698-3132, RESISTOR FXD 261 1% .125W.

Service Sheet 22 (Schematic):
Change A20R11 to 909 and A20R22 to 61.9.
Change A22R9 and R22 to 261.

Service Sheet 23 (Schematic):
Change A18R10 to 61.9.

CHANGE 3

Page 6-33, Table 6-3:
Change A26A4 to 08640-60351.

Page 6-34, Table 6-3:
Add the following A26A4 listings:
- C19, C20, 0180-2619, CAPACITOR FXD 22uF +/-10% 15VDC TA (C18 not assigned).
- CR16, 1901-0040, DIODE SWITCHING 30V 50mA 2nS D0-35 (CR15 not assigned).
- Q10, 1853-0007, TRANSISTOR PNP 2N3251 SI T0-18.
- R56, R59, 0757-0442, RESISTOR 10k 1% .125W (R54, R55 and R57 not assigned).
- R58, 0757-0464, RESISTOR 90.9k 1% .125W.

Pages 6-37 and 6-38, Table 6-3:
Change A26A4 to 08640-60350.
Add the following A26A4 listings:
- C18, 0160-0127, CAPACITOR FXD 1uF +/-20%25VDC CER.
- C19, C20, 0180-2619, CAPACITOR FXD 22uF +/-10% 15VDC CER.
- CR16, 1901-0040, DIODE SWITCHING 30V 50mA 2nS D0-35.
- Q10, 1853-0007, TRANSISTOR PNP 2N3251 SI T0-18.
- R56, R59, 0757-0442, RESISTOR FXD 10k 1% .125W F.
- R57, 0757-0280, RESISTOR FXD 1k 1% .125W.
- R58, 0757-0464, RESISTOR FXD 90.9k 1% .123W.

Service Sheet 12 (Component Locations):
Replace Figure 8-39 with the attached Figure 8-39.

A26A4 ASSEMBLY

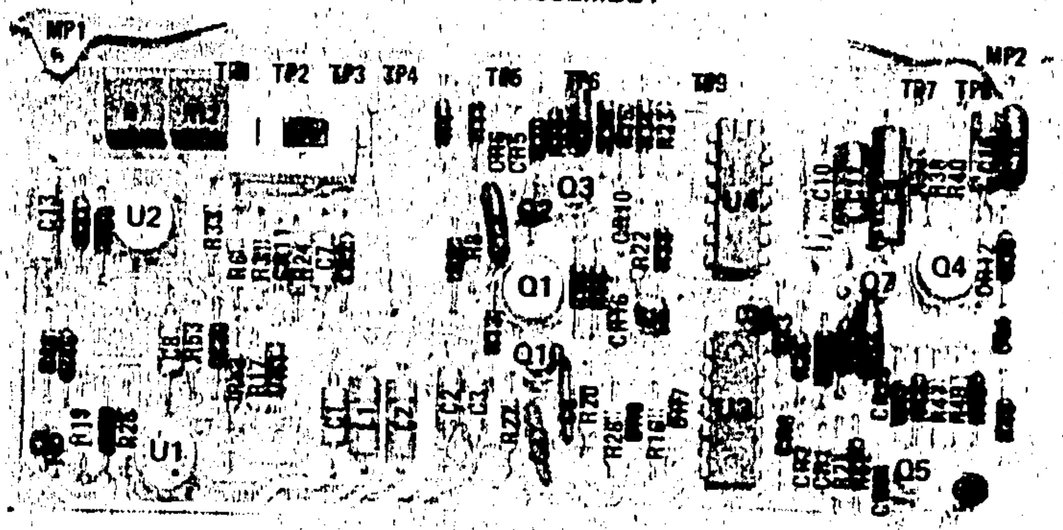
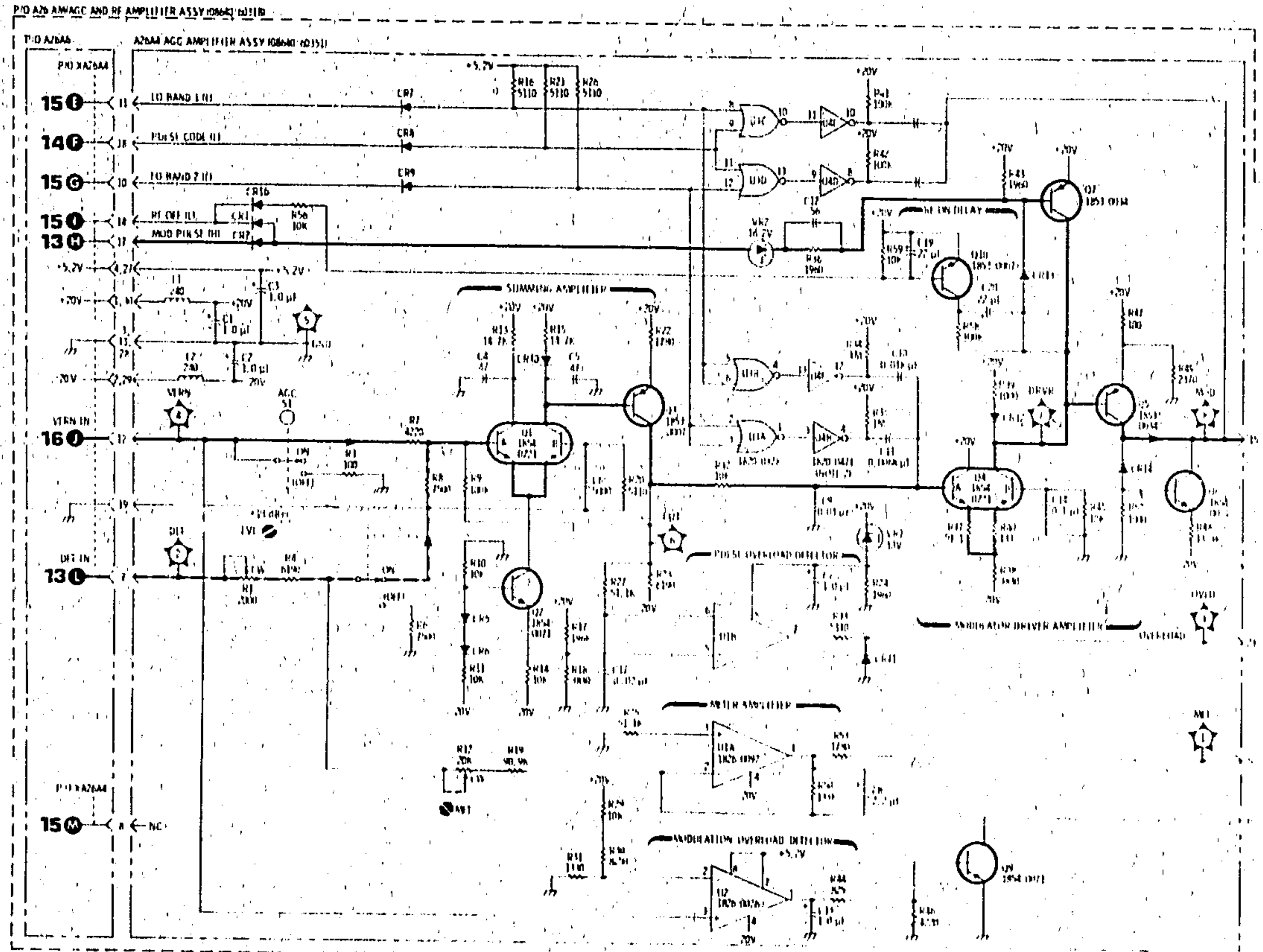


Figure 8-39. A26A4 Component Locations.

Service Sheet 12 (Schematic):
Replace the appropriate portion of the schematic diagram with the attached partial schematic.



A26A4 AGC AMPLIFIER ASSY
LO BAND 1 (L)
PULSE CODE (L)
LO BAND 2 (L)
RF OFF (L)
MOD PULSE (H)
+5.2V
+20V
-20V
VERN IN
DET IN
SUMMING AMPLIFIER
RF ON DELAY
PULSE OVERLOAD DETECTOR
MODULATOR DRIVER AMPLIFIER
METER AMPLIFIER
MODULATION OVERLOAD DETECTOR
OVERLOAD
NC

Service Sheet 12A (Component Locations):
Replace Figure 8-42 with the attached Figure 8-42.

A26A4 ASSEMBLY (OPTION 002)

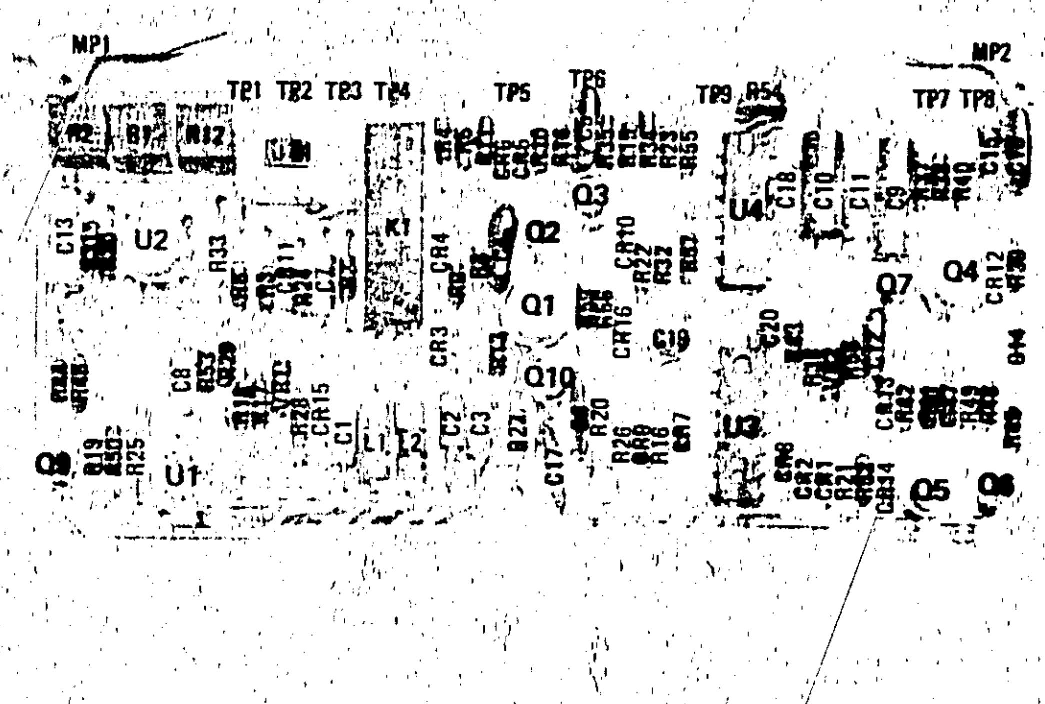
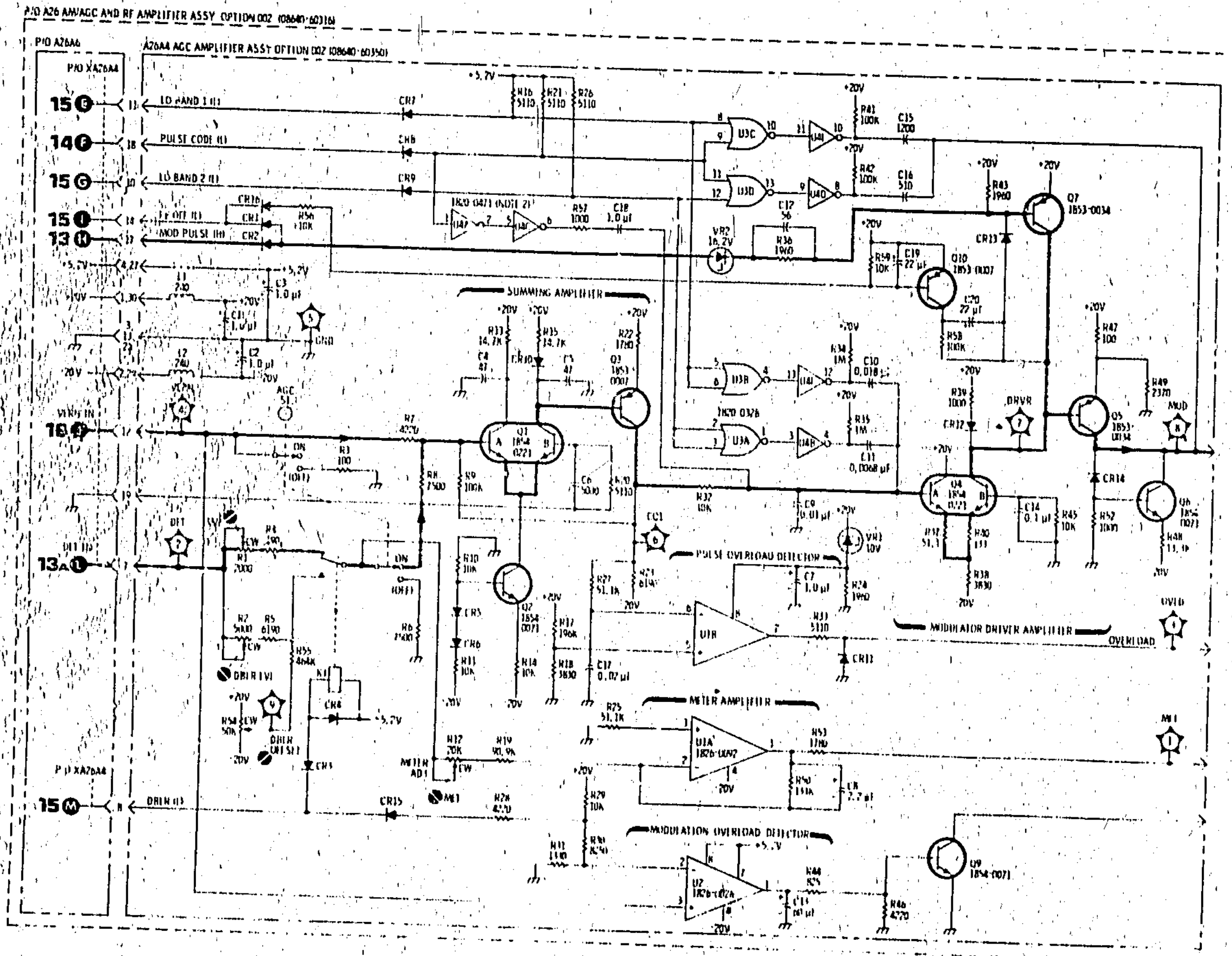


Figure 8-42. A26A4 Component Locations.

Service Sheet 12A (Schematic):
Replace the appropriate portion of the schematic diagram with the attached partial schematic.


P/O A26 AM/AGC AND RF AMPLIFIER ASSY OPTION 002 (08640-60316)
P/O A26A6
A26A4 AGC AMPLIFIER ASSY OPTION 002 (08640-60350)
P/O XA26A4
LO BAND 1 (I)
PULSE CODE (I)
LO BAND 2 (I)
MOD PULSE (H)
SUMMING AMPLIFIER
PULSE OVERLOAD DETECTOR
MODULATOR DRIVER AMPLIFIER
OVERLOAD
METER AMPLIFIER
MODULATION OVERLOAD DETECTOR
METER ADJ
DRVR
MOD

CHANGE 4

Page 6-27, Table 6-3:
Change A21C1, C2 and C6 to 0160-4584 with the same description.

NOTE
0160-4584 is the recommended replacement for A21C1, C2 and C6 for all serial prefixes.

CHANGE 5

Page 6-20, Table 6-3:
Change A11Q1 to 1853-0007, TRANSISTOR PNP SI TO-18.

Page 6-24, Table 6-3:
Change A18Q6, Q8, Q9 and Q11 to 1853-0007, TRANSISTOR PNP SI TO-18.

NOTE
1853-0007 is the recommended replacement for A11Q1 (Opt 001) and A18Q6, Q8, Q9 and Q11 for all serial prefixes.

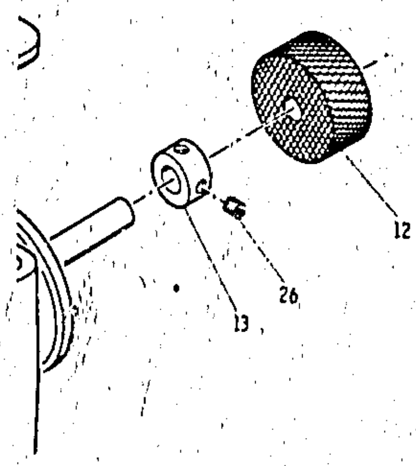
Page 6-41, Table 6-3:
Change MP55 and MP80 to NOT ASSIGNED.
Add MP95, 606A-34C-6, COLLAR SHAFT (MP94 not assigned).
Add MP96, 3030-0021, SCREW SET 8-32 .125in LG (for MP95).
Add MP97, 8160-0276, RFI RING MNL 1in OD .218in ID.

Service Sheet 9A (Schematic):
On the A11 Assembly, change the part number for Q1 to 1853-0007.

Service Sheet 23 (Schematic):
On the A18 Assembly, change the part number for Q6, Q8, Q9 and Q11 to 1853-0007.

Service Sheet A (legend):
Change Item Number 12 (Reference Designator and Description) to MP97 RFI Gasket.
Change Item Number 13 (Reference Designator and Description) to MP95 Retaining Collar.
Add Item Number 26, MP96 Setscrew.

Service Sheet A, Figure 8-73:
Replace the appropriate portion of Figure 8-73 with the following partial figure.



P/O Figure 8-73. A1 Output Level Assembly Illustrated Parts Breakdown (P/O Change 5).

CHANGE 6

Page 6-34, Table 6-3:
Change A26A4R1 to 2100-2489, RESISTOR TRMR 5k 10%.

Page 6-42, Table 6-3:
Change T1 to 9100-4024.

NOTE
9100-4024 is the sole recommended replacement for T1 for all instruments with serial prefix 1624U and above.

Service Sheet 12 (Schematic):
Change A26A4R1 to 5000.

CHANGE 7

Page 6-5, Table 6-3:
Change A1A1R1 to 0757-0401, RESISTOR FXD 100 1% .125W.

Page 6-9, Table 6-3:
Add A7C14, 0180-0229, CAPACITOR FXD 33uF +/-10% 10VDC TA.

Page 6-17, Table 6-3:
Change A10A2R3 to 0757-0398 RESISTOR 75 1% .125W.

Pages 6-30 and 6-31, Table 6-3:
Make the following changes to the A26 listings:
Change C17 and C18 to 0160-3219, CAPACITOR FD THRU 100pF 20% 50V CER
Add L9, 9140-0098, INDUCTOR COIL MLD 2.2uH 10% Q=33.
Change A26R1 to NOT ASSIGNED.

Page 6-34, Table 6-3:
Change A26A4R1 to 2100-2521, RESISTOR TRMR 2k 10% C SIDE ADJ 1 TURN.
Change A26A4R4 to 0757-0440, RESISTOR FXD 7500 1% .125W.

Page 6-38, Table 6-3:
Change A26A4R4 to 0757-0440, RESISTOR FXD 7500 1% .125W.

Service Sheet 7 (Schematic):
On the A7 Assembly, add C14, 33uF from the +5.2V input line (+ve polarity) to the ground input line.

Service Sheet 12 (Schematic):
Change A26A4R1 to 2000.
Change A26A4R4 to 7500.

Service Sheet 12A (Schematic):
Change A26A4R4 to 7500.

Service Sheet 13 (Schematic):
Change A26C17 and C18 to 100pF.
Service Sheet F (legend):
Change Item Number77 (reference Designator and Description) to A26L9 Inductor.

CHANGE 8

Page 6-5, Table 6-3:
Change A2Q1, Q2 and Q3 to 1854-0071, TRANSISTOR NPN SI.

Page 6-8, Table 6-3:
Add A5C10, 0180-2617, CAPACITOR FXD 6.8uF +/-10% 35VDC TA.

Service Sheet 6 (Schematic):
On the A5 Assembly, add C10, 6.8uF, from the -20V input line to the ground input line (+ve polarity).

Service Sheet 17 (Schematic):
Change the part number of A2Q1, Q2 ans Q3 to 1854-0071.

CHANGE 9

Page 6-41, Table 6-3:
Under S1, add 8160-0058, RFI BRAID CABLE.

Service Sheet 22 (Schematic):
Add a line (colour code 0) connecting the dashed line enclosing line switch S1 to chasis ground.

CHANGE 10

Page 6-7, Table 6-3:
Change A3A1A2C2 to 0160-3876, CAPACITOR FXD 47pF +/-20% 200VDC.

Page 6-41, Table 6-3:
Change R3 to 0698-3162, RESISTOR FXD 46.4k 1% .125W F.

Service Sheet 5 (Schematic):
Change A3A1A2C2 to 47pF.

Service Sheet 22 (Schematic):
Change R3 to 46.4k.

CHANGE 11

Page 6-8, Table 6-3:
Change A5Q1 and Q2 to 1854-0475, TRANSISTOR DUAL NPN.

Service Sheet 6 (Schematic):
Change the part number of A5Q1 and Q2 (at Q1A and Q2A) to 1854-0475.

CHANGE 12

Page 6-9, Table 6-3:
Add A7C15, 0160-3876, CAPACITOR FXD 47pF +/-20% 200V CER.
Add A7C16, C17, 0180-2618, CAPACITOR FXD 33uF +/-10% 10VDC TA.
Add A7C18, 0160-3451, CAPACITOR FXD .01uF +80 -20% 100VDC CER.

Page 6-10, Table 6-3:
Add A7L1, 9140-0129, INDUCTOR COIL MLD 220uH 5% Q=65.

Service Sheet 7 (Schematic):
Add A7L1, 220uH, between XA7 pin 5 (+5.2V line) and A7C14 (added in change 7).
Add A7C15, 47pF between the base and collector of A7Q2.

Service Sheet 8 (Schematic):
Add A7C16, 33uF, from U2A pin 4 (-ve polarity) to ground.
Add A7C17, 33uF, from U2B pin 7 (+ve polarity) to ground.
Add A7C18, .01uF, in parallel with A7R77.

•

CHANGE 13

Page 5-2, Paragraph 5-21:
Delete the A10A2R3 Selection Procedure.
Under A10A2R6-R8, R12-R14 and R18-R20 Selection, change the following reference designators:

Old Reference Designator	New Reference Designator
A10A2R6	A10A2R10
A10A2R7	A10A2R9
A10A2R8	A10A2R12
A10A2R12	A10A2R20
A10A2R13	A10A2R18
A10A2R14	A10A2R21
A10A2R18	A10A2R28
A10A2R19	A10A2R26
A10A2R20	A10A2R29

Page 5-3, Table 5-1:
Change the following reference designators:

Old Reference Designator	New Reference Designator
A10A2C55*	A10A2C8
A10A2R6	A10A2R10
A10A2R7	A10A2R9
A10A2R8	A10A2R12
A10A2R12	A10A2R20
A10A2R13	A10A2R18
A10A2R14	A10A2R21
A10A2R18	A10A2R28
A10A2R19	A10A2R26
A10A2R20	A10A2R29
A10A2R49*	A10A2R70
A10A2R50*	A10A2R69
A10A2R51*	A10A2R72

* Refer to the ERRATA section of this manual change supplement.

Page 5-3, Table 5-1:
Delete A10A2R3.
Add the following entry:

Component	Service Sheet	Range of Values	Basis of Selection
A10A2R2-4	11	--	See Paragraph 5-21j

Page 5-4, Paragraph 5-21:
Refer to the ERRATA section of this manual change supplement.
Under step h change the reference designator of A10A2C55 to A10A2C8.
Under A10A2R49-51 Selection change the reference designator of A10A2R49, R50 and R51 to A10A2R70, R69 and R72 respectively (4 places)
Add sub-paragraph 5-21j as follows:

5-21j. A10A2R2-R4 Selection. If the RF Divider EECL Bias Adjustment (Paragraph 5-47) cannot be performed successfully, it may be necessary to change the values of A10A2R2-4. These resistors form an attenuator pad which sets the signal level into A10A2U11. For most cases, if the value of the pad is less than 2dB, increase the attenuation of the pad. If increasing the attenuation does not correct the problem, try decreasing it.

Attenuation (dB)	Resistance (ohms)		
	R2	R3	R4
0	Open	Short	51.1
1	825	6.8	825
1.7	511	10	511
2	422	12	422
3	287	17.8	287

NOTE
The RF Divider EECL Bias Adjustment, Para 5-47, should be performed if the values of A10A2R2-R4 have been changed.

Page 5-40:
Add the following after Paragraph 5-46:

5-47. RF DIVIDER EECL BIAS ADJUSTMENT

REFERENCE: Service Sheet 11.

DESCRIPTION:
The output signal at RF OUTPUT is observed with a spectrum analyzer. The bias level for divider U12 is adjusted to eliminate any signal irregularities (that is, erratic frequency, sub-harmonics or increased level of the noise floor) as the Signal Generator is tuned across the 256-128MHz and 128-64MHz ranges. This procedure should be performed whenever the A3 RF Oscillator Assembly has been repaired or replaced (that is, any changes that affect the oscillator's output power level) or when A10A2U11 or U12 is replaced.

EQUIPMENT: Spectrum Analyzer . . . . HP 8554B/8552B/141T

PROCEDURE:

1. Connect spectrum analyzer to the Signal Generator's RF OUTPUT after setting the Signal Generator's controls as follows:

   Meter Function . . . . LEVEL
   AM . . . . OFF
   FM . . . . OFF
   RANGE 256-128MHz
   OUTPUT LEVEL Switch . . . . -10dBm
   OUTPUT LEVEL Vernier . . . . Fully CW

2. Set the spectrum analyzer's centre frequency to 250MHz, frequency span (scan width) to 50MHz per division, resolution bandwidth to 300kHz, input attenuation to 20dB and vertical scale to 10dB per division.

3. While observimg the RF OUTPUT signal with the spectrum analyzer, tune the Signal Generator across its frequency range. If the signal appears erratic or disappears or if the noise floor abruptly rises, adjust the BIAS adjustment, A10A2R6, until a clean and stable signal is again observed.

4. Turn the RANGE switch to 128-64MHz and repeat step 3.

5. If the BIAS adjustment, A10A2R6, requires readjustment on the 128-64MHz range, check the 256-128MHz range again for any signal irregularities.

NOTE

If the bias level cannot be adjusted for satisfactory operation on both ranges without readjustment, it may be necessary to select new values for A10A2R2-R4. Refer to Paragraph 5-19, Factory Selected Components.

Page 6-16 thru 6-18, Table 6-3:
Replace the entire A10A2 listing with the attached parts list.

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2	08640-60354	9	1	RF DIVIDER ASSEMBLY	28480	08640-60354
A10A2C1	0180-0374	3	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A10A2C2	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A10A2C3	0160-3456	6	28	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C4	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C5	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C6	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A2C7	0180-1743	2	7	CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C8				C8 IS TYPICALLY NOT PRESENT, REFER TO TABLE 5-1.*		
A10A2C9	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C10	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C11	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C12	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C13	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C14	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C15	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C16	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C17	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C18	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C19	0160-2055	9	20	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C20	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C21	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C22	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C23	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C24	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C25	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C27	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C28	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C29	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C30	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C31	0180-0197	8	3	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C32	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C35	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C36	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C38	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C39	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C40	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C41	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C42	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C43	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C44	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C45	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C46	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C47	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C48	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C49	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C50	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C51	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C52	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C53	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C54	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C55	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C56	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C57	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C58	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C59	0180-0100	3	2	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A10A2C60	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C61	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C62	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A10A2C63	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C64	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2CR1	1901-0025	2	17	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR2	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR5	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2CR6	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR7	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR8	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR9	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR10	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR11	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR12	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR13	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR14	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR15	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR16	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR17	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2L1	9100-1620	5	8	COIL-MLD 15UH 10% Q=65 .155DX.375LG-NOM	28480	9100-1620
A10A2L2	9140-0096	1	2	COIL-MLD 1UH 10% Q=50 .155DX.375LG-NOM	28480	9140-0096
A10A2L3	9140-0096	1		COIL-MLD 1UH 10% Q=50 .155DX.375LG-NOM	28480	9140-0096
A10A2L4	9100-1612	5	1	COIL-MLD 330NH 20% Q=45 .155DX.375LG-NOM	28480	9100-1612
A10A2L5				PART OF ETCHED CIRCUIT BOARD		
A10A2L6	9140-0094	9	1	COIL-MLD 680NH 10% Q=50 .155DX.375LG-NOM	28480	9140-0094
A10A2L7	9100-1615	8	1	COIL-MLD 1.2UH 10% Q=33 .155DX.375LG-NOM	28480	9100-1615
A10A2L8	9140-0098	3	1	COIL-MLD 2.2UH 10% Q=33 .155DX.375LG-NOM	28480	9140-0098
A10A2L9	9140-0114	4	1	COIL-MLD 10UH 10% Q=55 .155DX.375LG-NOM	28480	9140-0114
A10A2L10	9100-1620	5		COIL-MLD 15UH 10% Q=65 .155DX.375LG-NOM	28480	9100-1620
A10A2L11	9100-1620	5		COIL-MLD 15UH 10% Q=65 .155DX.375LG-NOM	28480	9100-1620
A10A2L12	9100-1620	5		COIL-MLD 15UH 10% Q=65 .155DX.375LG-NOM	28480	9100-1620
A10A2L13	9100-1628	3	1	COIL-MLD 43UH 5% Q=60 .155DX.375LG-NOM	28480	9100-1628
A10A2Q1	1854-0071	7	1	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A10A2Q2	1853-0034	0	2	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A10A2Q3	1853-0034	0		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A10A2Q4				NOT ASSIGNED		
A10A2Q5	1854-0345	5	1	TRANSISTOR NPN SI TO-72 PD=200MW FT=1GHZ	04713	MM8006
A10A2Q6	1853-0326	3	2	TRANSISTOR PNP SI PD=1W FT=50MHZ	04713	MPS-U51
A10A2Q7	1853-0326	3		TRANSISTOR PNP SI PD=1W FT=50MHZ	04713	MPS-U51
A10A2R1	0757-1000	7	1	RESISTOR 51.1 1% .5W F TC=0+-100	28480	0757-1000
A10A2R2	0698-7229	8	2	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A10A2R3	0698-7188	8	1	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T00-10R-G
A10A2R4	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A10A2R5	0757-0394	0	20	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R6	2100-1986	7	1	RESISTOR-TRMR 100 10% C TOP-ADJ 1-TRN	73138	82PR100
A10A2R7	0757-0984	4	9	RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R8	0757-0438	3	9	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R9	0698-7221	0	2	RESISTOR 237 1% .05W F TC=0+-100	24546	C3-1/8-T0-237R-G
A10A2R10	0698-7197	9	1	RESISTOR 23.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-23R7-G
A10A2R11	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R12	0698-7221	0		RESISTOR 237 1% .05W F TC=0+-100	24546	C3-1/8-T0-237R-G
A10A2R13	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R14	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R15	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R16	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R17	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R18	0698-7218	5	4	RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R19	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R20	0698-7200	5	2	RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A10A2R21	0698-7218	5		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R22	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R23	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A2R24	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R25	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R26	0698-7218	5		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R27	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R28	0698-7200	5		RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A10A2R29	0698-7218	5		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R30	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R31	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R32	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R33	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R34	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R35	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R36	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R37	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R38	0698-7227	6	4	RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R39	0698-7196	8	2	RESISTOR 12.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-12R1-G
A10A2R40	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R41	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R42	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R43	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R44	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R45	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2R46	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R47	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R48	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R49	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R50	0698-7190	2		RESISTOR 12.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-12R1-G
A10A2R51	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R52	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R53	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R54	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R55	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R56	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R57	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R58	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R59	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R60	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A10A2R61	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A10A2R62	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R63	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A2R64	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R65	0698-3243	8	1	RESISTOR 178K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1783-F
A10A2R66	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A2R67	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R68	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R69	0698-3447	4	2	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A2R70	0757-0379	1	1	RESISTOR 12.1 1% .125W F TC=0+-100	19701	MF4C1/8-T0-12R1-F
A10A2R71	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R72	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A2T1	08640-80355	3	5	TRANSFORMER, RF, BLUE	28480	08640-80355
A10A2T2	08640-80355	0		TRANSFORMER, RF, BLUE	28480	08640-80355
A10A2T3	08640-80355	5		TRANSFORMER, RF, BLUE	28480	08640-80355
A10A2T4	08640-80355	0		TRANSFORMER, RF, BLUE	28480	08640-80355
A10A2T5	08640-80355	0		TRANSFORMER, RF, BLUE	28480	08640-80355
A10A2T6	08640-80002	6	1	TRANSFORMER, RF 12-TURN	28480	08640-80002
A10A2TP1	1251-0600	0	4	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2U1	1826-0303	9	1	IC OP AMP GP 8-DIP-P	01928	CA741S
A10A2U2	1820-0817	8	3	IC FF ECL D-M/S DUAL MC10131P	04713	MC10131P
A10A2U3	1820-0817	8		IC FF ECL D-M/S DUAL MC10131P	04713	MC10131P
A10A2U4	1820-0535	7	1	IC DRVR TTL AND DUAL 2-INP	01295	SN75451BP
A10A2U5	1820-0802	1	3	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U6	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U7	1820-0753	1	2	IC GATE ECL DUAL 3-INP	28480	1820-0753
A10A2U8	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A10A2U9	1820-0803	2	2	IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U10	1820-0803	2		IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U11	1820-3982	8	1	IC DIFF AMPL HS 16-DIP-C	28480	1821-0942
A10A2U12	1820-2412	0	1	IC CNTR ECL BIN DUAL	28480	1820-2412
A10A2U13	1820-1354	0	1	IC CNTR ECL BIN	28480	1820-1354
A10A2U14	1820-1225	4	1	IC FF ECL D-M/S DUAL	04713	MC10231P
A10A2U15	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U16	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2VR1	1902-3002	3	2	DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	28480	1902-3002
A10A2VR2	1902-3002	3		DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	28480	1902-3002
A10A2W1	8120-1823	1	1	CABLE ASSY-COAX 50-OHM 1.9-IN-LG	28480	8120-1823
A10A2W2	8120-1824	2	1	CABLE ASSY-COAX 50-OHM 2.4-IN-LG	28480	8120-1824
A10A2W3	1820-1825	0	1	IC RCVR TTL BUS HEX	28480	1820-1825
A10A2W4	8120-1826	4	1	CABLE ASSY-COAX 50-OHM 5.6-IN-LG	28480	8120-1826
A10A2W5	8120-1827	5	1	CABLE ASSY-COAX 50-OHM 8.7-IN-LG	28480	8120-1827
A10A2W6	8120-2966	5	1	CABLE, COAX 50-OHM 9-IN-LG	28480	8120-2966
A10A2W7	8120-1829	7	1	CABLE ASSY-COAX 50-OHM 7.9-IN-LG	28480	8120-1829

Service Sheet 11 (simplified logic diagram):
Make the following changes to the A10 Divider/Filter Assembly simplified logic diagram:
Change the third divide-by-two divider from EECL to ECL.
Move the EECL to ECL Converter stage to after the second divide-by-two divider stage.

Service Sheet 11 (principles of operation):
Replace the entire principles of operation with the following:

RF Dividers (A10A2)
The A10A2 RF Divider Assembly frequency-divides the 256-512MHz signal from the RF oscillator to obtain lower output frequencies. The overall operation of the A10 Divider/Filter Assembly is described on Service Sheet 10. Refer also to Figure 8-43 for a simplified logic diagram of the RF Dividers and Filters. On the two highest ranges (256-512MHz and 512-1024MHz) the dividers are bypassed. On all other ranges, the signal from the oscillator is amplified and limited by buffer amplifier U11.

The outputs of the first two dividers drive complementary output OR gates (U7A and U8B) which drive the next divider stage with one output and another complementary OR gate (U7B and U8A) with the other. The latter gates drive output transformers T1 and T2 in push-pull, and are enabled by inverter transistors Q2 and Q3 respectively.

When an output OR gate is enabled, the next divider stage is disabled. (Note that ground is a logical high and negative or open a logic low for EECL and ECL devices.) The next three divider stages operate in a manner similar to the previous two stages. The major difference is that the complementary output OR gates, which follow the outputs of the first two dividers, have ben eliminated since the latter dividers (U14, U15A and U15B) have complementary outputs. The final four dividers each drive NOR gates (U5A, U5B, U5C, U5D, U16A, U16B, U16C and U16D) in push-pull which in turn drive a common output transformer T6 in push-pull. The last NOR gate output pair is enabled through diodes CR2, CR5 and CR9 connected in a logical OR configuration.

VR1, Q6, Q7 and associated components form two -2.0Vdc voltage regulators. The purpose of the -2.0Vdc supplies is to provide the ECL devices with the proper DC load current. (A 51.1ohm load resistor to -2.0Vdc provides the proper load termination.)

All output transformers drive pi-network pads which are switched onto the line leading to the modulator driver circuits. The attenuation of the first three pads (R10, R9 and R12, R20, R18 and R21, and R28, R26 and R29) is selected (from 3 to 6dB) to prevent excessive signal level from being applied to A26U2 (Service Sheet 12 or 12A). The attenuation is selected by changing the value of the resistors.

Schmitt Trigger (A10A2)

Amplifier U1 is a Schmitt Trigger which senses when the voltage VT (proportional to the RF oscillator frequency) reaches the value corresponding to the geometric mean of the frequency range. The reference voltage is determined by resistors R60 and R61 R65 adds a small amount of hysteresis. Transistor Q1 complements the amplifier output. Inverter U4A activates the low band relays A10A1K1 and K3 (Service Sheet 10) and U4B activates the high band relays A10A1K2 and K4 (Service Sheet 10). The inverters are driven in complement except that capacitors C62 and C63 hold both inverters on simultaneously for a few milliseconds during a transition to provide make-before-break action.

Service Sheet 11 (troubleshooting):
Under the RF Divider Troubleshooting table, change the references to U6 to U4 (4 places).

Service Sheet 11 (Component Locations):
Replace Figure 8-36 with the attached Figure 8-36.

Service Sheet 11 (Schematic):
Replace Figure 8-37 with the attached Figure 8-37.

CHANGE 14

Page 6-40,Table 6-3:
Change MP2 (except Option 002) to 0370-3037,CD4,KNOB,FREQUENCY RANGE.
Change MP2 (Option 002 only) to 0370-3038,CD5,KNOB,FREQUENCY RANGE.
Change MP5 to 0370-3035,CD2,KNOB,PEAK DEVIATION.

Page 6-42,Table 6-3:
Change W7 to 08640-20363,CD6,CABLE ASSY-COAX 8.8 INS-LG.

CHANGE 15.

Page 6-18,Table 6-3:
Change A18CR6 to 1901-0328,CD8,DIODE-PWR RECT,400V 1A,6 US.

Page 6-25,Table 6-3:
Change A20CR1 and CR3 to 1901-0028,CD5,DIODE-PWR RECT,400V 750mA,DO-29

Page 6-28,Table 6-3:
Change A22CR2 and CR6 to 1901-0028,CD5,DIODE-PWR RECT,400V 750mA,DO-29

CHANGE 16

This change supersedes parts of change 13.

Page 6-18 to 6-20, Table 6-3:
Change A10A2 to 08640-60370.
Change A10A2L5 to NOT ASSIGNED.
Change A10A2U12 to 1820-2642, IC CNTR ECL BIN DUAL.

Service Sheet 11 (Schematic):
Change A10A2 to 08640-60370.
Replace A10A2L5 with a direct connection and delete Note 3.
Change A10A2U12 part number to 1820-2642.

CHANGE 13 (Cont'd):

A10A2 ASSEMBLY

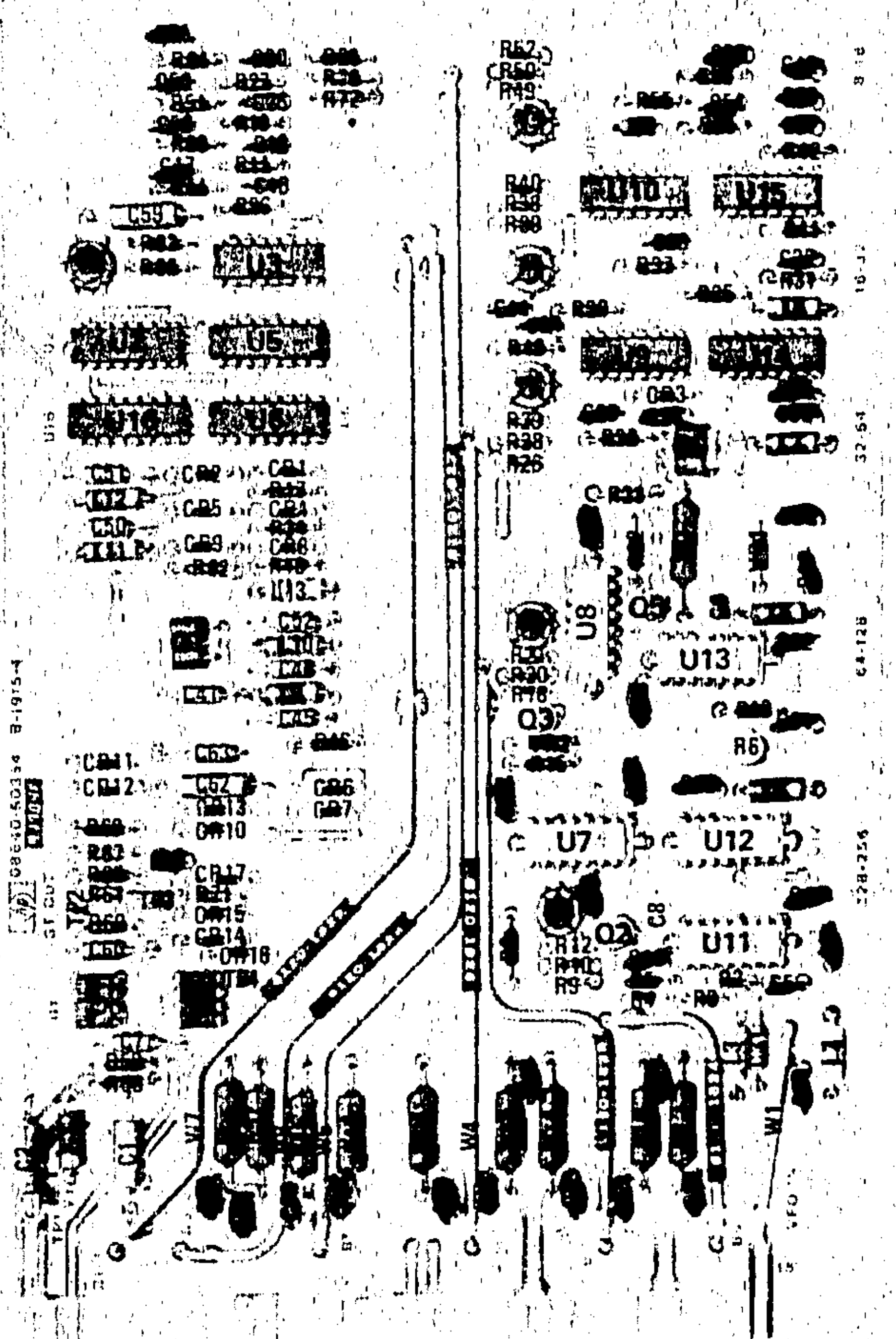


Figure 8-36. A10A2 RF Divider Assembly Component Locations (P/O Change 13).

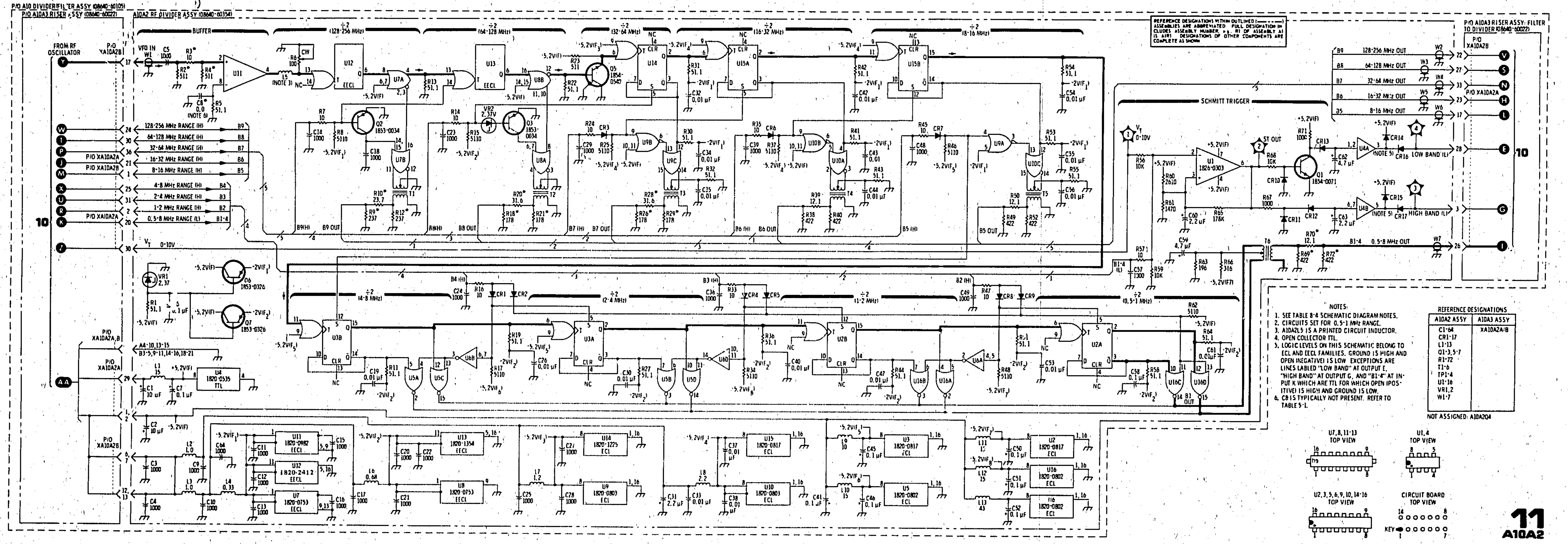


Figure 8-37 RF Dividers Schematic Diagram

SIGNAL GENERATOR
OPERATING AND SERVICE MANUAL

MANUAL IDENTIFICATION
Model Number: 8640A
Date Printed: Oct. 1976
Part Number: 08640-90114

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

To use this supplement, first, make all ERRATA corrections and then all appropriate serial number related changes indicated in the tables below.

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES
1608A	1
1634A, 1638A	1-3
1651A	1-3
1708A	1-4
1711A	1-5
1715A	1-6
1725A, 1726A	1-7
1734A, 1737A	1-8
1741A	1-9
1746A	1-10
1750A	1-11
1801A	1-12
1815A	1-13
1825A	1-14
1846A	1-15
1851A	1-16
1903A	1-17
1916A	1-18
1917A, 1925A	1-19
1918A	1-20

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES
1928A	1-19,21
1948A	1-19,21,22
2042A	1-19,21-23
2104A	1-19,21-24
2112A	1-19,21-25
2118A	1-19,21-26
2136A	1-19,21-27
2145A	1-19,21-28
2152A, 2222A	1-19,21-29
2223A	1-19,21-30
2227A	1-19,21-31
2232A	1-19,21-32
2240A	1-19,21-33
2246A	1-19,21-34
2309A	1-19,21-35
232[illegible]A	1-19,21-36
2333A	1-19,21-37
2407A	1-19,21-38
>> 2428A	1-19,21-39

>> NEW ITEM

NOTE:
Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends th. . 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.

Printed in U.S.A.

HEWLETT PACKARD

01 October 1984
25 Pages Text
25 Pages Illustrations
2 Foldouts

The following table lists all components affected by this Manual Changes supplement.

In the change column:

1. "E" indicates Errata information.
2. Numeric value is the manual change number.
3. "(r)" indicates the change describing the recommended replacement or action for that component.
   NOTE: Recommended replacement information applies to instruments of all serial prefixes unless otherwise noted.

SUMMARY OF CHANGES BY COMPONENT

Assy	Component	Change
A1	MP10	E(r)
	A1R1	12(r)
	R1	23
A2	——	30
	Q1,2,3	15
	C10	30
	R10	E
	R14	20
	U2	E(r)
A3	MP25	39(r)
	Q1	31
	R1	23
	A4	36
	A4R1-9	E
	A4R10	31
A5	C10	14
	MP3	E
	Q1,2	19
	R7	30
A7	——	2,22
	C14	13
	C15	17
	C16-18	22
	L1	22
	R12	E
	R13	2
	R40	2,33
	R41	33
	R42	33
A10	MP4	E
	A1	E
	A1C17,48,52,57,59, 60,63,65,66	E
	A1MP2	E
	A1S1-6	E(r)
	A2	21,26(r),30, 38
	A2C6	E(r)
	A2C7	5
	A2C18	34(r)
	A2C21	E
	A2C26	E
	A2C55	E,21
	A2E1,2	34(r)
	A2L5	26

Assy	Component	Change
A10 (cont.)	A2R2-4	21,38
	A2R6	30
	A2R9,10,12,16,20, 21,26,28,29,49-51	E,21
	A2R9,10,12,18,20, 21,26,28,29,69, 70,72	38
	A2R23,75	38
	A2R73	30,38
	A2T1-5	E
	A2U7	E,34
	A2U11	E
	A2U12	21,22,26,38
	A3XA10A2A	E
A11	——	E
	A1	E
	Q1	E
A13	R2	1
	R3	1
	R6	E
	R7	E
	S1,2	E
	XA15	E
A14	P1	E
A18	CR6	24(r)
	Q3	36
	Q6,8,9,11	E
	R14	25,26(r)
A20	CR1,3	24(r)
	Q1,7	36
A21	MP1	E
	A1C1,2,6	E,9(r)
	A1L3	30(r)
	A1R6	30(r)
	A1VR1,3	30
A22	CR2,6	24(r)
	Q1,4	36
A26	——	E
	C17,18	10(r)
	L9	10

Assy	Component	Change
A26 (cont.)	R1	10(r)
	A1CR1	E
	A1C4	1
	A1Q1,2	E
	A1Q3	32(r)
	A1Q10	32(r)
	A1R2	E
	A1R4,R9	31(r)
	A1VR2	37
	A2C5,7	E
	A2R19	18
	A2U2	19
	A3C3-6	E
	A3R1	30
	A4	3,7
	A4C13	1
	A4C18	3,4,7
	A4C19	3
	A4C20	7
	A4CR15	7
	A4CR16	3,7
	A4E1	30(r)
	A4Q5	E,30
	A4Q10	3,7
	A4R1	27(r),35
	A4R2,5	6
	A4R4	12(r)
	A4R54,55	7
	A4R56-59	3,7
	A4U1	22,36(r)
No Prefix	MP2	23
	MP5	23
	MP22	29
	MP55	8
	MP58	E
	MP60	E(r)
	MP80,95-97	8
	MP95	E(r)
	MP98	E
	MP101	14
	R3	16
	S1	14
	S2	18
	T1	E,11(r)
	W7	23(r)

ERRATA

Page i, Title Page:
Under SERIAL NUMBERS, change the first sentence to read as follows:
"This manual applies directly to instruments with serial numbers prefixed 1602A, 1603A and 1624U."

Page 1-12, Table 1-1:
Under Pulse Modulation, add the following footnote to Pulse Repetition Rate.
Pulse performance degrades below 500 Hz repetition rates.

Page 1-13, Table 1-1:
Under GENERAL CHARACTERISTICS, change Power Requirements specification to read:
Power Requirements: 100 or 120 volts (+5% -10%) from 48 to 440 Hz; or 220 or 240 volts (+5%, -10%) from 48 to 66 Hz. 175 VA max (Option 002: 190 VA max). 2.29 m (7-1/2 ft) power cable furnished with mains plug to match destination requirements.

Page 2-1, paragraph 2-7:
Change the first sentence to read:
"The Model 8640A requires a power source of 100 or 120 volts (+5%, -10%) from 48 to 440 Hz; or 220 or 240 volts (+5%, -10%) from 48 to 66 Hz, single phase."

In Figure 2-1, add the following after the third sentence:

| WARNING |

To avoid the possibility of hazardous electrical shock, do not operate this instrument at line voltages greater than 126.5 Vac with line frequencies greater than 66 Hz (leakage currents at these line settings may exceed 3.5 mA).

Page 2-1, Figure 2-1:
Delete PC BOARD, HP 5020-8157 from upper right hand corner of figure.

Page 4-45, paragraph 4-31:
Under SPECIFICATIONS, add the following footnote to Pulse Repetition Rate.
Pulse performance degrades below 500 Hz repetition rates.

Page 4-46, paragraph 4-31:
In step 2 under PROCEDURE, change the repetition rate to 500 Hz.

Page 4-47, paragraph 4-31:
In the table under step 6, change the first three Pulse Rate (Hz) entries to 500 Hz.

Page 4-59, Table 4-3:
Under Output Level Accuracy Test (Option 002 with Option 003), change "512--1024 MHz" to "0.5--512 MHz".

ERRATA (cont'd)

Page 5-3, paragraph 5-21:
Add the following:

h. If A10A2U11 has been replaced, use a RF spectrum analyzer to check for low frequency spurious signals while tuned to 520 MHz. The spurs will occur at approximately 80 dBc between 5 and 30 MHz. To suppress the spur, add A10A2C55, 2.2 pF, from A10A2U11 pin 8 to ground.

NOTE

A low-pass or notch filter at the input of the spectrum analyzer will prevent overdriving the input mixer with the signal generator fundamental.

i. A10A2R49-51 Selection. If A26U2 has been replaced, the second harmonic level at RF OUTPUT may rise out of specification on the low end of the 0.5--8 MHz ranges with low vernier settings. If the second harmonic level is out of specification, increase the output attenuation pad formed by R49-51. To determine proper attenuation, insert a 1 dB step attenuator in place of W7, between A10A1J2 and A26W3, RF IN (FROM DIV). Increase attenuation until harmonics are just within specified limits. Add the value of attenuation on the step attenuator to that presently installed on the A10A2 assembly and replace R49-51 with the new values from the table below. Total attenuation greater than 6 dB is not recommended. Check harmonics, AUX RF OUTPUT, and maximum RF OUTPUT power.

Attenuation	Resistance		
	R49	R50	R51
2 dB	12.1	422	422
3 dB	17.8	287	287
4 dB	23.7	237	237
5 dB	31.6	178	178
6 dB	38.3	147	147

NOTE

Attenuation should be no higher than necessary to bring a range's second harmonic within specification. Excessive attenuation may reduce maximum RF output level below +19 dBm.

k. A26A1R2 Selection. If A26A1Q1 or A26A1Q2 has been replaced, check the level of the subharmonics (that is, 1/2 and 3/2 the fundamental frequency) with respect to the fundamental. If the subharmonically related spurious output signals are out of specification, decrease the resistance of A26A1R2 by 10%.

ERRATA (cont'd)

Page 5-3, Table 5-1:
Add the following to Table 5-1:

Component	Service Sheet	Range of Values	Basis of Selection
A10A2C55	11	2.2 pF	See para. 5-21h.
A10A2R49-51	11	--------	See para. 5-21i.
A26A1R2	13A	13.3k ohm--14.7k ohm	See para. 5-21k.

Page 5-28, paragraph 5-40:
In step 5, change "A5TP2" to "A5TP6".
Add the following as the first sentence in step 8:
"Set FM to AC."

Page 6-5, Table 6-3:
A1MP10: The recommended replacement is 08640-80015 CD1 SHAFT, INNER 0.125" DIA, 9.38 LG.

Page 6-6, Table 6-3:
Change A2U2 to 1826-1113 (CD1) IC COMPARATOR PRCN TO-99 PKG.

Page 6-7, Table 6-3:
Replace the appropriate A3A4 assembly parts listing with the following:

Table 6-3. Replaceable Parts

Ref. Des.	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A4R1	2100-3054	6	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	02111	43P503
A3A4R2	2100-3109	2	2	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	02111	43P202
A3A4R3	2100-3123	0	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	02111	43P501
A3A4R4	2100-3154	7	2	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	02111	43P102
A3A4R5				NOT ASSIGNED		
A3A4R6				NOT ASSIGNED		
A3A4R7	0698-3439	4	1	RESISTOR 178 1% .125W F TC=0+-100	24546	C4-1/8-TO-178R-F
A3A4R8	0757-0416	7	5	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-TO-511R-F
A3A4R9	0757-0416	7		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-TO-511R-F

ERRATA (cont'd)

Page 6-8, Table 6-3:
Change A5MP3 to 0400-0018 (CD0) GROMMET-CHAN NCH .056-IN-GRV-HD.
Page 6-10, Table 6-3:
Change A7R12 to 2100-3109 RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN.
Pages 6-13 and 6-14, Table 6-3:
Change the following A10A1 listings:
Change C17 to 0160-4456 CAPACITOR-FXD 750 PF ±1% 300 WVDC MICA.
Change C48 to 0160-3395 CAPACITOR-FXD 800 PF ±1% 300 WVDC MICA.
Change C52 to 0160-4456 CAPACITOR-FXD 750 PF ±1% 300 WVDC MICA.
Change C57, C59 and C60 to 0160-4457 CAPACITOR-FXD 51 PF ±5% 300 WVDC MICA.
Change C63 to 0160-2538 CAPACITOR-FXD 400 PF ±1% 300 WVDC MICA.
Change C65 to 0160-2542 CAPACITOR-FXD 480 PF ±1% 300 WVDC MICA.
Change A10MP4 to 8160-0448 CD8 RFI ROUND STRIP 0.062 +-0.008 IN OD.
Page 6-15, Table 6-3:
Change A10A1MP2 to 00355-20034 with the same description.
r Change 3130-0480 to 08640-80013 CD9 CONTACT-SWITCH SWITCH CONTACT; 0.002-IN. The switch contacts are part of A10A1S1-S6, slide switches, and are listed under A10A1S1-S6.
Page 6-16, Table 6-3:
r Change A10A2C6 0160-4584 CD3 CAPACITOR-FXD .1UF ±20% 50VDC CER.
Change A10A2C21 to NOT ASSIGNED.
Change A10A2C22 to 0180-1743 CAPACITOR-FXD .1UF ±10% 35 VDC TA.
Add A10A2C55 0160-3872 CAPACITOR-FXD 2.2 PF ±0.25 PF 200 WVDC CER.
Page 6-17, Table 6-3:
Change A10A2R9 to 0698-7229 CD8 RESISTOR 511 1% .05W F TC=0±100. (Refer to Change 21.)
Change A10A2R10 to 0698-7188 CD8 RESISTOR 10 1% .05W F TC=0±100. (Refer to Change 21.)
Change A10A2R12 to 0698-7229 CD8 RESISTOR 511 1% .05W F TC=0±100. (Refer to Change 21).
Change A10A2R18 to 0698-7221 CD0 RESISTOR 237 1% .05W F TC=0±100. (Refer to Change 21).
Change A10A2R20 to 0698-7197 CD9 RESISTOR 23.7 1% .05W F TC=0±100. (Refer to Change 21).
Change A10A2R21 to 0698-7221 CD0 RESISOR 237 1% .05W F TC=0±100. (Refer to Change 21).
Change A10A2R26 to 0698-7229 CD8 RESISTOR 511 1% .05W F TC=0±100. (Refer to Change 21).
Change A10A2R28 to 0698-7188 CD8 RESISTOR 10 1% .05W F TC=0±100. (Refer to Change 21).
Change A10A2R29 to 0698-7229 CD8 RESISOR 511 1% .05W F TC=0±100. (Refer to Change 21).
Page 6-18, Table 6-3:
Change A10A2T1-T5 to 08640-60355 (CD0) TRANSFORMER RF (CODE BLUE).
Change A10A3XA10A2A to 1251-6052 (CD8) CONNECTOR-PC EDGE 15-CONT/ROW 2 ROWS.
If A10A2U7 is replaced, refer to CHANGE 34 for recommended replacement of A10A2C18 and addition of A10A2E1, E2.
Page 6-19, Table 6-3:
Change All part number to 08640-60020.
Change A11A1 to 08640-60116 FREQUENCY SELECT SWITCH ASSEMBLY.

ERRATA (cont'd)

Page 6-20 and 6-21, Table 6-3:
Change A11Q1 to 1853-0007 TRANSISTOR PNP 2N3251 SI TO-18 PD=360 MW.
Delete part number for A11A1 (see listing below).
Add A11A1 08640-60185 VARIABLE SWITCH ASSEMBLY (DOES NOT INCLUDE A11A1MP1-6).

Page 6-23, Table 6-3:
Under A13S1 and A13S2, change 5040-3440 to 5020-3440.

Page 6-24, Table 6-3:
Delete A14P1 listing from parts list.
Change A18Q6, A18Q8, A18Q9 and A18Q11 to 1853-0007 TRANSISTOR PNP 2N3251 SI TO-18 PD-360 MW.
Change A13XA15 to 1251-6052 (CD8) CONNECTOR-PC EDGE 15-CONT/ROW 2 ROWS.

Page 6-27, Table 6-3:
Change A21A1C1, A21A1C2, and A21A1C6 to 0160-5765 (CD4) CAPACITOR-FXD .1UF 100 VDC CER.
>> Add 08640-00164 (CD3) INSULATOR,RISER to A21MP1.

Page 6-30 and 6-31, Table 6-3:
Under A26, delete the note "(DOES NOT INCLUDE A26U1, U2).

Page 6-32, Table 6-3:
Change A26A2C5 and A26A2C7 to 0160-3458 (CD8) CAPACITOR-FXD 5000 PF ±10% 250 VDC CER.

Page 6-34, Table 6-3:
If A26A4Q5 is replaced, refer to CHANGE 30 for recommended addition of A26A4E1.

Page 6-36, Table 6-3:
Under A26, delete the note "(DOES NOT INCLUDE A26U1, U2)."
Change A26A1CR1 to 1906-0098 CD9 DIODE-MATCHED 1V. (The descriptions for A26A1CR2, CR3, and CR4 remain as written).

Page 6-38, Table 6-3:
If A26A4Q5 is replaced, refer to CHANGE 30 for recommended addition of A26A4E1.

Page 6-41, Table 6-3:
Add MP98 7120-7032 LABEL, SAFETY.
Change MP60 to 3050-0227 (CD3) WASHER-FL MTLC NO.6 .149-IN-ID and 0510-0052 (CD5) RETAINER-RING GRPR EXT .125-IN-DIA STL.
Change MP95 to 3050-0103 (CD4) WASHER-FL MTLC NO.12 .25-IN-ID and 0510-0005 (CD8) RETAINER-RING BSC EXT .25-IN-DIA STL.
>> Change MP58 to 8160-0276 (CD0) RFI RING MNL 1-IN-OD .235-IN-ID.

Page 8-25, Service Sheet 6 (schematic):
In the upper left portion of the schematic, change A13R2 to A13R6.
In the table of Reference Designations, add R6 to the A13 Assembly.

Page 8-33, Service Sheet 9A (component locations):
In Figure 8-30 (center figure), transpose reference designation R53 and R54.
In Figure 8-30 (center figure), change reference designation R35 (between C24 and R44) to R55.

Page 8-33, Service Sheet 9A (schematic):
Delete the part number for A11A1 Frequency Select Switch Assembly.
On the A11 assembly, change the part number for Q1 to 1853-0007.

Page 8-35, Service Sheet 10 (component locations):
Add designator C3 between K1 and C9.

ERRATA (cont'd)

Page 8-35, Service Sheet 10 (schematic):
Change the A10A1 part number to 08640-60204.
Change A10A1C66 to 350 pF.
Page 8-37, Service Sheet 11 (schematic):
Add A10A2C55, 2.2 pF, and an asterisk (indicating factory selected value) from U11 pin 8 to ground.
Add an asterisk (indicating factory selected values) to A10A2R49, R50 and R51.
Change A10A2R9* to 511 ohms. (Refer to Change 21).
Change A10A2R10* to 10 ohms. (Refer to Change 21).
Change A10A2R12* to 511 ohms. (Refer to Change 21).
Change A10A2R18* to 237 ohms. (Refer to Change 21.)
Change A10A2R20* to 23.7 ohms. (Refer o Change 21.)
Change A10A2R21* to 237 ohms. (Refer to Change 21.)
Change A10A2R26* to 511 ohms. (Refer to Change 21.)
Change A10A2R28* to 10 ohms. (Refer to Change 21.)
Change A10A2R29* to 511 ohms. (Refer to Change 21.)
Page 8-39, Service Sheet 12 (schematic):
Add value of .22 pf to A26A3C3*, C4*, C5* and C6*.
Page 8-45, Service Sheet 13A (schematic):
Add an asterisk (indicating factory selected value) to A26A1R2.
Page 8-55, Service Sheet 17 (schematic):
Change A2R10 to 42.2k.
Under NOTES, change the part number of A2U2 to 1826-1113.
Page 8-57, Service Sheet 22 (schematic):
Add the following T1 pin numbers to the A14 to T1 wire connections:

Color Code	T1 Pin No.
0	6
3	5
02	4
04	7
05	3

Page 8-59, Service Sheet 23 (schematic):
On the A18 assembly, change part number for Q6, Q8, Q9 and Q11 to 1853-0007.
Page 8-62, Figure 8-71:
Add the label R7 to the resistor located approximately .5 cm above XA2.
Page 8-67, Service Sheet B (legend):
Change Item Number 13 to 15.
Change Item Number 15 to 13.
Page 8-79, Service Sheet H (legend):
Change the reference designation corresponding to (33) A5R8.

CHANGE 1

Page 6-23, Table 6-3:
Change A13R2 to 0757-0442 RESISTOR 10K 1% .125W F TC=0+100.
Change A13R3 to 2100-2497 RESISTOR TRMR 2K 10% C TOP-ADJ 1-TRN.
Page 6-31, Table 6-3:
Change A26A1C4 to 0160-2209 CAPACITOR-FXD 260 PF ±5% 200 WVDC MICA
Page 6-34, Table 6-3:
Change A26A4C13 to 0180-2206 CAPACITOR-FXD 60 UF ±10% 6 VDC TANT.
Page 6-37, Table 6-3:
Change A26A4C13 to 0180-2206 CAPACITOR-FXD 60 UF ±10% 6 VDC TANT.
Page 8-25, Service Sheet 6 (schematic):
Make the following changes to the A13 assembly:
Change R2 to 10k ohms.
Change R3 to 2k ohms.
Page 8-39, Service Sheet 12 (schematic):
Change A26A4C13 to 60 uF.
Page 8-41, Service Sheet 12A (schematic):
Change A26A4C13 to 60 uF.
Page 8-43, Service Sheet 13 (schematic):
Change A26A1C4 to 360 pF.

CHANGE 2

Page 6-9 through 6-11, Table 6-3:
Change the part number for the A7 FM Shaping Assembly to 08640-60339.
Replace appropriate A7 assembly listings with the attached partial table entitled Table 6-3. Replaceable Parts (P/O CHANGE 2).
Page 8-27, Service Sheet 7 (schematic):
Change the part number for the A7 FM Shaping Assembly to 08640-60339.
Change A7R13 to 4.64k ohms.
Change A7R40 to 6.81k ohms.
Replace appropriate portions of schematic with the attached partial schematics entitled P/O Figure 8-21. FM Shaping Circuits and Varactor Bias Schematic Diagram (P/O CHANGE 2).

CHANGE 3

Pages 6-37 and 6-38, Table 6-3:
Change A26A4 to 08640-60350.
Add the following to the A26A4 listings:
C18 0160-0127 CAPACITOR-FXD 1 UF ±20% 25 WVDC CER.
C19, C20 0180-2619 CAPACITOR-FXD 22 UF ±10% 15 VDC TA.
CR16 1901-0040 DIODE-SWITCHING 30V 50 MA 2 NS DO-35.
Q10 1853-0007 TRANSISTOR PNP 2N3251 SI TO-18 PD=360 MW.
R56, R59 0757-0442 RESISTOR 10K 1% 0.125W F TC=0+100.
R57 0757-0280 RESISTOR 1K 1% 0.125W F TC=0+100.
R58 0757-0464 RESISTOR 90.9K 1% 0.125W F TC=0+100.
Page 8-41, Service Sheet 12A (component locations):
Replace Figure 8-42 with the attached Figure 8-42. A26A4 ACC Amplifier Assembly Component Locations (Option 002) (P/O Change 3).
Page 8-41, Service Sheet 12A (schematic):
Replace appropriate portion of the schematic diagram with the attached partial schematic diagram entitled P/O Figure 8-43. AGC Amplifiers and Amplitude Modulator Schematic Diagram (Option 002).

CHANGE 4

Page 6-37, Table 6-3:
Change A26A4C18 to 0180-2619 CAPACITOR-FXD 22 UF ±10% 15 VDC TA.
Page 8-41, Service Sheet 12A (schematic):
Change A26A4C18 to 22 uF with the positive polarity to R57. (Refer to Change 3.)

CHANGE 5

Page 6-16, Table 6-3:
Delete A10A2C7.
Page 8-37, Service Sheet 11 (schematic):
Delete A10A2C7.

CHANGE 6

Page 6-38, Table 6-3:
Change A26A4R2 to 2100-2522 RESISTOR-TRMR 10K 10% C SIDE-ADJ 1-TURN.
Change A26A4R5 to 0757-0274 RESISTOR 1.21K 1% 0.125W F TC=0±100.
Page 8-41, Service Sheet 12A (schematic):
Change A26A4R2 to 10k ohms.
Change A26A4R5 to 1210 ohms.

CHANGE 7

Page 6-33, Table 6-3:
Change A26A4 to 08640-60351.
Pages 6-34 and 6-35, Table 6-3:
Add the following to the A26A4 assembly listings.
C19, C20 0180-2619 CAPACITOR-FXD 22 UF ±10% 15 VDC TA (C18 not assigned).
CR16 1901-0040 DIODE-SWITCHING 30V 50 MA 2NS DO-35 (CR15 not assigned).
Q10 1853-0007 TRANSISTOR PNP 2N3251 SI TO-18 PD=360 MW.
R56, R59 0757-0442 RESISTOR 10K 1% 0.125W F TC=0±100 (R54, R55, and R57 not assigned).
R58 0757-0464 RESISTOR 90.9K 1% 0.125W F TC=0+100.
Page 8-39, Service Sheet 12 (component locations):
Replace Figure 8-39 with the attached Figure 8-39. A26A4 AGC Amplifier Assembly Component Locations (P/O CHANGE 7).
Page 8-39, Service Sheet 12 (schematic):
Replace appropriate portion of the schematic diagram with the attached partial schematic entitled P/O Figure 8-40. AGC Amplifiers and Amplitude Modulator Schematic Diagram (P/O CHANGE 7).

CHANGE 8

Page 6-41, Table 6-3:
Change MP55 and MP80 to NOT ASSIGNED.
Add MP95 606A-34C-6 COLLAR, SHAFT (MP94 not assigned).
Add MP96 3030-0021 SCREW-SET 8-32 .125-IN-LG FLAT-PT ALY (FOR MP95).
Add MP97 8160-0276 RFI RING MNL 1-IN-OD .218-IN-ID.

CHANGE 8 (cont'd)

Page 8-65, Service Sheet A (legend):
Change Item Number 12 (Reference Designator and Description) to MP97 RFI Gasket.
Change Item Number 13 (Reference Designator and Description) to MP95 Retaining Collar.
Add Item Number 26 MP96 Setscrew.

Page 8-65, Service Sheet A, Figure 8-73:
Replace appropriate portion of Figure 8-73 with the attached partial figure entitled P/O Figure 8-73. A1 Output Level Assembly Illustrated Parts Breakdown (P/O CHANGE 8).

CHANGE 9

r Page 6-27, Table 6-3:
Change A21A1C1, C2, and C6 to 0160-4584 CAPACITOR FXD .1 UF ±20% 50 WVDC CER.

CHANGE 10

r Page 6-30 and 6-31, Table 6-3:
Make the following changes to the A26 listings.
Change C17 and C18 to 0160-3219 CAPACITOR-FDTHRU 100PF 20% 500V CER.
Add L9 9140-0098 COIL-MLD 2.2 UH 10% Q=33 .155D X .375 LG - NOM.
Delete R1.

NOTE

When replacing A26R1, replace A26A4R4 as described in Change 12.

Page 8-43, Service Sheet 13 (schematic):
Make the following changes to the A26 assembly.
Change C17 and C18 to 100 pF.
Change R1 to L9, 2.2 uH.

Page 8-75, Service Sheet F (legend):
Change Item Number 77 (Reference Designator and Description) to A26L9 Inductor.

CHANGE 11

r Page 6-42, Table 6-3:
Change T1 to 9100-4024 TRANSFORMER, POWER.

CHANGE 12

r Page 6-5, Table 6-3:
Change A1A1R1 to 0757-0401 RESISTOR 100 1% .125W F TC=0±100.

r Page 6-34, Table 6-3:
Change A26A4R4 to 0757-0440 RESISTOR 7500 1% .125W F TC=0±100.

Page 6-38, Table 6-3:
Change A26A4R4 to 0757-0440 RESISTOR 7500 1% .125W F TC=0±100.

Page 8-39, Service Sheet 12 (schematic):
Change A26A4R4 to 7500 ohms.

Page 8-41, Service Sheet 12A (schematic):
Change A26A4R4 to 7500 ohms.

CHANGE 13

Page 6-9, Table 6-3:
Add A7C14 0180-0229 CAPACITOR-FXD 33 UF ±10% 10 VDC TA (Check Digit is 7).

Page 8-27, Service Sheet 7 (schematic):
On the A7 Assembly add C14, 33 uF, from the +5.2V input line (positive polarity) to the ground input line.

CHANGE 14

Page 6-8, Table 6-3:
Add A5C10 0180-2617 CAPACITOR-FXD 6.8 UF ±10% 35 VDC TA (Check Digit is 1).

Page 6-41, Table 6-3:
Add MP101 08640-00138 RETAINER (FOR RECTIFIER BOARD) (Check Digit is 1).

NOTE
MP99 and MP100 are not assigned.

Under S1, add the following:
8160-0058 RFI BRAID CABLE (Check Digit is 6).

Page 8-25, Service Sheet 6 (schematic):
On the A5 Assembly add C10, 6.8 uF, from the -20V input line to the ground input line (positive polarity).

Page 8-56, Service Sheet 22 (schematic):
Add a line (color code 0) connecting the dashed line enclosing line switch S1 to chassis ground (///).

CHANGE 15

Page 6-5, Table 6-3:
Change A2Q1, Q2, and Q3 to 1854-0071 TRANSISTOR NPN SI PD=300MW FT=200 MHZ (Check Digit is 7).

Page 8-55, Service Sheet 17 (schematic):
Change the part number of A2Q1, Q2, and Q3 to 1854-0071.

CHANGE 16

Page 6-41, Table 6-3:
Change R3 to 0698-3162 RESISTOR, 46.4K 1% .125W F TC=0±100 (Check Digit is 0).

Page 8-57, Service Sheet 22 (schematic):
Change R3 to 46.4K.

CHANGE 17

Page 6-9, Table 6-3:
Add A7C15 0160-3876 CAPACITOR-FXD 47 PF ±20% 200 VDC CER (Check Digit is 4).

Page 8-27, Service Sheet 7 (schematic):
On the A7 Assembly add C15, 47 pF, across the base and collector of Q2.

CHANGE 18

Page 6-32, Table 6-3:
Change A26A2R19 to 2100-2574 RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN (Check Digit is 3).
Page 6-41, Table 6-3:
Change S2 to 3101-0415 SWITCH-SL DPDT MINTR .5A 125VAC/DC (Check Digit is 0).
Page 8-49, Service Sheet 14 (schematic):
On the A26A2 Assembly change R19 to 500 ohms.

CHANGE 19

Page 6-8, Table 6-3:
Change A5Q1 and A5Q2 to 1854-0475 TRANSISTOR-DUAL NPN PD = 750 MW (Check Digit is 5).
Page 6-33, Table 6-3:
Change A26A2U2 to 1820-0054 CD5 IC GATE TTL NAND QUAD 2-INP.
Page 8-25, Service Sheet 6 (schematic):
Change the part number of A5Q1A and A5Q2A to 1854-0475.
Page 8-43, Service Sheet 13 (schematic):
Change the part number of A26A2U2A to 1820-0054.

CHANGE 20

Page 6-6, Table 6-3:
Change A2R14 to 2100-2514 RESISTOR-TRMR 20K 10% C SIDE-ADJ 1 TRN (Check Digit is 1).

CHANGE 21

Page 5-2, paragraph 5-21:
Delete the A10A2R3 Selection procedure;
Under A10A2R6-R8, R12-14, and R18-R20 Selection, change the following reference designations:

Old Reference Designations	New Reference Designations
A10A2R6	A10A2R10
A10A2R7	A10A2R9
A10A2R8	A10A2R12
A10A2R12	A10A2R20
A10A2R13	A10A2R18
A10A2R14	A10A2R21
A10A2R18	A10A2R28
A10A2R19	A10A2R26
A10A2R20	A10A2R29

CHANGE 21 (cont'd)

Page 5-3, Table 5-1:
Change the following reference designations:

Old Reference Designations	New Reference Designations
A10A2C55*	A10A2C8
A10A2R6	A10A2R10
A10A2R7	A10A2R9
A10A2R8	A10A2R12
A10A2R12	A10A2R20
A10A2R13	A10A2R18
A10A2R14	A10A2R21
A10A2R18	A10A2R28
A10A2R19	A10A2R26
A10A2R20	A10A2R29
A10A2R49*	A10A2R70
A10A2R50*	A10A2R69
A10A2R51*	A10A2R72
*Refer to the errata section of this Manual Change Supplement	

Delete A10A2R3.

Add the following entry:

Component	Service Sheet	Range of Values	Basic of Selection
A10A2R2-4	11	--	See paragraph 5-21j

Page 5-3, paragraph 5-21:

Under step h change the reference designation of A10A2C55 to A10A2C8 (one place). Refer to the errata section of this Manual Change Supplement.
Under "i. A10A2R49-51 Selection" change the reference designation of A10A2R49, R50, and R51 to A10A2R70, R69, and R72 respectively (four places). Refer to the errata section of this Manual Change Supplement.
Add the following after the A10A2R70, R69, and R72 Selection procedure (see above change).

CHANGE 21 (cont'd)

Page 5-3, paragraph 5-21:

j. **A10A2R2-R4 Selection.** If the RF Divider EECL Bias Adjustment (paragraph 5-47) cannot be performed successfully, it may be necessary to change the values of A10A2R2-R4. These resistors form an attenuator pad which sets the signal level into A10A2U11. For most cases, if the value of the pad is less than 2 dB, increase the attenuation of the pad. Refer to the following table for the resistor values. If increasing the attenuation does not correct the problem, try decreasing it.

Attenuation (dB)	Resistance (ohms)		
	R2	R3	R4
0	Open	Short	51.1
1	825	6.8	825
1.7	511	10	511
2	422	12	422
3	287	17.8	287

NOTE

The RF Divider EECL Bias Adjustment, paragraph 5-47, should be performed if the values of A10A2R2-R4 have been changed.

Page 5-40:

Add the following after paragraph 5-46:

5-47. RF DIVIDER EECL BIAS ADJUSTMENT

REFERENCE: Service Sheet 11.

DESCRIPTION: The output signal at RF OUTPUT is observed with a spectrum analyzer. The bias level for divider U12 is adjusted to eliminate any signal irregularities (that is, erratic frequency, sub-harmonics, or increased level of the noise floor) as the Signal Generator is tuned across the 256-128 MHz and 128-64 MHz ranges. This procedure should be performed whenever the A3 RF Oscillator Assembly has been repaired or replaced (that is, any changes that affect the oscillator's output power level) or when A10A2U11 or U12 is replaced.

5-47. RF DIVIDER EECL BIAS ADJUSTMENT (cont'd)

EQUIPMENT: Spectrum Analyzer .... HP 8554B/8552B/141T

PROCEDURE: 1. Connect spectrum analyzer to the Signal Generator's RF OUTPUT after setting the Signal Generator's controls as follows:

Meter Function .... LEVEL
AM .... OFF
FM .... OFF
RANGE .... 256-128 MHz
OUTPUT LEVEL Switch .... -10 dBm
OUTPUT LEVEL Vernier .... Fully cw

2. Set the spectrum analyzer's center frequency to 250 MHz, frequency span (scan width) to 50 MHz per division, resolution bandwidth to 300 kHz, input attenuation to 20 dB, and vertical scale to 10 dB per division.

3. While observing the RF OUTPUT signal with the spectrum analyzer, tune the Signal Generator across its frequency range. If the signal appears erratic or disappears or if the noise floor abruptly rises, adjust the BIAS adjustment, A10A2R6, until a clean and stable signal is again observed.

4. Turn the RANGE switch to the 128-64 MHz range and repeat step 3.

5. If the BIAS adjustment, A10A2R6, requires readjustment on the 128-64 MHz range, check the 256-128 MHz range again for any signal irregularities.

NOTE

If the bias level cannot be adjusted for satisfactory operation on both ranges without readjustment, it may be necessary to select new values for A10A2R2-R4. Refer to paragraph 5-19, Factory Selected Components.

Page 6-16 through 6-18, Table 6-3:

Replace the entire A10A2 listing with the attached parts list, Table 6-3. Replaceable Parts.

Page 8-36, Service Sheet 11 (simplified logic diagram):

Make the following changes to the A10 Divider/Filter Assembly simplified logic diagram.

Change the third divide-by-two divider from "EECL" to "ECL".

Move the "EECL-ECL Converter" stage (located after the third divide-by-2 divider stage) to after the second divide-by-2 divider stage.

CHANGE 21 (cont'd)

Page 8-36, Service Sheet 11 (principles of operation):
Replace the entire principles of operation with the following:

RF Dividers (A10A2)

The A10A2 RF Divider Assembly frequency-divides the 256-512 MHz signal from the RF oscillator to obtain lower output frequencies. The overall operation of the A10 Divider/Filter Assembly is described on Service Sheet 10. Refer also to Figure 8-43 for a simplified logic diagram of the RF Dividers and Filters. On the two highest frequency ranges (256-512 MHz and 512-1024 MHz) the dividers are bypassed. On all other ranges, the signal from the oscillator is amplified and limited by buffer amplifier U11.

The outputs of the first two dividers drive complementary-output OR gates (U7A and U8B) which drive the next divider stage with one output and another complementary OR gate (U7B and U8A) with the other. The latter gates drive output transformer T1 and T2 in push-pull, and are enabled by inverter transistor Q2 and Q3 respectively.

When an output OR gate is enabled, the next divider stage is disabled. (Note that ground is a logical high and negative or open a logical low for EECL and ECL devices.) The next three divider stages operate in a manner similar to the previous two stages. The major difference is that the complementary-output OR gates, which follow the outputs of the first two dividers, have been eliminated since the latter dividers (U14, U15A and U15B) have complementary-outputs. The final four divider stages each drive NOR gates (U5A, U5B, U5C, U5D, U16A, U16B, U16C, and U16D) in push-pull which in turn drive a common output transformer T6 in push-pull. The last NOR-gate output pair is enabled through diodes CR2, CR5, and CR9 connected in a logical OR configuration.

VR1, Q6, Q7, and associated components form two -2.0 Vdc voltage regulators. The purpose of the -2.0 Vdc supplies is to provide the ECL devices with the proper dc load current. (A 51.1 ohm load resistor to -2.0 Vdc provides the proper load termination.)

All output transformers drive pi-network pads which are switched onto the line leading to the modulator circuits. The attenuation of the first three pads (R10, R9, and R12; R20, R18, and R21; and R28, R26, and R29) is selected (from 3 to 6 dB) to prevent excessive signal level from being applied to A26U2 (Service Sheet 12 or 12A). The attenuation level is selected by changing the value of the resistors.

CHANGE 21 (cont'd)

Page 8-37, Service Sheet 11 (Principles of Operation) (cont'd):

Schmitt Trigger (A10A2)

Amplifier U1 is a Schmitt Trigger which senses when the voltage V_T (proportional to the RF oscillator frequency) reaches the value corresponding to the geometric mean of the frequency range. The reference voltage is determined by resistors R60 and R61; R65 adds a small amount of hysteresis. Transistor Q1 complements the amplifier output. Inverter U4A activates the low-band relays A10A1K1 and K3 (Service Sheet 10); and U4B activates the high-band relays A10A1K2 and K4 (Service Sheet 10). The inverters are driven in complement except that capacitors C62 and C63 hold both inverters on simultaneously for a few milliseconds during a transition to provide a make-before-break action.

Page 8-36, Service Sheet 11 (troubleshooting):
Under the RF Divider Troubleshooting table, change references to U6 to U4 (four places).
Page 8-37, Service Sheet 11 (component locations):
Replace Figure 8-44 with the attached Figure 8-36, A10A2 RF Divider Assembly Component Locations.
Page 8-37, Service Sheet 11 (schematic):
Replace Figure 8-45 with the attached Figure 8-37, RF Divider Schematic Diagram.

CHANGE 22

Page 6-9 and 6-10, Table 6-3:
Add A7C16 and C17 0180-2618 CD2 CAPACITOR-FXD 33 UF +10% 10 VDC TA.
Add A7C18 0160-3451 CD1 CAPACITOR-FXD 0.01 UF +80 -20% 100 VDC CER.
ADD A7L1 9140-0129 CD1 COIL-MLD 220 UH 5% Q=65 .155 DX .375 LG-NOM.
Page 6-18, Table 6-3:
Change A10A2U12 to 1820-2412 CD3 IC CNTR ECL BIN DUAL. (Refer to Change 21).
Page 6-35, Table 6-3:
Change A26A4U1 to 1826-0547 CD3 IC OP AMP DUAL 8-DIP-P.
Page 6-39, Table 6-3:
Change A26A4U1 to 1826-0547 CD3 IC OP AMP DUAL 8-DIP-P.
Page 8-27, Service Sheet 7 (component locations):
Replace Figure 8-22 with the attached Figure 8-22, P/O A7 FM Shaping Assembly Component Locations.
Page 8-27, Service Sheet 7 (schematic):
Add A7L1 220 uH between XA7-pin 5 (+5.2V line) and A7C14 (added in Change 13).
Page 8-29, Service Sheet 8 (component locations):
Replace Figure 8-26 with the attached Figure 8-26, P/O A7 FM Shaping Assembly Component Locations.
Page 8-29, Service Sheet 8 (schematic):
Add A7C16, 33 uF, from U2A-4 (-polarity) to ground (+polarity).
Add A7C17, 33 uF, from U2B-7 (+polarity) to ground (-polarity).
Add A7C18, 0.01 uF, across R77.

CHANGE 22 (cont'd)

r Page 8-27, Service Sheet 11 (schematic):
Change the part number of A10A2U12 to 1820-2412. (Refer to Change 21).

r Page 8-39, Service Sheet 12 (schematic):
Change A26A4U1 to 1826-0547.

Page 8-41, Service Sheet 12A (schematic):
Change A26A4U1 to 1826-0547.

CHANGE 23

Page 6-5, Table 6-3:
Change A1R1 to 2100-3855 CD5 RESISTOR-VAR CONTROL CP1K 10% LIN.

Page 6-6, Table 6-3:
Change A3R1 to 2100-3856 CD6 RESISTOR-VAR CONTROL C10K 10% LIN.

Page 6-40, Table 6-3:
Change MP2 (except Option 002) to 0370-3037 CD4 KNOB, FREQUENCY RANGE.
Change MP2 (Option 002 only) to 0370-3038 CD5 KNOB, FREQUENCY RANGE.
Change MP5 to 0370-3035 CD2 KNOB, PEAK DEVIATION.

r Page 6-42, Table 6-3:
Change W7 to 08640-20363 CD6 CABLE ASSY-COAS 8.8-IN-LG.

CHANGE 24

r Page 6-24, Table 6-3:
Change A18CR6 to 1901-0328 CD8 DIODE-PWR RECT 400V 1A 6US.

r Page 6-25, Table 6-3:
Change A20CR1 and CR3 to 1901-0028 CD5 DIODE-PWR RECT 400V 750 MA DO-29.

r Page 6-28, Table 6-3:
Change A22CR2 and CR6 to 1901-0028 CD5 DIODE-PWR RECT 40V 750 MA DO-29.

CHANGE 25

Page 6-25, Table 6-3:
Change A18R14 to 0757-0438 CD3 RESISTOR 5 11K 1% .125W F TC=0±100.

Page 8-59, Service Sheet 23 (schematic):
Change A18R14 to 5110 ohms.

CHANGE 26

r Page 6-16, Table 6-3:
Change A10A2 to 08640-60370 CD9 RF DIVIDER ASSEMBLY. (Refer to Change 21).
Change A10A2L5 description to read NOT ASSIGNED. (Refer to Change 21.)

Page 6-18, Table 6-3:
Change A10A2U12 to 1820-2642 CD1 IC CNTR ECL BIN DUAL.

r Page 6-25, Table 6-3:
Change A18R14 to 0757-0290 CD5 RESISTOR 6.19K 1% .125W F TC=0±100.

r Page 8-37, Service Sheet 11 (schematic):
Change A10A2 RF DIVIDER ASSY part number to 08640-60370. (Refer to Change 21.)
Delete A10A2L5. Also, delete NOTE 3. In table of REFERENCE DESIGNATIONS, Change L1-13 to read L1-4, 6-13. (Refer to Change 21.)
Change A10A2U12 part number to 1820-2642.

CHANGE 26 (cont'd)

Page 8-59, Service Sheet 23 (schematic):
Change A18R14 to 6190 ohms.

CHANGE 27

r Page 6-38, Table 6-3:
Change A26A4R1 to 2100-2489 CD6 RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN.
Page 8-41, Service Sheet 12A (schematic):
Change A26A4R1 to 5k ohms.

CHANGE 28

Page 1-9, Table 1-1:
Change Output Level Flatness specification for frequency range 0.5-64 MHz; Option 002 combination to read ±0.75 dB.
Page 4-36, paragraph 4-24:
Change Output Level Flatness specification for frequency range 0.5-64 MHz; Option 002 Combination to read ±0.75 dB.
Change Output Level Limits (dBm) for Option 002; frequency range 0.5-64 MHz to read 8.25 to 9.75.

CHANGE 29

Page 6-27, Table 6-3:
Delete MP22.
Page 6-42, Figure 6-1:
Delete MP22.

CHANGE 30

Page 6-5, Table 6-3:
Add A2C10 0160-2306 (CD3) CAPACITOR-FXD 27PF ±5% 300VDC MICA 28480.
Page 6-8, Table 6-3:
Add A5R7 0699-1043 (CD4) RESISTOR FIXED 3.3K 5% 2W F TC=0±100.
Page 6-17, Table 6-3:
Change A10A2R6 to 0757-0276 (CD7) RESISTOR 61.9 1% .125W F TC=0±100 24546 D4-1/8-TO-6192-F.
r Page 6-27, Table 6-3:

NOTE

If zener diodes A21A1VR1, A21A1VR3 or resistor A21A1R6 fail, replace R6 with inductor A21A1L3 as recommended below.

Delete A21A1R6.
Add A21A1L3 9100-2249 INDUCTOR RF-CH-MLD 150NH 10% .105D X .26LG 28480.
Page 6-33, Table 6-3:
Change A26A3R1 to 0698-7224 RESISTOR 316 1% .05W F TC=0±100 24546 C3-1/8-TO-316R-F.
r Page 6-34, Table 6-3:
Add A26A4E1 9170-0847 (CD3) CORE SHIELDING BEAD 02114 56-590-65/38 PARLENE COATED. (Added to A26A4Q5).

CHANGE 30 (cont'd)

r Page 6-38, Table 6-3:
Add A26A4E1 9170-0847 (CD3) CORE SHIELDING BEAD 02114 56-590-65/38 PARLENE COATED. (Added to A26A4Q5).

Page 8-25, Service Sheet 6 (schematic):
Change A5R7 to 3300 ohms.

Page 8-37, Service Sheet 11 (component locations):
Replace Figure 8-36 with the attached Figure 8-36 A10A2 RF Divider Assembly Component Locations (P/O CHANGE 30).

Page 8-37 Service Sheet 11 (schematic):
Replace the appropriate portion of the service sheet with the attached partial schematic, Figure 8-37 RF Dividers Schematic Diagram (P/O CHANGE 30).

Page 8-39, Service Sheet 12 (schematic):
Change A26A3R1 to 316 ohms.
r On the A26A4 AGC AMPLIFIER ASSY, add E1, ferrite bead to the base lead of A26A4Q5.
In the Table of Reference Designations, add E1 to the A26A4 ASSY.

r Page 8-41, Service Sheet 12A (schematic):
On the A26A4 AGC AMPLIFIER ASSY, add E1, ferrite bead to the base lead of A26A4Q5.
In the Table of Reference Designations, add E1 to the A26A4 ASSY.

Page 8-47, Figure 8-51:
Change R6 to L3 on the Component Locator.

Page 8-47, Service Sheet 13B:
Add L3 to the LIST OF REFERENCE DESIGNATORS under the A21A1 Assembly.
Change resistor R6 to an inductor L3, 150 nH.

Page 8-55, Service Sheet 17:
Replace appropriate portion of the schematic diagram with the attached partial schematic (P/O Figure 8-60. Meter Switch and Drive Schematic).
In the table of REFERENCE DESIGNATIONS under A2 Assembly, change C1-9 to read C1-1C.

Page 8-55, Service Sheet 17:
Replace the A2 Meter Switch and Drive Assembly Component Locator with the figure (P/O Figure 8-58. Meter Switch and Drive Assembly Component Locations) contained in this Manual Changes supplement.

CHANGE 31

Page 5-3, Table 5-1:
Add the following information to the table of Factory Selected Components:

Component	Service Sheet	Range of Values	Basis of Selection
A3A4R10	5	0--287 ohms	See paragraph 5-21

CHANGE 31 (cont'd)

Page 5-3, Paragraph 5-19:
Add the following component factory-selection procedure:

1. A3A4R10 Selection. If the Oscillator transistor (A3Q1) is replaced, perform the FM Deviation Sensitivity Test found on page 4-52, paragraph 4-35. If the test limits are exceeded, increase the value of A3A4R10* until the Signal Generator is within the specified limits. After changing the value of A3A4R10 perform the RF Output Level Flatness Test found on page 4-36, paragraph 4-24. Also, check to see that the RF Oscillator will start when the Signal Generator settings are as follows:

1) FM on INTernal.
2) FM PEAK DEVIATION to 2.56 MHz.
3) FM Vernier fully clockwise.
4) RF FREQUENCY at 550 MHz.
5) FINE TUNE fully clockwise.

Turn the instrument ON and OFF and verify that the RF Oscillator is operating as indicated by the RF Level Meter. If the RF Oscillator will not start under the above conditions, decrease the value of A3A4R10 by increments of 10%.

Page 6-7, Table 6-3:
Add the following component to the Replaceable Parts List:
A3A4R10* 0698-3440 (CD7) RESISTOR 196 1% .125W F TC=0±100 245461 C4 1/8-TO-196R-F.

r Page 6-36, Table 6-3:
Change A26A1R4 to 0699-0938 RESISTOR 26.1 (CD4) 1% .05W F TC=0±100 28480.

r Page 6-37, Table 6-3:
Change A26A1R9 to 0699-0584 RESISTOR 90.9 (CD6) 1% .05W F TC=0±100 28480.

Page 8-23, Service Sheet 5:
Add the series resistor A3A4R10* (196 ohms) between A3A4FL4 and Wire 7 on the schematic.
Add R10 to the table of REFERENCE DESIGNATIONS, under the A3A4 ASSY.

CHANGE 32

r Page 6-31, Table 6-3:
Change A26A1Q3 to 1855-0420 (CD2) TRANSISTOR JFET 2N4391 N-CHAN D-MODE 01295 2N4391.

r Page 6-36, Table 6-3:
Change A26A1Q10 to 1855-0420 (CD2) TRANSISTOR JFET 2N4391 N-CHAN D-MODE 01295 2N4391.

CHANGE 33

Page 6-10, Table 6-3:
Change A7R40 to 0757-0483 (CD3) RESISTOR 5.11K 1% .125W F TC=0±100 24546 C4-1/8-TO-5111-F.
Change A7R41 to 2100-3056 (CD8) RESISTOR-TRMR 5K 10% C SIDE-ADJ 17 TRN 02111 43P502.
Change A7R42 to 0757-0441 (CD8) RESISTOR 8.25K 1% .125W F TC=0±100 29546 C4-1/8-TO-8251-F.
Page 8-27, Service Sheet 7:
Change A7R40 to 5110 ohms.
Change A7R41 to 5000 ohms.
Change A7R42 to 8250 ohms.

r CHANGE 34

Page 6-16, Table 6-3:
Change A10A2C18 part mumber to 0160-3448 CD6.
Add A10A2E1 9170-0847 CD3 2 CORE-SHIELDING BEAD.
Add A10A2E2 9170-0847 CD3 CORE-SHIELDING BEAD.
Page 8-37, Service Sheet 11 (schematic):
In the upper left portion of the A10A2 RF DIVIDER ASSEMBLY schematic, add E1 (ferrite bead symbol) between C18 and the node of Q2, U7B. Add E2 (ferrite bead symbol) between C18 and ground.

CHANGE 35

Page 6-34, Table 6-3:
Change A26A4R1 to 2100-2489 CD6 RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN.
Page 8-38, Service Sheet 12 (Schematic):
Change A26A4R1 to 5K ohms.

CHANGE 36

Page 6-24, Table 6-3:
Replace A18Q3 with 1884-024 (CD9) THYRISTOR SCR VRRM=400, and 1205-0095 (CD0) HEAT SINK SGL TO-5/TO-39-CS.
Page 6-25, Table 6-3:
Replace A20Q1 and A20Q7 each with 1884-0244 (CD9) THYRISTOR-SCR VRRM=400, and 1205-0361 (CD3) HEAT SINK SGL TO-5/TO-39-CS.
Page 6-28, Table 6-3:
Replace A22Q1 and A22Q4 each with 1884-0244 (CD9) THYRISTOR-SCR VRRM=400, and 1205-0361 (CD3) HEAT SINK SGL TO-5/TO-39-CS.
r Page 6-35, Table 6-3:
Change A26A4U1 to 1826-0785 (CD1) IC OP AMP LOW-BIAS-H-IMPD DUAL 8-DIP-C.
r Page 6-39, Table 6-3:
Change A26A4U1 to 1826-0785 (CD1) IC OP AMP LOW-BIAS-H-IMPD DUAL 8-DIP-C.
Page 8-21, Service Sheet 5 (component locations):
Replace Figure 8-16 with the attached Figure 8-16. P/O A3A4 Connector Board Assembly Locations. P/O CHANGE 36.
Page 8-24, Service Sheet 6 (component locations):
Replace Figure 8-18 with the attached Figure 8-18. P/O A3A4 Connector Board Assembly Locations. P/O CHANGE 36.

CHANGE 36 (cont'd)

r Page 8-39, Service Sheet 12 (schematic):
Change A26A4U1 to 1826-0785.

r Page 8-41, Service Sheet 12A (schematic):
Change A26A4U1 to 1826-0785.

Page 8-57, Service Sheet 22 (schematic):
Change A20Q1 and A20Q7 to 1884-0244.
Change A22Q1 and A22Q4 to 1884-0244.

Page 8-59, Service Sheet 23 (schematic):
Change A18Q3 to 1884-0244.

CHANGE 37

Page 6-31, Table 6-3:
Change A26A1VR2 to 1902-0956 CD0 DIODE-ZNR 8.2V 5% DO-35 PD = .4W TC = +.065%

Page 6-37, Table 6-3:
Change A26A1VR2 to 1902-0956 CD0 DIODE-ZNR 8.2V 5% DO-35 PD = .4W TC = +.065%

Page 8-43, Service Sheet 13 (schematic):
In the top, left-hand portion of the schematic, change the value of A26A1VR2 to 8.2V.

Page 8-45, Service Sheet 13A (schematic):
In the left-center portion of the schematic, change the value of A26A1VR2 to 8.2V.

CHANGE 38

Page 5-2, paragraph 5-21:
Delete paragraphs 5-21d. and 5-21e.

Page 5-3, paragraph 5-21:
Delete paragraphs 5-21h., 5-21i. and 5-21j.

Page 5-3, Table 5-1:
Delete all references to A10A2 components.

Page 6-16 through 6-18, Table 6-3:
Replace the entire A10A2 parts listing with the attached partial parts list, "Table 6-3. Replaceable Parts (P/O CHANGE 38)".

ERRATA (to "Table 6-3. Replaceable Parts (P/O CHANGE 38)"):

>> Page 6-18, Table 6-3:
Change A10A2U12 to 1820-3485 (CD2) IC PRESCR ECL.

Page 8-36, SERVICE SHEET 11 (PRINCIPLES OF OPERATION):
Replace the entire PRINCIPLES OF OPERATION with the attached "RF Dividers (A10A2) (P/O CHANGE 38)".
Replace appropriate portion of Figure 8-35. with the attached "P/O Figure 8-35. Simplified Logic Diagram of the Divider/Filter Assembly. (P/O CHANGE 38)."

Page 8-37, SERVICE SHEET 11 (component locations):
Replace Figure 8-36. with the attached "Figure 8-36. A10A2 RF Divider Assembly Component Locations (P/O CHANGE 38)."

CHANGE 38 (cont'd)

Page 8-37, SERVICE SHEET 11 (schematic):
Replace Figure 8-37. with the attached "Figure 8-37. RF Dividers Schematic Diagram (P/O CHANGE 38)".

ERRATA (to "Figure 8-37. RF Dividers Schematic Diagram (P/O CHANGE 38)")

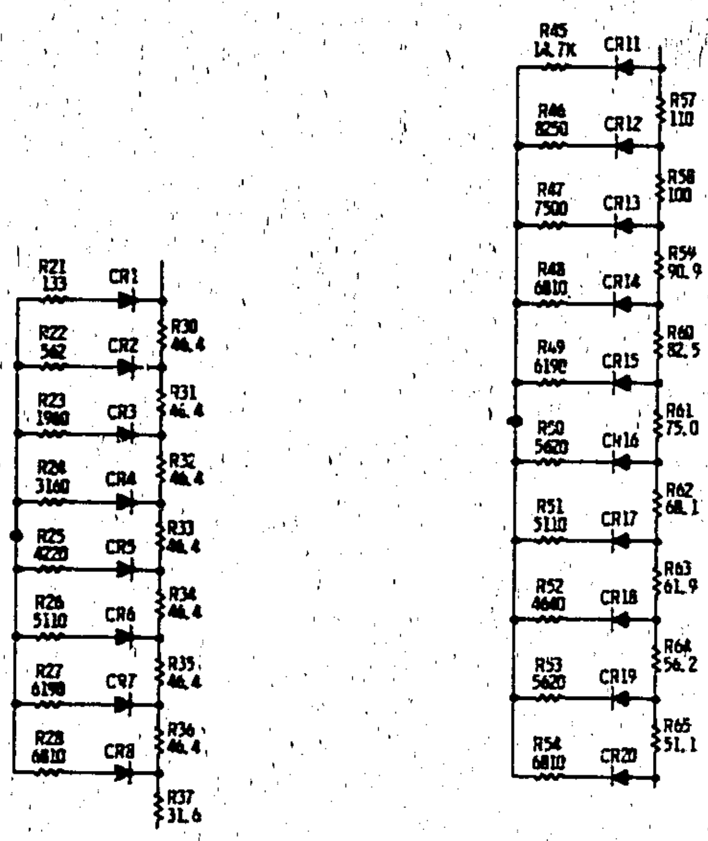
Page 8-37, SERVICE SHEET 11 (schematic):
In the upper left corner of the A10A2 assembly, change R23 and R75 to 133 ohms, and change R73 to 46.4 ohms.
Transpose the dependancy notation input symbols "T" and "D" in both U12 and U14.
Add a bar "-" above "Q" at pin 3 in U15A.
Change U11 and U12 to read "ECL" not "EECL".

>> CHANGE 39

r Page 6-6, Table 6-3:
Change A3MP25 to 08640-40092 (CDO). This part is the recommended replacement for all instruments back to Serial Prefix Number 1440A.

Table 6-3. Replaceable Parts (P/O CHANGE 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7R13	0698-3155	2	RESISTOR 4.64K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4641-F
A7R21	0698-3437	1	RESISTOR 133 1% .125W F TC=0+-100	16299	C4-1/8-T0-133R-F
A7R22	0757-0417	1	RESISTOR 562 1% .125W F TC=0+-100	24546	C4-1/8-T0-562R-F
A7R23	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1961-F
A7R24	0757-0279	1	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3161-F
A7R25	0698-3154	1	RESISTOR 4.22K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4221-F
A7R26	0757-0438	2	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A7R27	0757-0290	2	RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A7R28	0757-0439	6	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A7R30	0698-4037	7	RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A7R31	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A7R32	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A7R33	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A7R34	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A7R35	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A7R36	0698-4037		RESISTOR 46.4 1% .125W F TC=0+-100	16299	C4-1/8-T0-46R4-F
A7R37	0757-0180	1	RESISTOR 31.6 1% .125W F TC=0+-100	24546	C3-1/8-T0-31R6-F
A7R40	0757-0439	6	RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C3-1/8-T0-6811-F
A7R44	0698-3156	1	RESISTOR 14.7K 1% .125W F TC=0+-100	16299	C4-1/8-T0-1472-F
A7R45	0757-0441	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
A7R47	0757-0440	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A7R48	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A7R49	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-6191-F
A7R50	0757-0200	2	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A7R51	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A7R52	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	16299	C4-1/8-T0-4641-F
A7R53	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
A7R56	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6811-F
A7R57	0757-0402	1	RESISTOR 110 1% .125W F TC=0+-100	24546	C4-1/8-T0-111-F
A7R58	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A7R59	0757-0400	1	RESISTOR 90.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-90R9-F
A7R60	0757-0399	1	RESISTOR 82.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-82R5-F
A7R61	0757-0398	1	RESISTOR 75 1% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-F
A7R62	0757-0397	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
A7R63	0757-0276	1	RESISTOR 61.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-61R9-F
A7R64	0757-0395	1	RESISTOR 56.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R2-F
A7R65	0757-0394	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F



P/O Figure 8-21. FM Shaping Circuits and Varactor Bias Schematic Diagram (P/O Change 2)

A26A4 ASSEMBLY (OPTION 002)

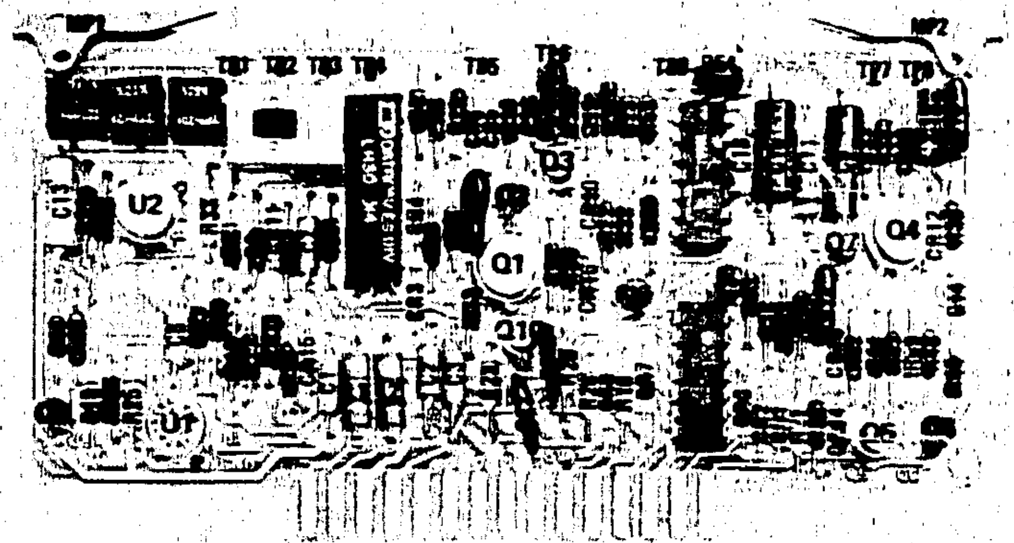
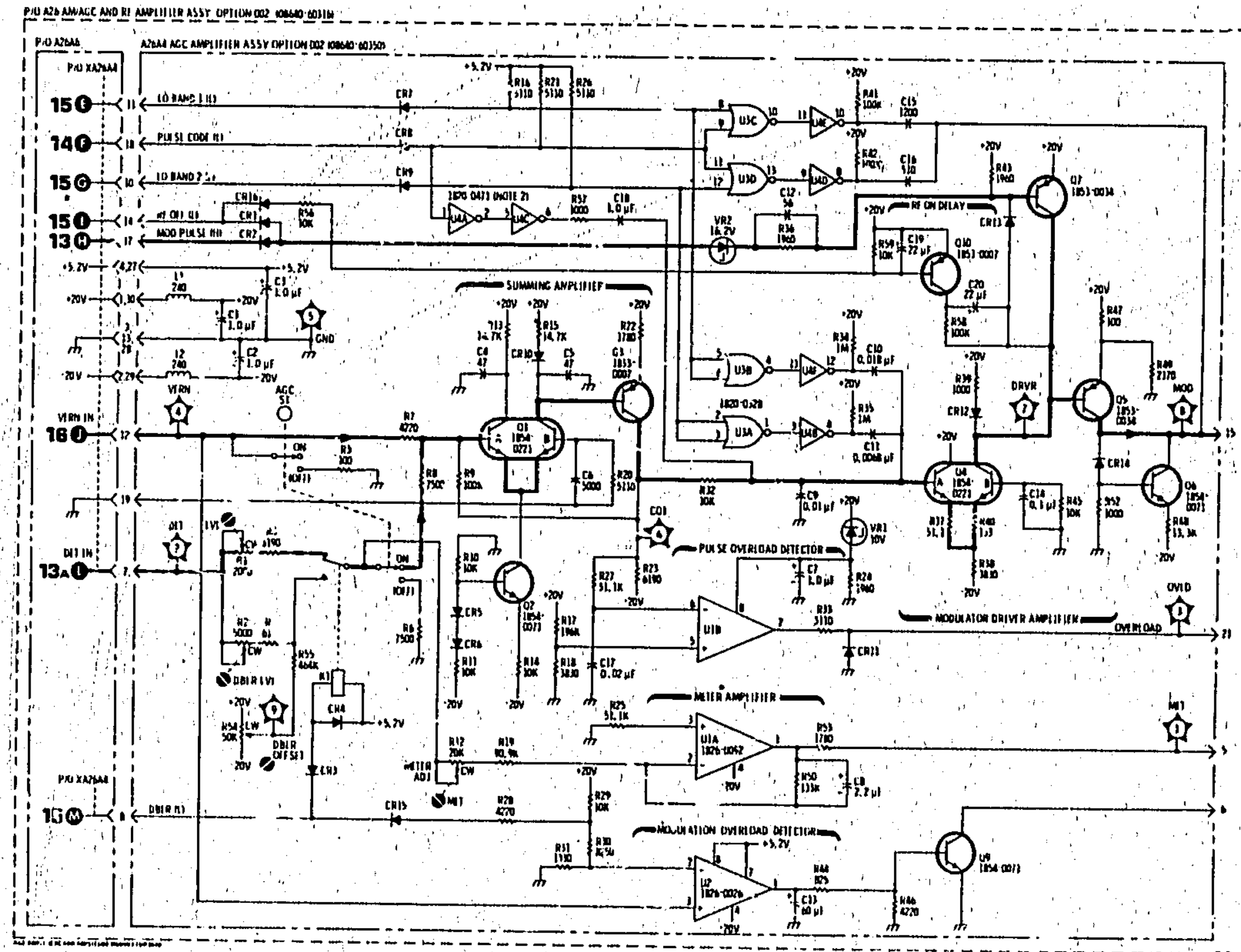


Figure 8-42. A26A4 AGC Amplifier Assembly Component Locations (Option 002) (P/O Change 3)



P/O Figure 8-43. AGC Amplifiers and Amplitude Modulator Schematic Diagram (Option 002) (P/O Change 3)

A26A4 ASSEMBLY

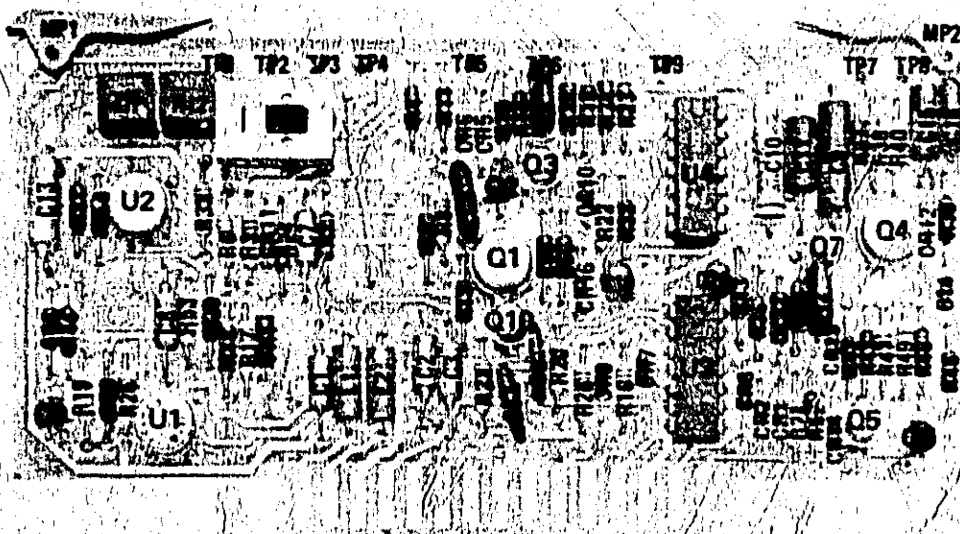
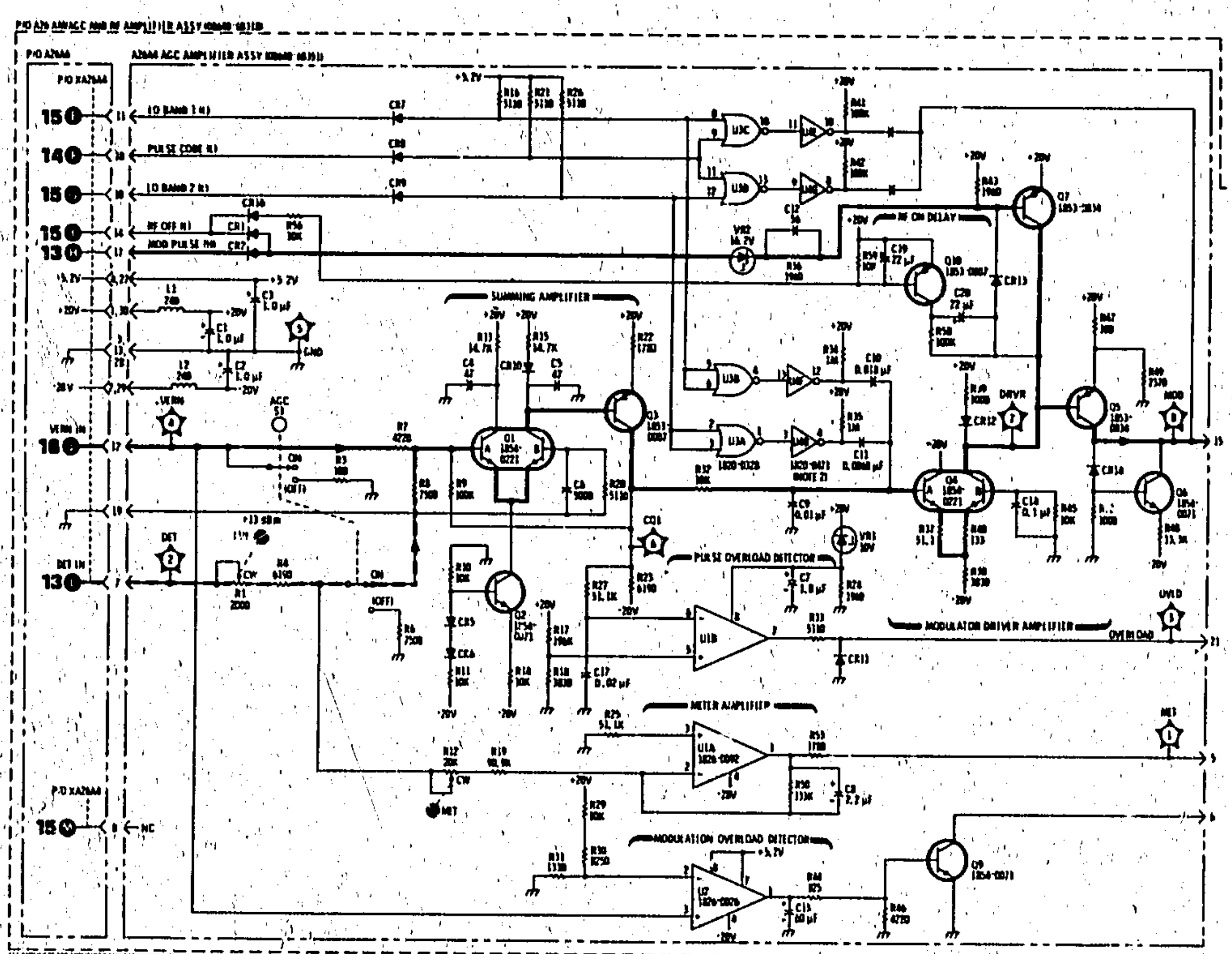
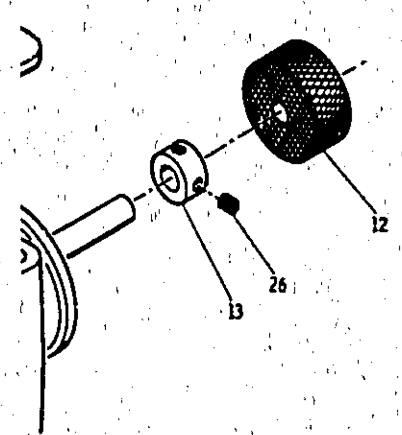


Figure 8-39. A26A4 AGC Amplifier Assembly Component Locations (P/O Change 7)



P/O Figure 8-40. AGC Amplifiers and Amplitude Modulator Schematic Diagram (P/O Change 7)



P/O Figure 8-73. A1 Output Level Assembly Illustrated Parts Breakdown (P/O Change 8)

Table 6-3. Replaceable Parts (P/O Change 21) (1 of 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2	08640-60354	0	1	RF DIVIDER ASSEMBLY	28480	08640-60354
A10A2C1	0180-0374	3	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A10A2C2	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A10A2C3	0160-3456	6	28	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C4	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C5	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C6	0160-4084	8	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A10A2C7	0180-1743	2	7	CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C8				C8 IS TYPICALLY NOT PRESENT, REFER TO TABLE 8-1.		
A10A2C9	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C10	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C11	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C12	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C13	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C14	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C15	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C16	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C17	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C18	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C19	0160-2055	9	20	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C20	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C21	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C22	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C23	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C24	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C25	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C27	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C28	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C29	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C30	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C31	0180-0197	8	3	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C32	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C35	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C36	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C38	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C39	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C40	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C41	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C42	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C43	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C44	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C45	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C46	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C47	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C48	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C49	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C50	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C51	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C52	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C53	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C54	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C55	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C56	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C57	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C58	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C59	0180-0100	3	3	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A10A2C60	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C61	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C62	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A10A2C63	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C64	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2CR1	1901-0025	2	17	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR2	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR5	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025

See introduction to this section for ordering information

Table 6-3. Replaceable Parts (P/O Change 21) (2 of 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2CR6	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR7	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR8	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR9	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR10	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR11	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR12	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR13	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR14	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR15	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR16	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR17	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2L1	9100-1620	5	8	COIL-MLD 15UH 10% Q=65 .155DX.375LG-NOM	28480	9100-1620
A10A2L2	9140-0096	1	2	COIL-MLD 1UH 10% Q=50 .155DX.375LG-NOM	28480	9140-0096
A10A2L3	9140-0096	1		COIL-MLD 1UH 10% Q=50 .155DX.375LG-NOM	28480	9140-0096
A10A2L4	9100-1612	5	1	COIL-MLD 330NH 20% Q=45 .155DX.375LG-NOM	28480	9100-1612
A10A2L5				PART OF ETCHED CIRCUIT BOARD		
A10A2L6	9100-0094	9	1	COIL-MLD 680NH 10% Q=50 .155DX.375LG-NOM	28480	9100-0094
A10A2L7	9100-1615	8	1	COIL-MLD 1.2UH 10% Q=33 .155DX.375LG-NOM	28480	9100-1615
A10A2L8	9140-0098	3	1	COIL-MLD 2.2UH 10% Q=33 .155DX.375LG-NOM	28480	9140-0098
A10A2L9	9140-0114	4	1	COIL-MLD 10UH 10% Q=55 .155DX.375LG-NOM	28480	9140-0114
A10A2L10	9100-1620	5		COIL-MLD 15UH 10% Q=65 .155DX.375LG-NOM	28480	9100-1620
A10A2L11	9100-1620	5		COIL-MLD 15UH 10% Q=65 .155DX.375LG-NOM	28480	9100-1620
A10A2L12	9100-1620	5		COIL-MLD 15UH 10% Q=65 .155DX.375LG-NOM	28480	9100-1620
A10A2L13	9100-1628	3	1	COIL-MLD 43UH 5% Q=60 .155DX.375LG-NOM	28480	9100-1628
A10A2Q1	1854-0071	7	1	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A10A2Q2	1853-0034	0	2	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A10A2Q3	1853-0034	0		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A10A2Q4				NOT ASSIGNED		
A10A2Q5	1854-0580	5	1	TRANSISTOR NPN SI TO-72 PD=200MW FT=1GHZ	04713	MM8006
A10A2Q6	1853-0326	3	2	TRANSISTOR PNP SI PD=1W FT=50MHZ	04713	MPS-U51
A10A2Q7	1853-0326	3		TRANSISTOR PNP SI PD=1W FT=50MHZ	04713	MPS-U51
A10A2R1	0757-1000	7	1	RESISTOR 51.1 1% .5W F TC=0+-100	28480	0757-1000
A10A2R2	0698-7229	8	2	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A10A2R3	0698-7188	8	1	RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T00-10R-G
A10A2R4	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-G
A10A2R5	0757-0394	0	20	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R6	2100-1986	7	1	RESISTOR-TRMR 100 10% C TOP-ADJ 1-TRN	73138	82PR100
A10A2R7	0757-0984	4	6	RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R8	0757-0438	3	9	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R9	0698-7221	0	2	RESISTOR 237 1% .05W F TC=0+-100	24546	C3-1/8-T0-237R-G
A10A2R10	0698-7197	9	1	RESISTOR 23.7 1% .05W F TC=0+-100	24546	C3-1/8-T00-23R7-G
A10A2R11	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R12	0698-7221	0		RESISTOR 237 1% .05W F TC=0+-100	24546	C3-1/8-T0-237R-G
A10A2R13	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R14	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R15	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R16	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R17	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R18	0698-7218	5	4	RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R19	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R20	0698-7200	5	2	RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A10A2R21	0698-7218	5		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R22	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R23	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
A10A2R24	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R25	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R26	0698-7218	5		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R27	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R28	0698-7200	5		RESISTOR 31.6 1% .05W F TC=0+-100	24546	C3-1/8-T00-31R6-G
A10A2R29	0698-7218	5		RESISTOR 178 1% .05W F TC=0+-100	24546	C3-1/8-T0-178R-G
A10A2R30	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R31	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R32	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R33	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R34	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R35	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R36	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R37	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R38	0698-7227	6	2	RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R39	0698-7190	2	2	RESISTOR 12.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-12R1-G
A10A2R40	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R41	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R42	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R43	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R44	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R45	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984

See introduction to this section for ordering information

Table 6-3. Replaceable Parts (P/O Change 21) (3 of 3)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2R46	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R47	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R48	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R49	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R50	0698-7196	2		RESISTOR 12.1 1% .05W F TC=0+-100	24546	C3-1/8-T00-12R1-G
A10A2R51	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R52	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-G
A10A2R53	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R54	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R55	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R56	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R57	0757-0984	4		RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A10A2R58	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R59	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R60	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A10A2R61	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A10A2R62	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R63	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A2R64	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R65	0698-3203	8	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
A10A2R66	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A2R67	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R68	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R69	0698-3447	4	2	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A2R70	0757-0379	1	1	RESISTOR 12.1 1% .125W F TC=0+-100	19701	MF4C1/8-T0-12R1-F
A10A2R71	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R72	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A2T1	08640-60355	0	5	TRANSFORMER, RF, BLUE	28480	08640-60355
A10A2T2	08640-60355	0		TRANSFORMER, RF, BLUE	28480	08640-60355
A10A2T3	08640-60355	0		TRANSFORMER, RF, BLUE	28480	08640-60355
A10A2T4	08640-60355	0		TRANSFORMER, RF, BLUE	28480	08640-60355
A10A2T5	08640-60355	0		TRANSFORMER, RF, BLUE	28480	08640-60355
A10A2T6	08640-80002	6	1	TRANSFORMER, RF 12-TURN	28480	08640-80002
A10A2TP1	1251-0600	0	4	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2U1	1820-0383	9	1	IC OP AMP GP 8-DIP-P	01928	CA741G
A10A2U2	1820-0817	8	3	IC FF ECL D-M/S DUAL MC10131P	04713	MC10131P
A10A2U3	1820-0817	8		IC FF ECL D-M/S DUAL MC10131P	04713	MC10131P
A10A2U4	1820-0539	7	1	IC DRVR TTL AND DUAL 2-INP	01295	SN75451BP
A10A2U5	1820-0802	1	3	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U6	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U7	1820-0753	1	2	IC GATE ECL DUAL 3-INP	28480	1820-0753
A10A2U8	1820-0753	1		IC GATE ECL DUAL 3-INP	28480	1820-0753
A10A2U9	1820-0803	2	2	IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U10	1820-0803	2		IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U11	1820-0982	8	1	IC DIFF AMPL MO 16-DIP-C	28480	1820-0982
A10A2U12	1820-0736	0	1	IC CNTR ECL BIN DUAL	28480	1820-0736
A10A2U13	1820-1334	0	1	IC CNTR ECL BIN	28480	1820-1334
A10A2U14	1820-1225	4	1	IC FF ECL D-M/S DUAL	04713	MC10231P
A10A2U15	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U16	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2VR1	1902-3002	3	2	DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	28480	1902-3002
A10A2VR2	1902-3002	3		DIODE-ZNR 2.37V 5% DO-7 PD=.4W TC=-.074%	28480	1902-3002
A10A2W1	8120-1823	1	1	CABLE ASSY-COAX 50-OHM 1.9-IN-LG	28480	8120-1823
A10A2W2	8120-1824	2	1	CABLE ASSY-COAX 50-OHM 2.4-IN-LG	28480	8120-1824
A10A2W3	1820-1025	0	1	IC RCVR TTL BUS HEX	28480	1820-1025
A10A2W4	8120-1826	4	1	CABLE ASSY-COAX 50-OHM 5.4-IN-LG	28480	8120-1826
A10A2W5	8120-1827	5	1	CABLE ASSY-COAX 50-OHM 8.7-IN-LG	28480	8120-1827
A10A2W6	8120-2966	5	1	CABLE, COAX 50-OHM 9-IN-LG	28480	8120-2966
A10A2W7	8120-1829	7	1	CABLE ASSY-COAX 50-OHM 7.9-IN-LG	28480	8120-1829

See introduction to this section for ordering information

A10A2 ASSEMBLY

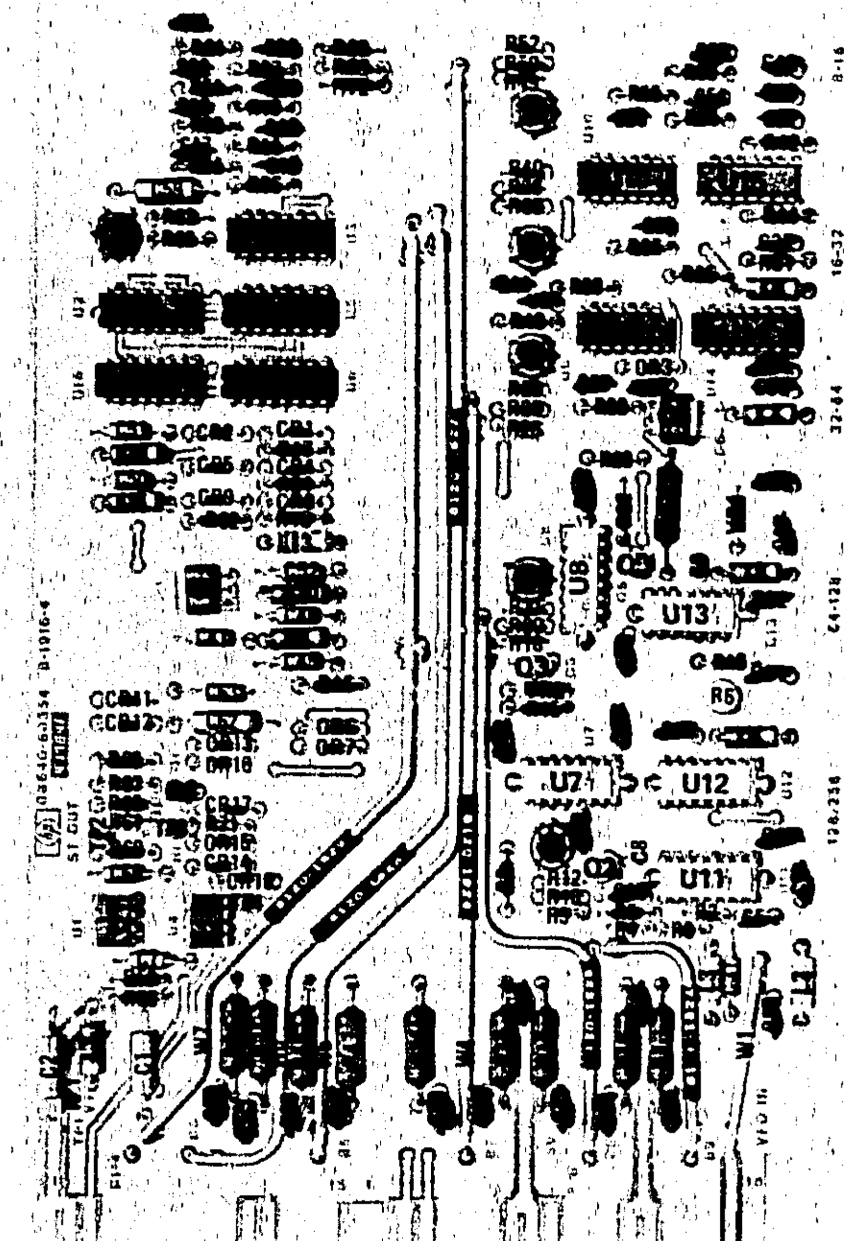


Figure 8-36. A10A2 RF Divider Assembly Component Locations (P/O Change 21)

P/O A7 ASSEMBLY

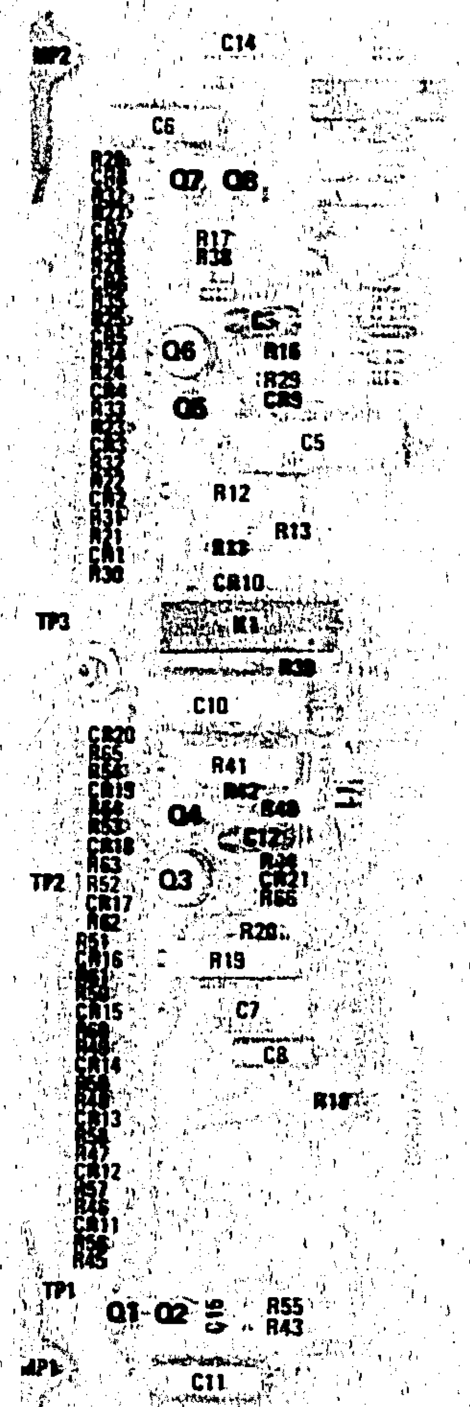


Figure 8-22. P/O A7 FM Shaping Assembly Component Locations (P/O Change 22)

P/O A7 ASSEMBLY

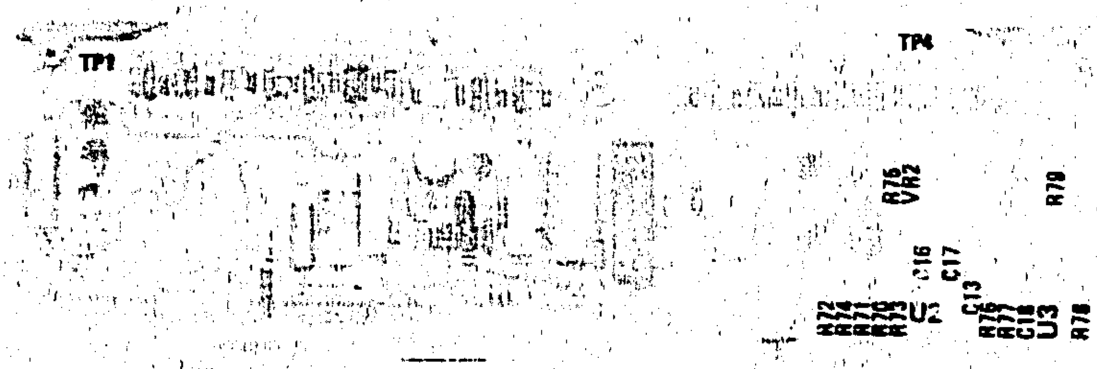


Figure 8-26. P/O A7 FM Shaping Assembly Component Locations (P/O Change 22)

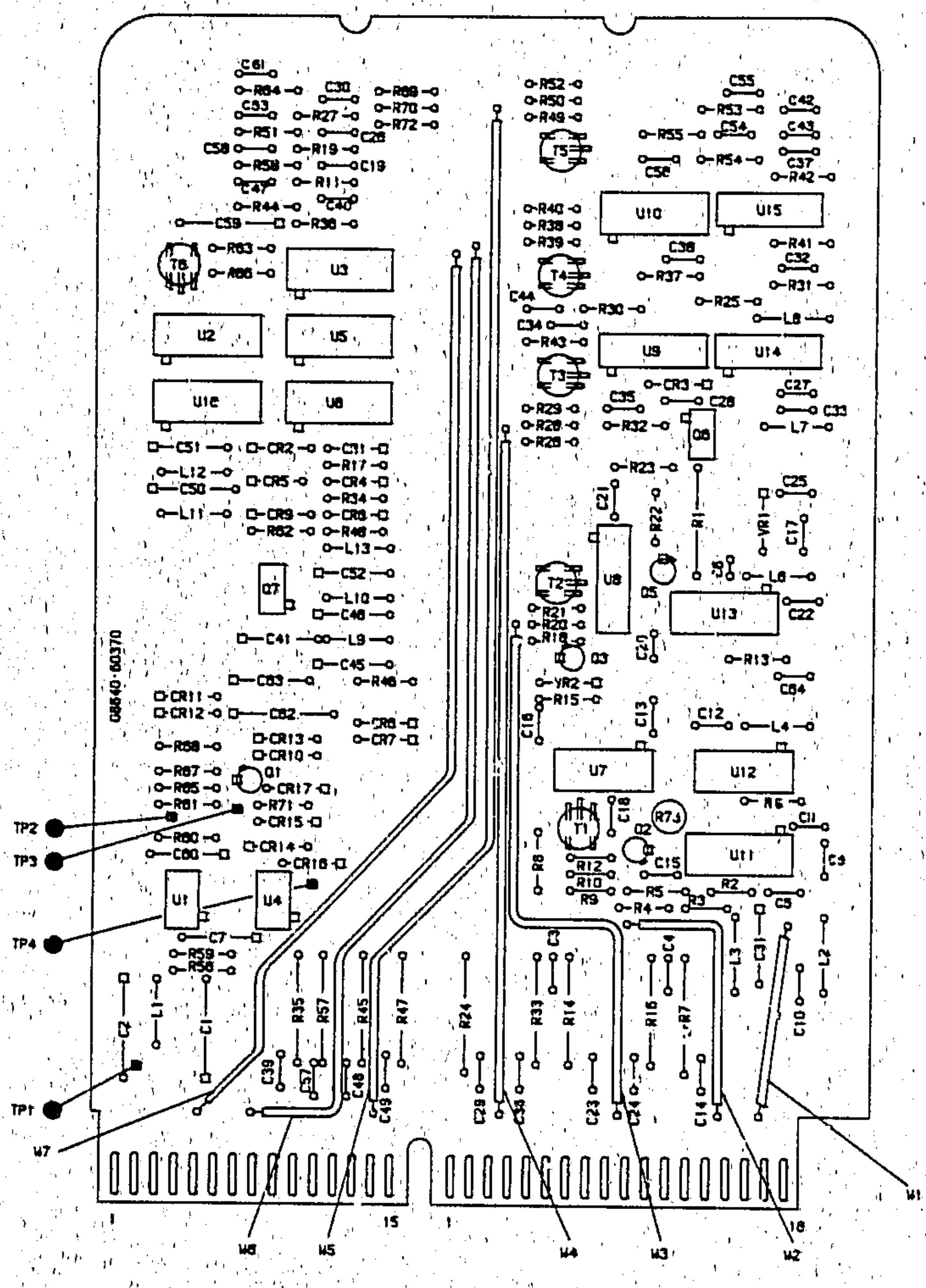


Figure 8-36. A10A2 RF Divider Assembly Component Locations (P/O CHANGE 30)

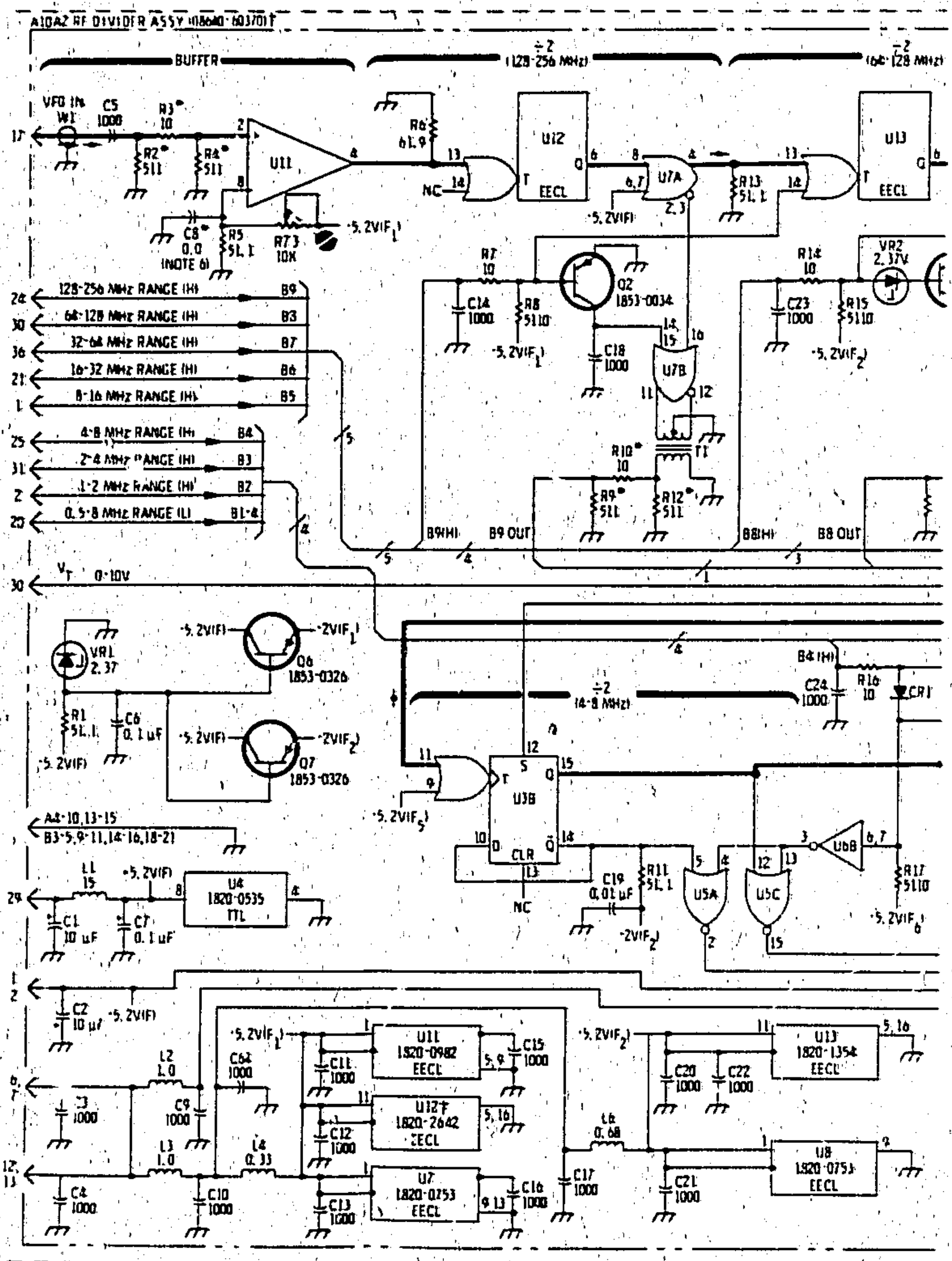
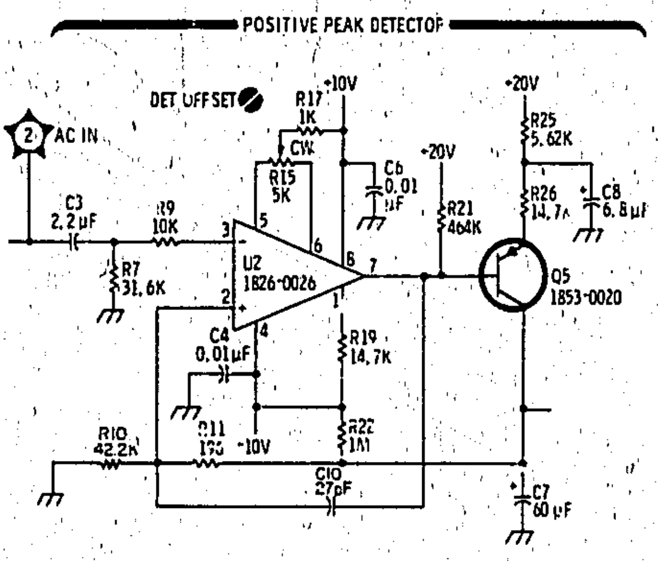
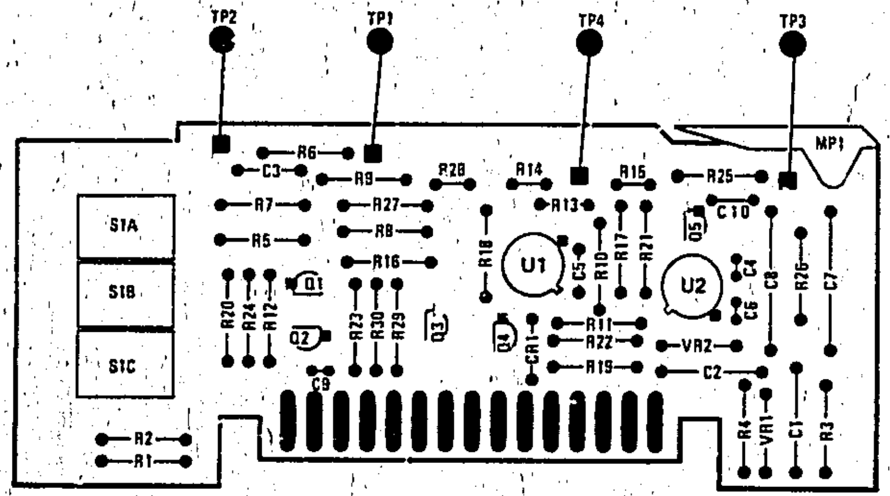


Figure 8-37. RF Divider Schematic Diagram (P/O CHANGE 38)



P/O Figure 8-60. Meter Switch and Drive Schematic Diagram (P/O CHANGE 30)



P/O Figure 8-58. Meter Switch and Drive Assembly Component Locations (P/O CHANGE 30)

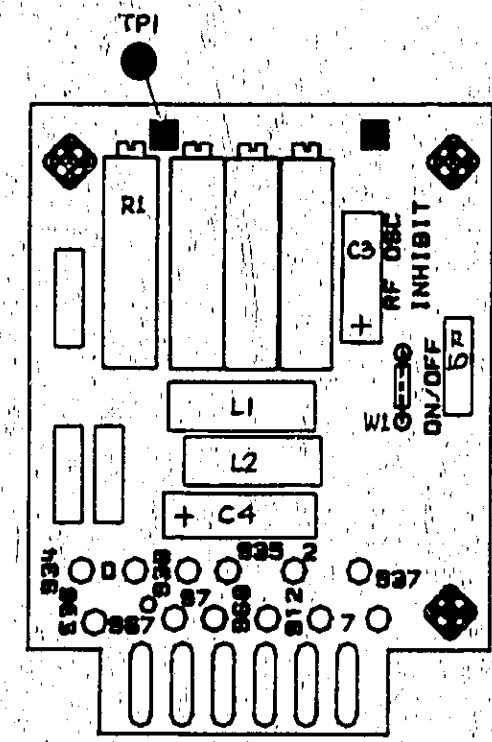


Figure 8-16. P/O A3A4 Connector Board Assembly Component Locations (P/O CHANGE 36)

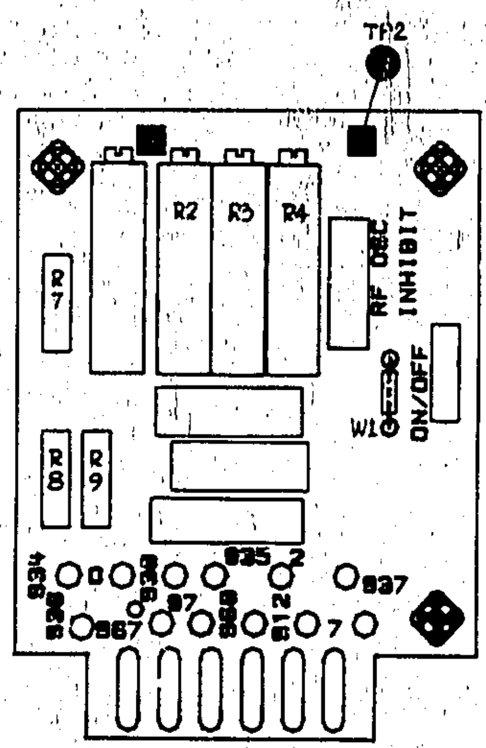


Figure 8-18. P/O A3A4 Connector Board Assembly Component Locations (P/O CHANGE 36)

Table 6-3. Replaceable Parts (P/O CHANGE 38)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2	08640-60303	A	1	RF DIVIDER ASSEMBLY	28480	08640-60303
A10A2C1	0180-0374	3	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A10A2C2	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
A10A2C3	0160-3456	6	16	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C4	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C5				NOT ASSIGNED		
A10A2C6	0160-0576	5	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A10A2C7	0180-1743	2	7	CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C8				NOT ASSIGNED		
A10A2C9	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C10	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C11	0160-3878	6	4	CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A2C12	0160-3879	7	7	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A2C13	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A2C14	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C15	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A2C16	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A2C17	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A2C18	0160-3878	6		CAPACITOR-FXD 1000PF +-20% 100VDC CER	28480	0160-3878
A10A2C19	0160-2055	9	20	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C20				NOT ASSIGNED		
A10A2C21	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A2C22	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A2C23	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C24	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C25	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C26	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C27	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C28	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C29	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C30	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C31	0180-0197	8	3	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C32	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C33	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C35	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C36	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C37	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C38	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C39	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C40	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C41	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C42	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C43	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C44	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C45	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C46	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C47	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C48	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C49	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C50	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C51	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C52	0180-1743	2		CAPACITOR-FXD .1UF+-10% 35VDC TA	56289	150D104X9035A2
A10A2C53	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C54	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C55	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C56	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C57	0160-3456	6		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A10A2C58	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C59	0180-0100	3	2	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A10A2C60	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C61	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A10A2C62	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A10A2C63	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A10A2C64	0140-0149	6	2	CAPACITOR-FXD 470PF +-5% 300VDC MICA	72136	DM15F471J0300WV1CR
A10A2C65	0140-0149	6		CAPACITOR-FXD 470PF +-5% 300VDC MICA	72136	DM15F471J0300WV1CR
A10A2C66				NOT ASSIGNED		
A10A2C67				NOT ASSIGNED		
A10A2C68				NOT ASSIGNED		
A10A2C69	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A10A2C70	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (P/O CHANGE 38)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2C71				NOT ASSIGNED		
A10A2C72				NOT ASSIGNED		
A10A2C73				NOT ASSIGNED		
A10A2C74	0160-3874	2	1	CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A10A2C75	0160-3875	3	1	CAPACITOR-FXD 22PF +-5% 200VDC CER 0+-30	28480	0160-3875
A10A2CR1	1901-0025	2	18	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR2	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR5	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR6	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR7	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR8	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR9	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR10	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR11	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR12	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR13	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR14	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR15	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR16	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR17	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2CR18	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A10A2L1	9100-1620	5	4	INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A10A2L2	9140-0096	1	2	INDUCTOR RF-CH-MLD 1UH 10% .166DX.385LG	28480	9140-0096
A10A2L3	9140-0096	1		INDUCTOR RF-CH-MLD 1UH 10% .166DX.385LG	28480	9140-0096
A10A2L4	9100-1612	5	1	INDUCTOR RF-CH-MLD 330NH 20%	28480	9100-1612
A10A2L5				NOT ASSIGNED		
A10A2L6	9140-0094	9	1	INDUCTOR RF-CH-MLD 680NH 10%	28480	9140-0094
A10A2L7	9100-1615	8		INDUCTOR RF-CH-MLD 1.2UH 10%	28480	9100-1615
A10A2L8	9140-0098	3	1	INDUCTOR RF-CH-MLD 2.2UH 10%	28480	9140-0098
A10A2L9	9140-0114	4	1	INDUCTOR RF-CH-MLD 10UH 10% .166DX.385LG	28480	9140-0114
A10A2L10	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A10A2L11	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A10A2L12	9100-1620	5		INDUCTOR RF-CH-MLD 15UH 10% .166DX.385LG	28480	9100-1620
A10A2L13	9100-1628	3	1	INDUCTOR RF-CH-MLD 43UH 5% .166DX.385LG	28480	9100-1628
A10A2L14				NOT ASSIGNED		
A10A2L15	9100-3922	4	2	INDUCTOR-FIXED 120-1300 HZ	28480	9100-3922
A10A2L16	9100-3922	4		INDUCTOR-FIXED 120-1300 HZ	28480	9100-3922
A10A2Q1	1854-0071	7	1	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A10A2Q2	1854-0477	7	1	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	04713	2N2222A
A10A2Q3	1854-0632	6	1	TRANSISTOR NPN SI PD=180MW FT=4GHZ	25403	BFR-91
A10A2Q4				NOT ASSIGNED		
A10A2Q5				NOT ASSIGNED		
A10A2Q6	1853-0326	3	2	TRANSISTOR PNP SI PD=1W FT=50MHZ	04713	MPS-U51
A10A2Q7	1853-0326	3		TRANSISTOR PNP SI PD=1W FT=50MHZ	04713	MPS-U51
A10A2R1	0757-1000	7	1	RESISTOR 51.1 1% .5W F TC=0+-100	28480	0757-1000
A10A2R2	0698-7284	5	1	RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-F
A10A2R3	0698-7227	8	4	RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A10A2R4	0698-7236	7	10	RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R5	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R6	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R7	0757-0346	2	7	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R8				NOT ASSIGNED		
A10A2R9				NOT ASSIGNED		
A10A2R10				NOT ASSIGNED		
A10A2R11	0757-0394	0	17	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R12				NOT ASSIGNED		
A10A2R13	0698-7218	7	4	RESISTOR 82.5 1% .05W F TC=0+-100	24546	C3-1/8-T0-82R5-F
A10A2R14	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R15	0698-7227	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A10A2R16	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R17	0757-0438	3	7	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R18	0698-7219	6	1	RESISTOR 196 1% .05W F TC=0+-100	24546	C3-1/8-T0-196R-F
A10A2R19	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R20	0698-7208	3	1	RESISTOR 68.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-68R1-F
A10A2R21	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R22	0698-7223	2	3	RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A10A2R23	0698-7215	2	3	RESISTOR 133 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A10A2R24	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R25	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R26	0698-7229	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A10A2R27	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R28	0698-7188	8		RESISTOR 10 1% .05W F TC=0+-100	24546	C3-1/8-T0-10R-F
A10A2R29	0698-7227	8		RESISTOR 511 1% .05W F TC=0+-100	24546	C3-1/8-T0-511R-F
A10A2R30	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (P/O CHANGE 38)

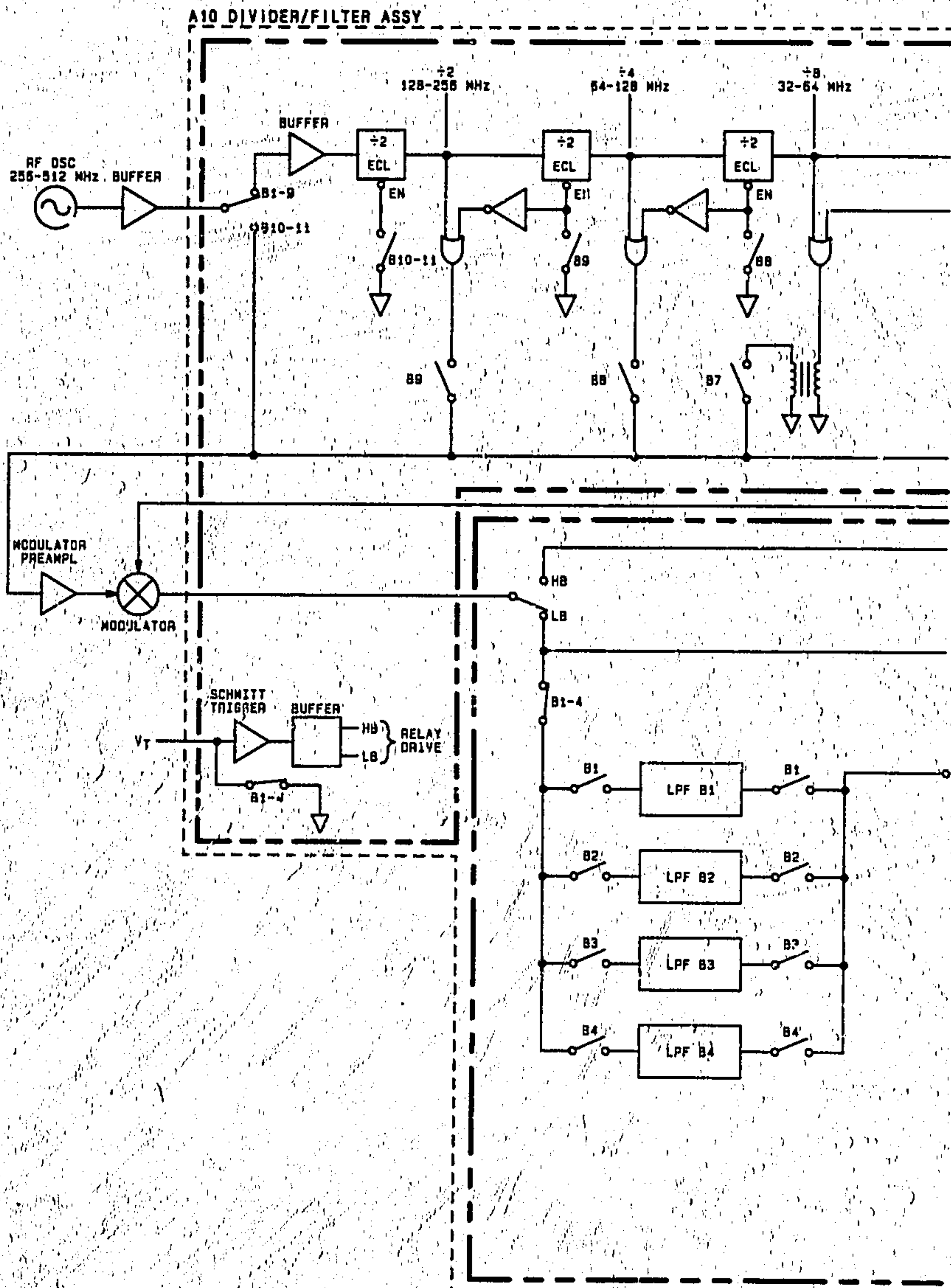
Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2R31	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R32	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R33	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R34	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R35	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R36	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R37	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R38	0698-7227	6	4	RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-F
A10A2R39	0698-7198	2	2	RESISTOR 12.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-12R1-F
A10A2R40	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-F
A10A2R41	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R42	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R43	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R44	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R45	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R46	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R47	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R48	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R49	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-F
A10A2R50	0698-7198	2		RESISTOR 12.1 1% .05W F TC=0+-100	24546	C3-1/8-T0-12R1-F
A10A2R51	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R52	0698-7227	6		RESISTOR 422 1% .05W F TC=0+-100	24546	C3-1/8-T0-422R-F
A10A2R53	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R54	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R55	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R56	0757-0442	9	3	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R57	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A10A2R58	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R59	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R60	0698-0085	0	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
A10A2R61	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1471-F
A10A2R62	0757-0438	3		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
A10A2R63	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A10A2R64	0757-0394	0		RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
A10A2R65	0698-3243	8	1	RESISTOR 178K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1783-F
A10A2R66	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8-T0-316R-F
A10A2R67	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R68	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A10A2R69	0698-3447	4	2	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A2R70	0757-0377	1	1	RESISTOR 12.1 1% .125W F TC=0+-100	19701	MF4C1/8-T0-12R1-F
A10A2R71	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R72	0698-3447	4		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
A10A2R73	0698-7204	9		RESISTOR 46.4 1% .05W F TC=0+-100	24546	C3-1/8-T0-46R4-F
A10A2R74	0698-7210	7		RESISTOR 82.5 1% .05W F TC=0+-100	24546	C3-1/8-T0-82R5-F
A10A2R75	0698-7215	2	1	RESISTOR 133 1% .05W F TC=0+-100	24546	C3-1/8-T0-133R-F
A10A2R76	0698-7210	7		RESISTOR 82.5 1% .05W F TC=0+-100	24546	C3-1/8-T0-82R5-F
A10A2R77	0698-7223	2		RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A10A2R78	0698-7215	2	4	RESISTOR 133 1% .05W F TC=0+-100	24546	C3-1/8-T0-133R-F
A10A2R79	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R80				NOT ASSIGNED		
A10A2R81	0698-7215	2		RESISTOR 133 1% .05W F TC=0+-100	24546	C3-1/8-T0-133R-F
A10A2R82	0698-7210	7		RESISTOR 82.5 1% .05W F TC=0+-100	24546	C3-1/8-T0-82R5-F
A10A2R83	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R84	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R85	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R86	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R87	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R88	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R89	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R90				NOT ASSIGNED		
A10A2R91				NOT ASSIGNED		
A10A2R92				NOT ASSIGNED		
A10A2R93				NOT ASSIGNED		
A10A2R94				NOT ASSIGNED		
A10A2R95				NOT ASSIGNED		
A10A2R96	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R97	0698-7223	2		RESISTOR 287 1% .05W F TC=0+-100	24546	C3-1/8-T0-287R-F
A10A2R98	0698-7215	2		RESISTOR 133 1% .05W F TC=0+-100	24546	C3-1/8-T0-133R-F
A10A2R99	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R100	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R101	0698-7215	2		RESISTOR 133 1% .05W F TC=0+-100	24546	C3-1/8-T0-133R-F
A10A2R102	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A10A2R103	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R104	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F
A10A2R105	0698-7236	7		RESISTOR 1K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1001-F

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts (P/O CHANGE 38)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10A2T1	08640-60355	0	3	TRANSFMR-RF BLU	28480	08640-60355
A10A2T2	08640-60355	0		TRANSFMR-RF BLU	28480	08640-60355
A10A2T3	08640-60355	0		TRANSFMR-RF BLU	28480	08640-60355
A10A2T4	08640-00002	6	1	XFMR RF 12 TURN	28480	08640-00002
A10A2TP1	1251-0600	0	4	CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP2	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP3	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2TP4	1251-0600	0		CONNECTOR-SGL CONT PIN 1.14-MM-BSC-SZ SQ	28480	1251-0600
A10A2U1	1826-0303	9	1	IC OP AMP GP 8-DIP-P PKG	3L585	CA741C
A10A2U2	1820-0817	8	3	IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U3	1820-0817	8		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U4	1820-0535	7	1	IC DRVR TTL AND DUAL 2-INP	01295	SN75451BP
A10A2U5	1820-0802	1	3	IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U6	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2U7	1820-3435	2	1	IC GATE ECL/10K OR-NOR DUAL 4-INP	28480	1820-3435
A10A2U8	1820-0770	6	1	IC GATE ECL OR-NOR DUAL 4-INP	04713	MC1660L
A10A2U9	1820-0803	2	3	IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U10	1820-0803	2		IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U11	1820-3405	2	1	IC 12090 1 FF-D	28480	1820-3405
A10A2U12	1820-1132	2	1	IC FF ECL D-M/S	04713	MC1670L
A10A2U13	1820-0803	2		IC GATE ECL OR-NOR TPL	04713	MC10105P
A10A2U14	1820-1225	4	1	IC FF ECL D-M/S DUAL	04713	MC10231P
A10A2U15	1820-0817	0		IC FF ECL D-M/S DUAL	04713	MC10131P
A10A2U16	1820-0802	1		IC GATE ECL NOR QUAD 2-INP	04713	MC10102P
A10A2VR1	1902-0943	5	1	DIODE-ZNR 2.4V 5% DO-35 PD=.4W TC=-.037%	28480	1902-0943
A10A2W1	08640-20384	1	1	COAX CABLE ASSY	28480	08640-20384
A10A2W2	08640-20385	2	1	COAX CABLE ASSY	28480	08640-20385
A10A2W3	08640-20386	3	1	COAX CABLE ASSY	28480	08640-20386
A10A2W4	08640-20387	4	1	COAX CABLE ASSY	28480	08640-20387
A10A2W5	08640-20388	5	1	COAX CABLE ASSY	28480	08640-20388
A10A2W6	08640-20389	6	1	COAX CABLE ASSY	28480	08640-20389
A10A2W7	08640-20390	9	1	COAX CABLE ASSY	28480	08640-20390

See introduction to this section for ordering information
*Indicates factory selected value


A10 DIVIDER/FILTER ASSY
÷2
128-256 MHz
÷4
64-128 MHz
÷8
32-64 MHz
BUFFER
÷2
ECL
EN
RF OSC
256-512 MHz
BUFFER
B1-9
B10-11
B9
B8
B7
MODULATOR
PREAMPL
MODULATOR
HB
LB
B1-4
SCHMITT
TRIGGER
BUFFER
RELAY
DRIVE
V_T
B1
LPF B1
B2
LPF B2
B3
LPF B3
B4
LPF B4

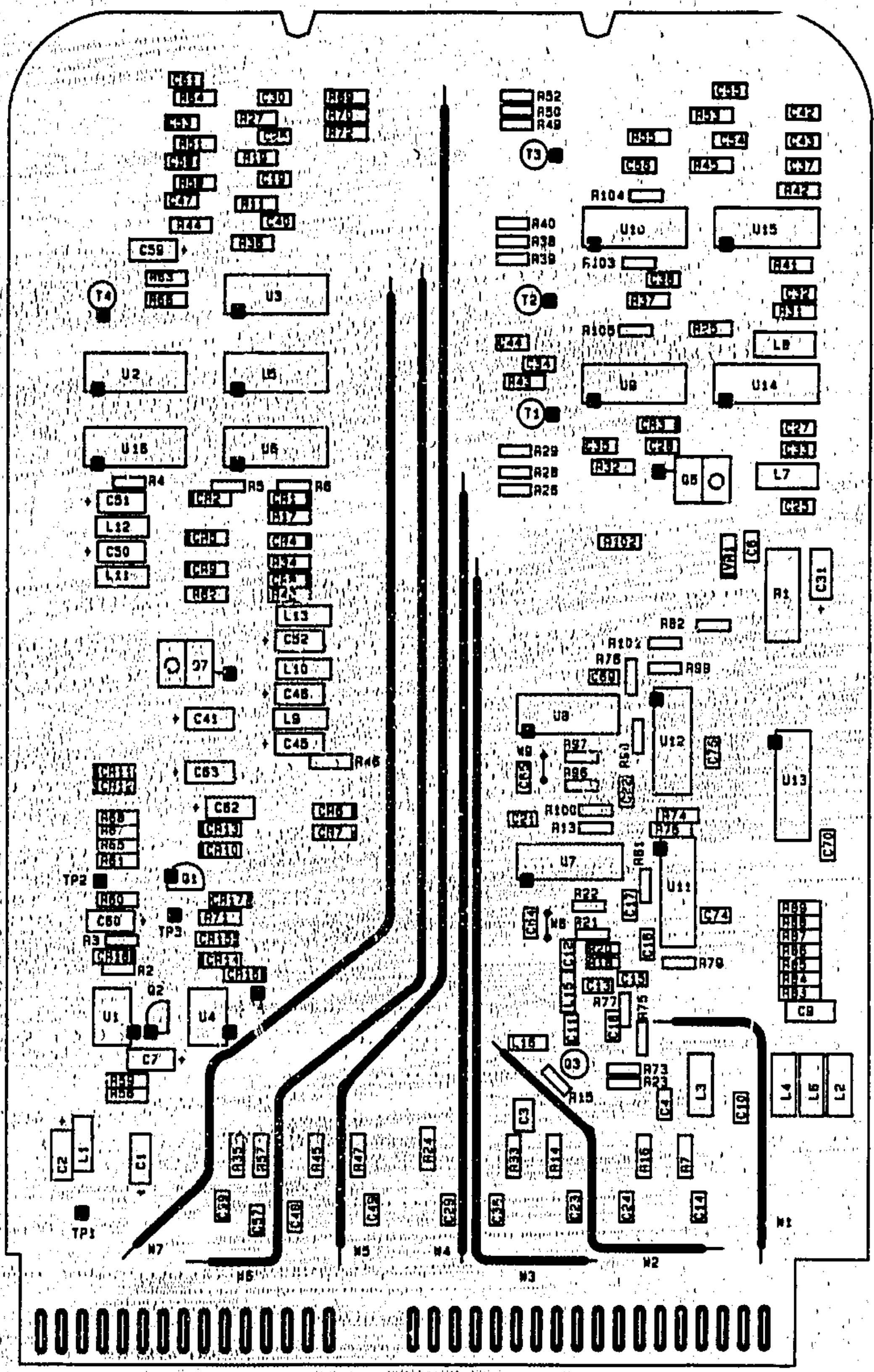


Figure 8-36. A10A2 RF Divider Assembly Component Locations
(P/O CHANGE 38)

SERVICE SHEET 11

PRINCIPLES OF OPERATION

RF Dividers (A10A2) (P/O CHANGE 38)

The A10A2 RF Divider Assembly frequency-divides the 256 to 512 MHz signal from the RF oscillator to obtain the lower output ranges. Overall operation of the A10 Divider/Filter Assembly is described on Service Sheet 10. Refer also to Figure 8-43 for a simplified logic diagram of the RF Dividers and Filters. On the two highest frequency ranges (256-512 MHz and 512-1024 MHz), the dividers are bypassed. On all other ranges, the signal from the oscillator is amplified and buffered by transistor Q3 and input to the divider chain, which begins with U11. All dividers are ECL and all are D flip-flops wired to divide-by-two ($\bar{Q}$ output tied to D input).

The output for the selected frequency range is obtained by (1) enabling all needed dividers, (2) disabling the next divider, (3) enabling the output of the last-used divider, and (4) disabling the outputs of all pevious dividers. Disabling all subsequent dividers eliminates sub-harmonics. Disabling the outputs of all previous dividers minimizes harmonics. Consider, for example, the selection of the 32-64 MHz frequency range (band 7).

(1) Dividers U11, U12, and U14 must be enabled. The RANGE switch places an ECL high (short to ground) on line B7 and ECL lows on lines B9, B8, and B6 through B1. (The lows result from opens on the RANGE switch and pull-down resistors, such as R89, on the lines.) Since lines B9 through B1 are not all low, the combination of gates U13A, U13B, and U13C cause the output of U13A to be low. This enables U11 (pin 9 is low). The low on line B9 is buffered by the OR output of U7B which enables U12. The low on line B8 is buffered by the OR output of U8B, which enables U14.

(2) Divider U15A must be disabled. The high on line B7 sets U15A, which inhibits the divide-by-two function. Since U15A is disabled, no signal is present at U15B and subsequent dividers though they are all enabled. (3) The output path of U14 must be enabled. U9C couples the output of U14 through T1 and on to the RF output (via the B7 OUT line). The high on line B7 is inverted by U9B, which enables U9C to pass the divided RF signal from U14.

(4) The outputs of U11 and U12 must be disabled. Since line B7 only is high, U7A is disabled by the high at the NOR output of U7B, and U8A is disabled by the high at the NOR output of U8B.

Note that dividers U11 and U12 (via U7B and U8B) drive their respective output lines (B9 OUT and B8 OUT) directly. Dividers U14, U15A, and U15B drive complementary OR gates which are transformer-coupled to the output lines via pi-network attenuators. This push-pull arrangement helps preserve waveform symmetry for best even-harmonic balance. The attenuators prevent excessive signal level from being applied to A26U2 (Service Sheet 12 or 12A). The last four dividers share a common transformer T4 and attenuator, and they couple to the transformer via OR gate pairs driven in complement.

VR1, Q6, Q7, and associated components form two -2.0 Vdc voltage regulators. The purpose of the supplies is to provide the ECL devices with the proper dc load current. (A 50 ohm load to -2 Vdc provides the proper load termination.)

Schmitt Trigger (A10A2)

Amplifier U1 is a Schmitt Trigger which senses when the voltage V_T (proportional to the RF oscillator frequency) reaches the value corresponding to the geometric mean of the frequency band. The reference voltage is determined by resistors R55 and R57; R58 adds a small amount of hysteresis. Transistor Q1 complements the amplifier output. Inverter U6A activates the low band relays A10A1K1 and K3 (Service Sheet 10); and U6B activates the high band relays A10A1K2 and K4 (Service Sheet 10). The inverters are driven in complement except that capacitors C18 and C19 hold both inverters on simultaneously for a few milliseconds during a transistion to provide a make-before-break action.

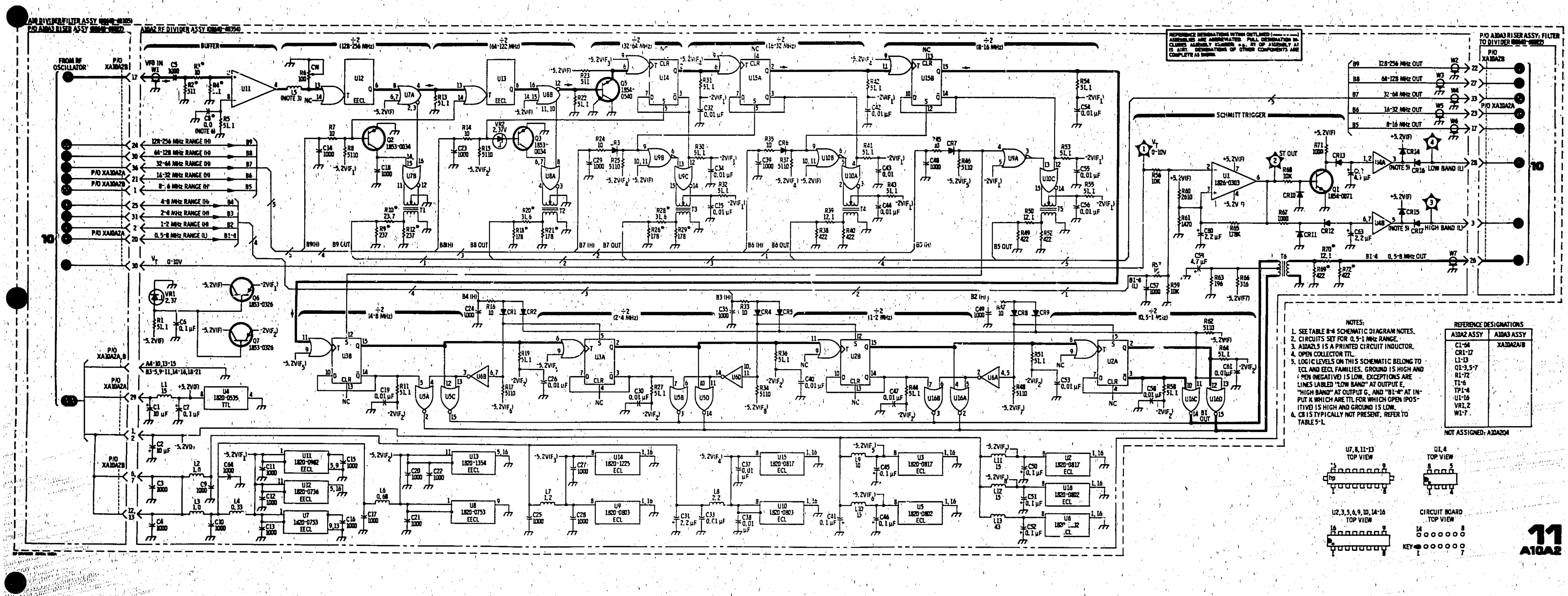


Figure 8-37. RF Divider Schematic Diagram (P/O Change 21)

MANUAL CHANGES

CON'T

NOTES:

1. SEE TABLE 8-4 SCHEMATIC DIAGRAM NOTES.

2. LOGIC LEVELS ON THIS SCHEMATIC BELONG TO ECL AND EECL FAMILIES. GROUND IS HIGH AND OPEN (NEGATIVE) IS LOW. EXCEPTIONS ARE LINES LABLED "LOW BAND" AT OUTPUT E, "HIGH BAND" AT OUTPUT G, AND "B1-4" AT INPUT K WHICH ARE TTL FOR WHICH OPEN (POSITIVE) IS HIGH AND GROUND IS LOW.

REFERENCE DESIGNATIONS

A10A2 ASSY	A10A3 ASSY
C1-4,6,7, 9-19,21-65, 69,70,74,75 CR1-18 L1-4,6-13, 15,16 Q1-3,6,7 R1-7,11, 13-79,81-89, 96-105 T1-4 TP1-4 U1-16 VR1 W1-9	XA10A2A/B

NOT ASSIGNED:
A10A2C5,8,20 66-68,71-73
A10A2L5,14
A10A2Q4,5
A10A2R8-10,12, 80,90-95

11
A10A2

Figure 8-37. RF Divider Schematic Diagram (P/O CHANGE 38)