Errata

Title & Document Type: 5257A Transfer Oscillator Operating and Service Manual

Manual Part Number: 05257-90016

Revision Date: January 1974

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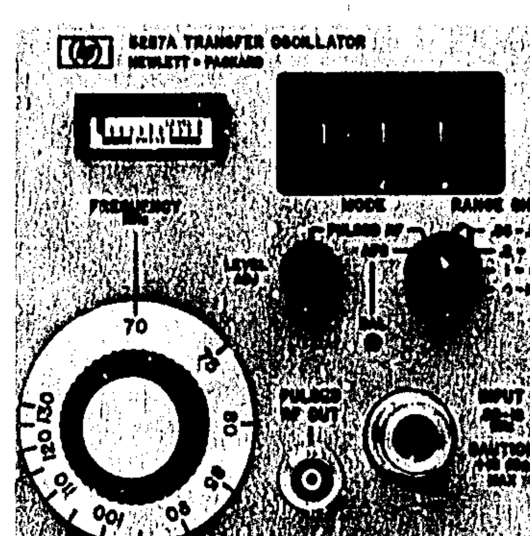
HP 5257A

OPERATING AND SERVICE MANUAL

TRANSFER OSCILLATOR
5257A



HEWLETT hp PACKARD

HP 5257A

CERTIFICATION

The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facilities, or to the calibration facilities of other International Standards Organization members.

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This Hewlett-Packard product is warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery. Hewlett-Packard will repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard. No other warranty is expressed or implied. We are not liable for consequential damages.

Service contracts or customer assistance agreements are available for Hewlett-Packard products that require maintenance and repair on-site.

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

TRANSFER OSCILLATOR

5257A

SERIAL PREFIX: 1348A

This Operating and Service Manual applies to HP 5257A instruments with serial number prefix 1348A.

SERIAL PREFIXES NOT LISTED

For serial prefixes above 1348A, a "Manual Changes" sheet is included with this manual. For serial prefixes 748-, 804-, 820-, 848-, 928-, 976-, 1104-, and 1124A, see Section VII.

HP 5245L MODIFICATION

See Paragraph 2-15 for HP 5257A use in HP 5245L Counters having serial prefix numbers 516-, 402-, or 335- and below.

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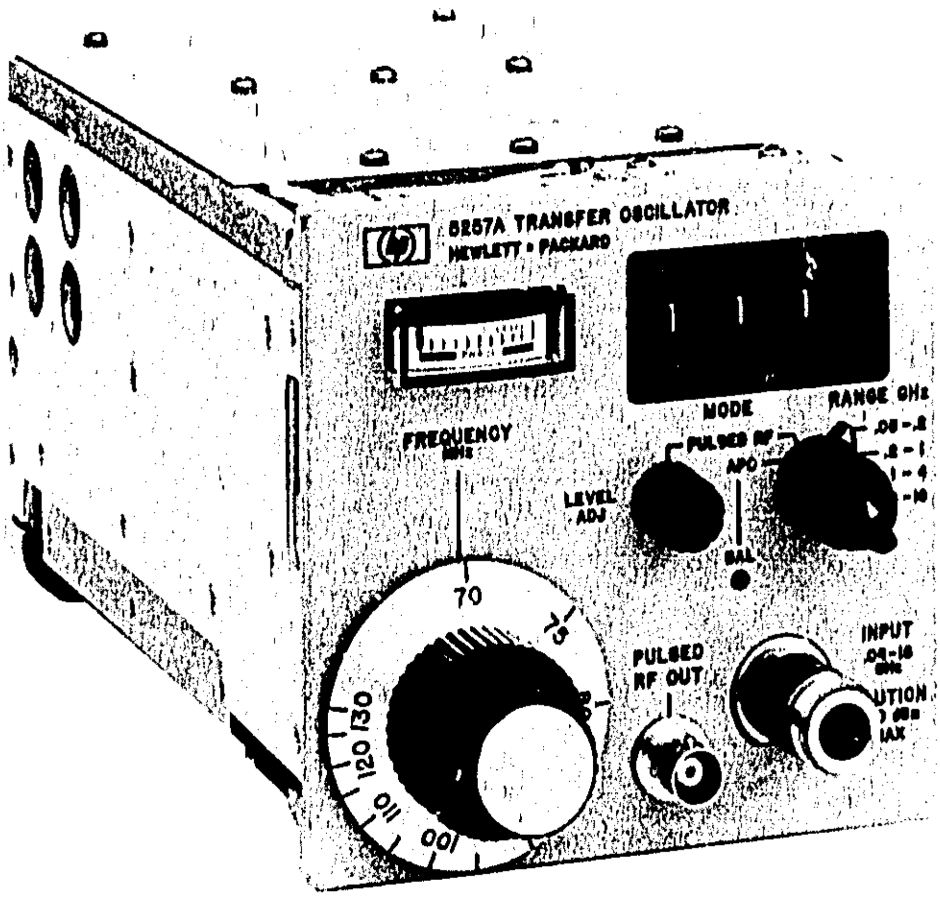
HEWLETT PACKARD

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure 1-1. Model 5257A



SECTION I
GENERAL INFORMATION

1-1. DESCRIPTION

1-2. The Hewlett-Packard Model 5257A Transfer Oscillator plug-in extends to 18 GHz the frequency measuring capability of Hewlett-Packard counters: series 5245L, 5245M, 5246L, 5247M, 5248L/M, and the 5345A. It features simple one-dial tuning, direct readout of input frequency, and a front panel meter for zero beat detection. Both cw and pulsed rf signals can be quickly and easily measured with this unit. For cw signals, an automatic phase control (APC) circuit securely locks the internal VFO to the input frequency which aids tuning and allows measurement of noisy, frequency modulated, and rapidly drifting signals. A lock detector for cw signals causes the counter to display all zeros until the Model 5257A is properly tuned to phase lock. The Model 5257A has a frequency range from 50 MHz to 18 GHz and replaces several narrower range units. It also has the advantage of measuring a specific frequency while rejecting sidebands and spurious signals.

1-3. The instrument uses a wideband sampler to compare the input signal waveform with the internal VFO. This eliminates the need for a harmonic generator following the VFO and requires far less power than other methods. In operation the VFO is tuned to a subharmonic of the input signal to produce a dc voltage at the sampler output when the input and internal waveforms are coincident each time the sampling gate opens. The automatic phase control circuit operates from this dc voltage. The circuitry has a wide capture range and it is only necessary to tune through the proper frequency and the VFO will "lock in". Therefore, tuning is rapid and uncritical. If the lock is lost due to an intermittent signal, the Model 5257A will automatically relock when the signal again appears.

1-4. The front panel meter deflection is used to adjust input signal level, to detect zero beat for both cw and pulsed rf measurements, and to observe the dc error voltage in the phase lock loop. The meter eliminates the need for an oscilloscope to detect zero beat, such as needed for conventional transfer oscillators.

1-5. A jack on the front panel, connected to the sampler output circuitry, permits use of the Model 5257A for down conversion to extend the range of low frequency instruments and devices such as oscilloscopes, FM discriminators, etc. Also, an oscilloscope can be connected to this jack for very precise observation of zero beat when measuring pulsed rf signals.

1-6. Thumbwheel switches automatically perform harmonic computation for the counter by extending the counter's gate time by the factor N. In this way, the counter's readout is the actual input frequency. At an N setting of 001 the counter either reads the VFO frequency or the VFO frequency divided by four in the lowest range. (The VFO range of 66.7 to 133.3 MHz must be prescaled for the 50 to 200 MHz input range.) N can be determined exactly, and verified, by simple procedures to be described later in this manual.

1-7. SPECIFICATIONS

1-8. Table 1-1 contains all technical specifications for the Model 5257A when operated in HP Electronic Counters.

1-9. IDENTIFICATION

1-10. Hewlett-Packard uses a two-section serial number mounted on the rear panel. Earlier instruments use an 8-digit serial number (000-00000). The first three digits are a serial prefix number; the last five digits refer to the specific instrument. Later instruments use a 9-digit serial number (0000A00000). The first four digits are the serial prefix and the last five digits refer to the specific instrument.

1-11. If the serial prefix of your instrument differs from that listed on the title page of this manual, there are differences between this manual and your instrument. Lower serial prefixes are documented in Section VII, and higher serial prefixes are covered with manual change sheets included with the manual. If the change sheet is missing, contact the nearest Hewlett-Packard Sales and Service Office listed on the inside rear cover of this manual.

1-12. COOLING

1-13. The Model 5257A is cooled by the ventilation system of the counter in which it is installed. See counter service manual for cooling system maintenance instructions.

Table 1-1. Specifications *

FREQUENCY RANGE: 50 MHz to 18 GHz.

INPUT SIGNAL CAPACITY: CW signals. Pulsed RF signals. Signals with high FM content.

CW MEASUREMENT ACCURACY: Retains Counter accuracy.

INPUT SENSITIVITY: 100 mV rms (-7 dBm) for input frequencies of 50 MHz to 15 GHz. 140 mV rms (-4 dBm) for input frequencies of 15 to 18 GHz and VFO frequency of 125 to 133.3 MHz.

INPUT IMPEDANCE: 50 ohms nominal.

MAXIMUM INPUT: +10 dBm for CW signals. 2 V peak-to-peak for pulsed RF signals.

APC LOCK RANGE: Approximately ±0.2% of input frequency.

METER: APC Mode: indicates loop phase error under locked conditions.
Pulsed RF Mode: zero beat indicator.

PULSED RF OUT: For external oscilloscope, 0.5 volt peak-to-peak.

PULSE CARRIER FREQUENCY MEASUREMENTS:
Minimum Pulse Width: 0.5 μsec.
Minimum Repetition Rate: 10 pulses per sec.
Accuracy: 0.01 cycle per pulse width (typical error ±20 kHz or less for pulse width > 2 μs; ±50 kHz < 2 μs)

VFO: Frequency Range: 66.7 to 133.3 MHz.
Drift: (With constant temperature in operational range of 0° to 55°C) typically ±2 parts in 10^5 per minute immediately after turn on. Typically ±1 part in 10^7 per minute after 2 hours of operation.
Temperature Variation: Typically 1 part in 10^4 per degree C.

INPUT CONNECTOR: Precision Type N female.

WEIGHT: Net 7-1/4 lbs. (3.3 kg);
Shipping 10 lbs (4.5 kg).

OPTION 001: Precision Type APC-7 input connector.

*When used with HP 5245M, 5245L (serial prefix 402 or above), 5246L, M54-5245L, or 5247M Counters. Modification Kit (05203-6030) available to adapt HP 5245L serial prefix 335 and below.

When used with 5345A an HP 10590A Plug-in Adapter is required.

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section contains information on unpacking, inspection, repacking, storage, and installation.

2-3. UNPACKING AND INSPECTION

2-4. If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect the instrument for damage (dents, scratches, broken knobs, etc). If the instrument is damaged or fails to meet specification (Performance Check, Table 5-3), notify the carrier and the nearest Hewlett-Packard sales and service office immediately (sales and service offices are listed at the back of this manual). Retain the shipping carton and the padding material for the carrier's inspection. The sales and service office will arrange for the repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

2-5. STORAGE AND SHIPMENT

2-6. PACKAGING. To protect your instrument during shipment or storage, use the best packaging methods available. Your Hewlett-Packard sales and service office can provide materials similar to those used for original factory packaging. Contract packaging companies can provide dependable custom packaging on short notice.

a. If possible, use the original container designed for the instrument. Otherwise, use a strong carton (350 lb/sq inch bursting strength) or wooden box to house the instrument.

b. Wrap the instrument in heavy paper or plastic before placing it in the shipping container.

c. Use plenty of packing material around all sides of the instrument and protect the front panel with cardboard strips.

d. Seal the package with strong tape or metal bands; mark "Delicate Instrument".

e. Refer to the address list at the rear of this manual and check with your Hewlett-Packard sales and service office for shipping instructions. All correspondence should refer to an instrument by model number and the full eight-digit serial number.

2-7. ENVIRONMENT. Conditions during storage and shipment should normally be limited as follows:

a. Maximum temperature 167°F (75°C).

b. Minimum temperature -40°F (-40°C).

CAUTION

TURN COUNTER POWER OFF BEFORE INSTALLING OR REMOVING FREQUENCY CONVERTER.

2-8. INSTALLATION

2-9. The Model 5257A plugs into the rectangular compartment at the right-hand side of the front panel of the Electronic Counter. To install unit in counter, first check that retaining latch is turned fully counterclockwise, then push unit firmly into compartment until front panel of plug-in is flush with front panel of counter. Then turn retaining latch clockwise until it is tight.

2-10. To remove unit from counter, turn retaining latch counterclockwise to its stop. Then grasp input connector and oscillator knob and firmly pull unit from counter. If any difficulty is encountered with installation or removal, check that retaining latch is fully counterclockwise.

2-11. Power Requirements

2-12. All electrical power required to operate the Model 5257A is supplied by the counter in which the unit is installed.

2-13. Electrical Connections

2-14. The INPUT and PULSED RF OUT connectors on front panel of plug-in (see Figure 3-9) are the only external electrical connections to the unit. All other connections are made through the 50-pin connector at the rear of plug-in when installed in counter.

2-15. Modifications

2-16. When Model 5257A is used with an HP 5245L Counter having a serial prefix number between 402- and 516-, A22R38 on 5245L Gate Control Assembly (5243A-65R) should be changed to 4700 ohms (HP Part No. 0683-4725).

2-17. When Model 5257A is used with an HP 5245L Counter with serial prefix 335 and below, HP 5245L must be modified. A Modification Kit (HP Part No. 05243-6030) is available from your Hewlett-Packard Sales and Service office, complete with instructions for modification.

NOTE

HP 5245L Counters displaying the sticker "ACCEPTS HP MODELS 5251 THRU 5256" inside the plug-in compartment do not require the modifications listed in Paragraph 2-17.

OPERATION

SECTION III

OPERATION

3-1. DESCRIPTION

3-2. Model 5257A Transfer Oscillator plug-in unit increases to 18 GHz the frequency measuring capability of Hewlett-Packard counters: 5245L/M, 5246L, 5247M, 5248L/M, and 5345A. The measured frequency is displayed on the counter for all types of radio frequency carriers including cw, fm, and pulsed. Controls and jacks are described in detail in Paragraphs 3-13 through 3-22. Step by step operating procedures are given in Figures 3-9 and 3-10.

3-3. An internal VFO, tunable from 66.7 to 133.3 MHz, functions as a transfer oscillator to reduce the input frequencies to within the counter's input frequency limitations. The VFO frequency is high to maintain a 66.7 MHz or more separation between harmonics on the three highest frequency ranges. A four-to-one divider (prescaler) reduces the VFO frequency for counting and sampling in the .05 to .2 GHz range. The VFO is inherently very stable which is useful when using the unit as a down converter. But as a transfer oscillator, the automatic phase control mode for cw signals eliminates any drift effects and in the pulsed rf mode the short time it takes for a measurement makes drift effects negligible.

3-4. To compensate for wide variations in input signal levels and the very wide range of input frequencies for which the Model 5257A is designed, a level adjustment is provided on the front panel. This control, labeled LEVEL ADJ, should be turned fully counterclockwise before applying the input signal. When tuning into zero beat, with the MODE switch in the PULSED RF position, the meter pointer will rise and reach a maximum at zero beat. LEVEL ADJ is then turned clockwise until the maximum meter deflection sits at the red scale line (located at nine-tenths of full scale). An exception may occur with very stable cw input signals. In these cases, the meter reading might drop to zero at exact zero beat so the level adjustment is made when tuned outside the dip.

3-5. At all times observe the maximum allowable input signal power of +10 dBm for cw carriers and 2 volts peak-to-peak voltage for any signal. Exceeding these limits may seriously damage the hot carrier diodes of the 18 GHz input sampler. Use caution, especially for pulsed signals, where peak voltages may be quite high even at low power. When in doubt, use an attenuator and decrease attenuation until the Model 5257A responds to the signal.

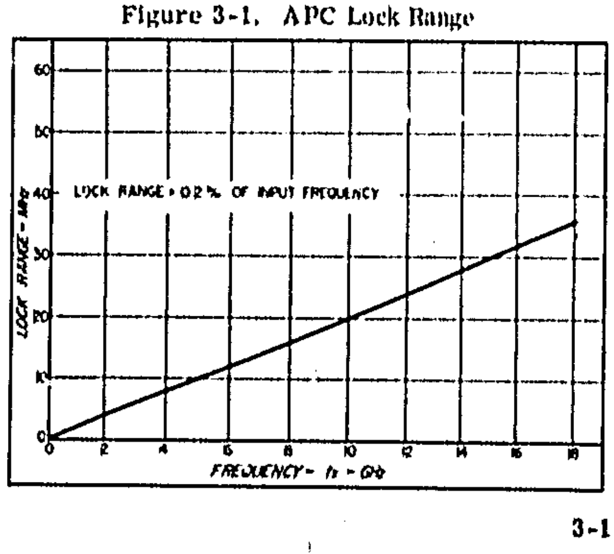
3-6. In the APC Mode a cw signal may be phase locked by tuning the FREQUENCY MHz control through any subharmonic of the input frequency. The meter reads the phase lock error voltage near mid-scale deflection. Mid-scale deflection representing 0 phase error may drift slightly due to the dc amplifier circuitry. (This does not affect instrument accuracy.) The deflection for 0 phase error may be checked by observing the meter while tuned between adjacent phase lock frequencies. Deflection for zero error may be adjusted to mid-scale with the APC adjustment potentiometer reached through a hole in the top cover. See Page 5-4 for APC adjustment. After phase lock, FREQUENCY MHz should be adjusted until the meter reads the 0 error deflection previously determined. Once the signal has been captured or phase locked, the VFO frequency will be independent of movement of the FREQUENCY MHz control corresponding to a lock of approximately 0.2% of the input frequency. APC lock range versus input frequency is shown in Figure 3-1.

3-7. Counter display is controlled by an inhibit gate operated from the Model 5257A phase-lock loop. In the APC Mode when phase lock is not present the counter display is all zeros. When phase lock occurs the display is a frequency count. In the PULSED RF mode the counter reads frequency continually.

3-8. The PULSED RF mode of operation is available for frequency measurement of signals which cannot be phase locked. These include pulsed rf signals as well as very heavily frequency modulated carriers. Typical fm performance curves for the Model 5257A are shown in Figure 3-2. Signals with modulation in the area above the curves usually require the PULSED RF mode while those falling below the curve can be measured in the APC mode.

3-9. With pulsed rf input signals the minimum error in frequency measurement is dependent upon the pulse width due to imperfect zero beat. The Model 5257A has a typical error of 0.01 cycle per pulse width. Pulse width versus error is shown in Figure 3-3. For example, with a 1 μs pulse: cycles error/pulse width = 10^{-2} cycles/10^{-6} = 10^{4} cycles or 10 kHz error. For a 10 GHz carrier this becomes 10^{4} Hz error/10^{10}

Figure 3-1. APC Lock Range



Hz carrier = 1 x 10^{-6} error in measurement at this frequency. Operation of the 5257A is specified for a minimum pulse width of 0.5 μsec. Therefore, absolute error in measurement can always be less than ±20 kHz.

3-10. The front panel jack labeled PULSED RF OUT is useful for down conversion applications of the Model 5257A as well as for visual zero beat tuning in the PULSED RF mode. This jack makes available the amplified sampler output for connection to other equipment. In the frequency measurement of pulsed rf signals an oscilloscope can be used to supplement the meter tuning indicator. Typical waveforms observed in tuning for zero beat are shown in Figure 3-4. In down conversion the transfer oscillator and sampler produce signals suitable for driving low frequency equipment. Figure 3-5 is a block diagram showing the set up for measuring fm demodulation characteristics with a Hewlett-Packard 302A Wave Analyzer. In these applications it is useful to show the frequency spectral density of the transfer oscillator. From this the noise contributed by the VFO may be calculated:

$$[S_{f_v}(f)]^{1/2} \quad NB_{eq}^{\ 1/2} = \Delta f_{rms}(f)$$

where $S_{f_v}(f)$ is the frequency spectral density of the VFO, N is the harmonic number of the VFO to the input frequency, and B_{eq} is the equivalent power bandwidth. The values of $S_{f_v}(f)$ for the Model 5257A VFO can be obtained from the curves of Figure 3-6. (Refer to Hewlett-Packard Journal, March 1967; Application Note No. 87; and HP 5210A Manual.)

Figure 3-2. Maximum FM in APC Mode

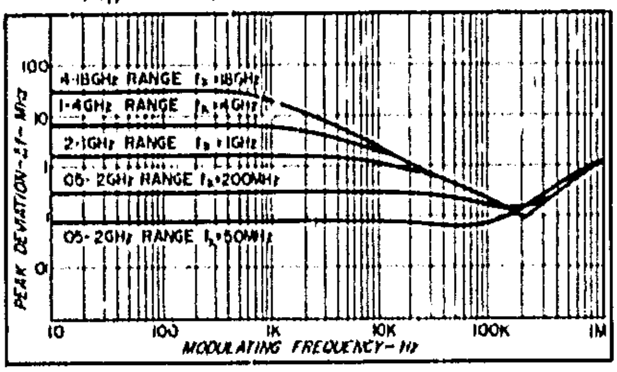
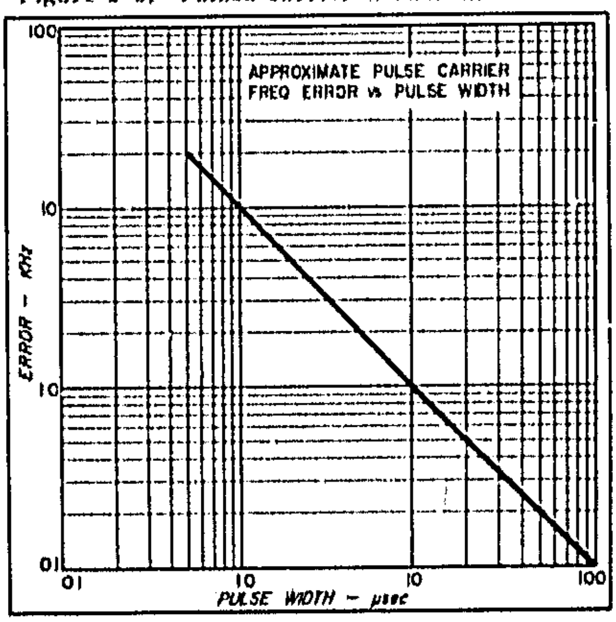
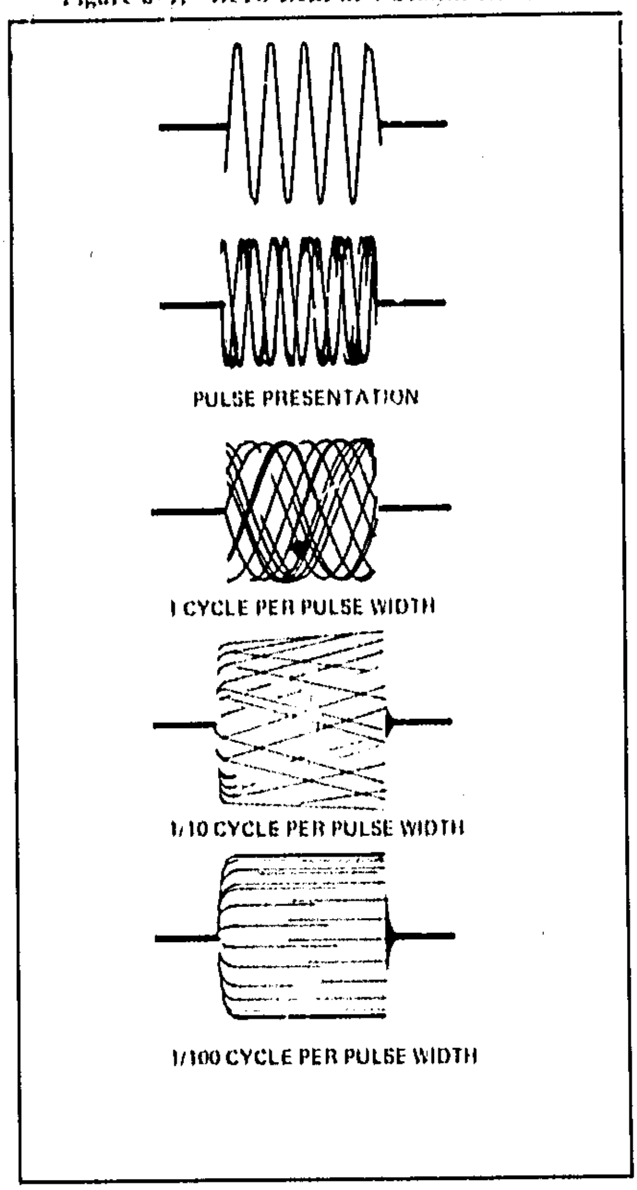


Figure 3-3. Pulsed Carrier Measurement Error



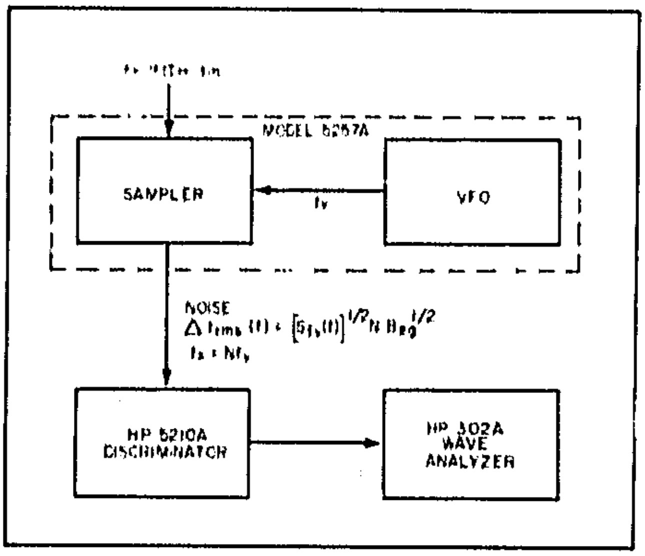
3-11. The thumbwheels extend the counter gate time in increments of units, tens, and hundreds causing the counter to read directly the sampling frequency and its multiples. With the thumbwheels set at 001 the counter reads the fundamental sampling frequency. At any other setting the counter reads a multiple of the sampling frequency. Thus, to directly read the frequency it is only necessary to find the proper harmonic "N" number and set the thumbwheels to this number. Calculation of "N" is described in Paragraphs 3-26 through 3-30.

Figure 3-4. Zero Beat at PULSED RF OUT



3-12. For basic set up of the counter used with the Model 5257A plug-in unit, refer to the appropriate counter operating manual. When the counter's FUNCTION switch is positioned at PLUG IN the counter's accessory connector plug is activated and the counter receives its input signal from the Model 5257A. Also the counter's gate time control is taken over by the Model 5257A but the setting of the counter's TIME BASE determines frequency resolution. A TIME BASE of 1 ms provides ±1 kHz resolution, the ±1 count of the last digit in the display. This time base is generally suitable for the whole frequency range from .05 to 18 GHz with 8 digit readout counters. In the microwave range where this degree of resolution is not required a 0.1 ms TIME BASE will shorten counting time and give a ±10 kHz resolution. Likewise on lower frequencies the TIME BASE can be lengthened for the maximum resolution the 8 digit readout allows.

Figure 3-5. 5257A Down Conversion



3-13. CONTROLS AND INPUTS

3-14. GENERAL. The function of the front-panel tuning control, input connector, mode selector, level control, meter and pulsed rf output connector are described in Paragraphs 3-15 through 3-22.

3-15. INPUT CONNECTOR. Signal input impedance is 50Ω nominal for connection to an unknown frequency source. The connector is a precision "N" type female connector. An exploded view of the input connector is shown in Figure 6-1. Changing two parts of the assembly converts the "N" type to the APC-7 or vice versa. See Paragraphs 3-24 and 3-25 for allowable input voltages.

3-16. FREQUENCY MHz CONTROL. The dial reads the VFO frequency. For convenience however, the counter readout provides the sampling frequency measurement used for calculations. (Do not use the dial reading for calculations.) Concentric knobs on this dial provide coarse and fine tuning. Coarse tuning

Figure 3-6. Frequency Spectral Density of VFO

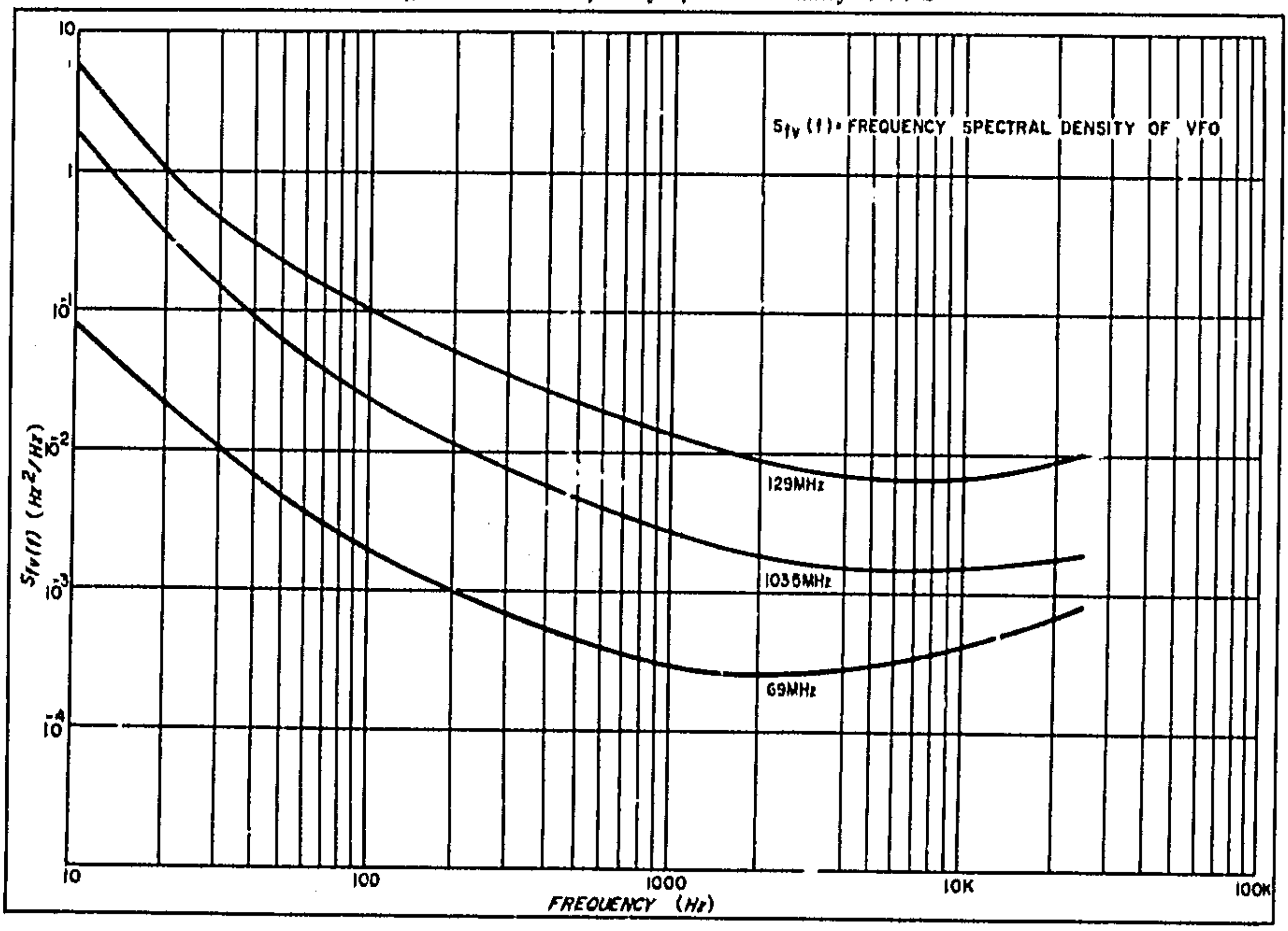
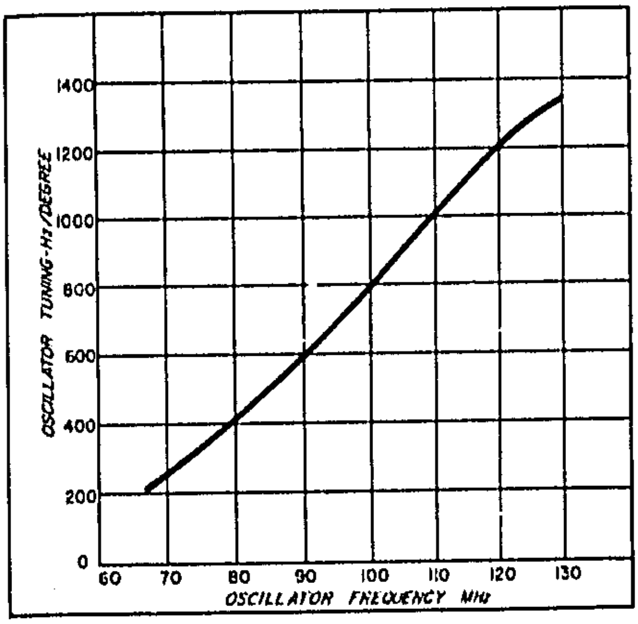


Figure 3-7. Oscillator Tuning



has a 63 to 1 gear reduction while the fine tuning has a 632 to 1 reduction. The oscillator is settable to 1/20 of a degree with fine tuning. See Figure 3-7 for oscillator tuning characteristics.

3-17. METER. In the PULSED RF mode the meter reads the relative amplitude of the difference frequency (beat) between the VFO harmonic and the input signal. At nine-tenths of full scale a red division line marks the optimum level at zero beat for Model 5257A frequency measurements. In the APC MODE, the meter monitors phase error of the phase-lock loop. Zero phase error deflection is nominally at mid-scale. When out of phase lock, in the APC MODE, the meter reads the nominal mid-scale deflection. In phase lock the meter reads above, below, or at the zero phase error deflection depending upon phase error.

3-18. MODE. Selects PULSED RF and APC modes. This is the red knob concentric with the RANGE selector knob.

3-19. THUMBWHEEL SWITCHES. The thumbwheels are set to harmonic numbers N of the sampling frequency. They actuate switches which preset a counter decade assembly in the Model 5257A to extend the counter gate in increments of units, tens, and hundreds. At a setting of 001 the counter reads the sampling frequency (N = 1).

3-20. LEVEL ADJ. This control adjusts amplifier gain to compensate for wide variations in input signal levels and the wide frequency range of the instrument. Initially, LEVEL ADJ is turned fully counterclockwise and after tuning to zero beat it is turned clockwise until the meter reads at the red division line.

3-21. RANGE. Range is selected with the black knob which is concentric with the MODE switch knob. It includes four ranges: .05-.2 GHz, .2-1 GHz, 1-4 GHz, and 4-18 GHz. This switch compensates the phase-lock loop for the wide frequency range of the instrument. It also selects a gate time extension factor for the counter: the scale is 1N in the .05 to .2 GHz range and 4N in the higher ranges.

3-22. PULSED RF OUT. This BNC connector goes to the sampler output circuitry. It may be used for applications other than frequency measurement such as down conversion to extend the frequency range of low frequency instruments. An oscilloscope may be connected for viewing the sampler output waveform during zero beat tuning in the PULSED RF MODE.

3-23. INPUT VOLTAGES

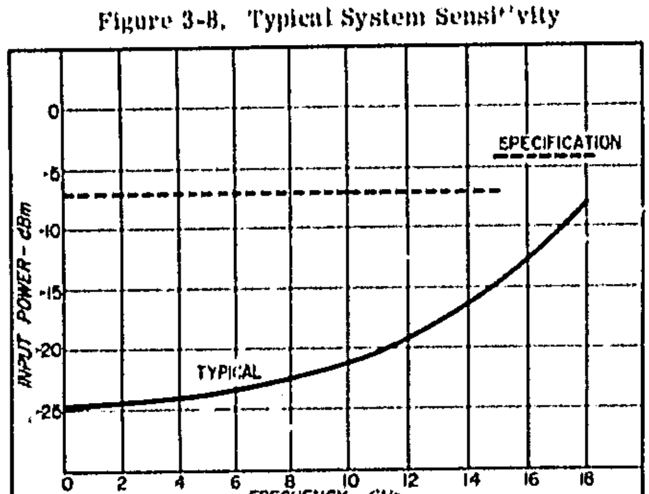
3-24. MAXIMUM INPUT VOLTAGE. The maximum input voltage must not be exceeded to prevent hot carrier diode damage in the sampler. Peak voltage is the critical quantity rather than average or rms values. Know the signal voltage before applying it to the INPUT jack. Use attenuators as a precautionary measure where the input voltage is questionable. Extra care should be taken with pulsed signals, since short voltage spikes can be just as damaging as steady state values. The maximum permissible input voltage is 2 volts, peak to peak - equivalent to 0.707 volts rms (+10 dBm) for a cw carrier.

3-25. MINIMUM INPUT VOLTAGE. A minimum input amplitude is specified to assure proper instrument operation, even though it may respond to lower amplitudes. Figure 3-8 gives typical system sensitivity versus input frequency. The Model 5257A will measure input signals from .05 to 15 GHz with amplitudes in excess of 100 mV (-7 dBm), and from 15 to 18 GHz with amplitudes in excess of 140 mV (-4 dBm) using a VFO frequency of 125 to 133.3 MHz. The input level should be sufficient to allow adjustment of meter deflection to the red indicator line.

3-26. CALCULATION OF N

3-27. For frequency ranges above .2 GHz, if the input signal frequency is known to within the sampling frequency (from 66.7 to 133.3 MHz), the harmonic number N can be found directly. In this case, estimated input frequency f_x is divided by sampling frequency f_s as read on the counter with the thumbwheels set at 001. The answer is N: $f_x/f_s = N$, where f_s equals VFO frequency f_v.

Figure 3-8. Typical System Sensitivity



3-28. In the .05 to .2 GHz range, sampling frequency f_s is VFO frequency f_v prescaled by four. The counter reads this sampling frequency, not the VFO frequency. Therefore, for direct calculation of N the estimated input signal frequency f_x should be known to within the sampling frequency (from 16.3 to 33.3 MHz). Hence the procedure is the same as in Paragraph 3-27. The estimated input frequency f_x is divided by the counter reading f_s and the answer is N: $f_x/f_s = N$, where f_s equals VFO frequency f_v divided by 4.

3-29. Briefly, the frequency measurement procedure using direct calculation of N is as follows: set the thumbwheels at 001. Tune FREQUENCY MHz for an indication of zero beat or phase lock, observing LEVEL ADJ and MODE switch positions described in Paragraph 3-4. Read sampling frequency on the counter. Divide the sampling frequency into the estimated frequency to obtain N (slide rule accuracy is permissible). Turn thumbwheels to N. Read actual input frequency on counter's display.

3-30. When input frequency f_x is known to be outside the limits for direct calculation of N stated in Paragraphs 3-27 and 3-28, a different procedure is followed. The thumbwheels are set to 001, FREQUENCY MHz is tuned to zero beat or phase lock while observing LEVEL ADJ and MODE switch position described in Paragraph 3-4, and the counter readout is recorded as f_1. FREQUENCY MHz is retuned to an adjacent zero beat or phase lock and the counter readout is recorded as f_2. The first frequency f_1 divided by the difference in the frequencies yields harmonic number N of the second frequency f_2 (slide rule accuracy is permissible):

EXAMPLE 1. Assume unknown f_x is approximately 11.9 GHz; Time Base = 1 ms.

a. Where f_2 is lower than f_1:

$f_x = (N - 1) f_1$ and $f_x = Nf_2$,

$N = f_1/(f_1 - f_2)$.

f_1 = 119532. kHz (read on counter) tuning lower in frequency gives

f_2 = 118349. kHz (read on counter)

$f_1 - f_2$ = 1183. kHz

N = 119.5/1.183 = 101, set thumbwheels to 101,

f_x = 101 x 118.349 = 11953261. kHz (read on counter).

b. Where f_2 is higher than f_1:

$f_x = (N + 1) f_1$ and $f_x = Nf_2$,

$N = f_1/(f_2 - f_1)$.

f_1 = 119532. kHz (read on counter) tuning higher in frequency gives

f_2 = 120740. kHz (read on counter)

$f_2 - f_1$ = 1208. kHz

N = 119.5/1.208 = 99, set thumbwheels to 99, f_x = 120.740 x 99 = 11953261. kHz (read on counter).

EXAMPLE 2. Assume unknown f_x is approximately 1.1 GHz; Time Base = 1 ms.

a. Where f_2 is lower than f_1:

f_1 = 110000 kHz (read on counter) tuning lower in frequency gives

f_2 = 100000 kHz (read on counter)

$f_1 - f_2$ = 10000 kHz

N = 110/10 = 11. Set thumbwheels to 11;

f_x = 11 x 100000 = 1100000 kHz.

b. Where f_2 is higher than f_1:

f_1 = 1100000 kHz (read on counter) tuning higher in frequency gives

f_2 = 122000 kHz (read on counter)

$f_1 - f_2$ = 12000 kHz

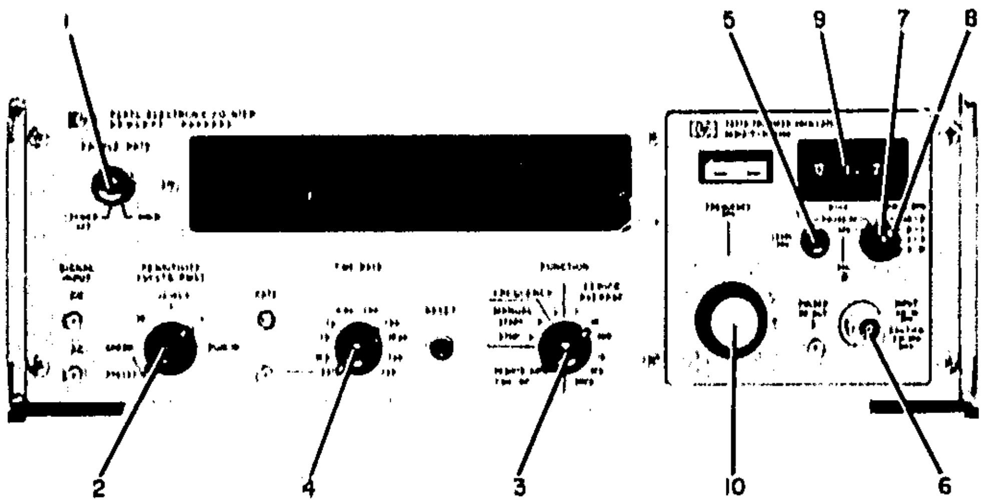
N = 110/12 = 9

f_x = 122000 x 9 = 1100000 kHz.

3-31. VERIFICATION OF HARMONIC NUMBER N

3-32. The transfer oscillator method of measuring frequencies higher than the counter's capability requires that harmonic number "N" be known exactly. Since there are many harmonics to choose from, the operating procedures in Figures 3-9 and 3-10 outline a foolproof method of verifying the selected harmonic number. In use, harmonic number "N" is either increased or decreased by 1 on the thumbwheel switches and the internal VFO is retuned for zero beat or phase lock at an adjacent harmonic to match the change on the switches. Thus, the measured frequency displayed is the same in both cases if the choice was correct.

Figure 3-9. Pulsed RF and FM Measurement



CAUTION: Do not apply more than +10 dBm (2 V peak-to-peak) to 5257A INPUT connector.

1. Turn power on by turning SAMPLE RATE control cw out of POWER OFF.
2. Set switch on Counter to PLUG-IN.
3. Set switch on Counter to FREQUENCY.
4. Set switch on Counter to 0.1 ms. Note: Other gate times may be used.
5. Turn 5257A LEVEL control fully ccw.
6. Connect signal to be counted to 5257A INPUT (f_x).
7. Set MODE switch to PULSED RF.
8. Set RANGE switch to correct range for input frequency.
9. Set N switches to 001.
10. Tune FREQUENCY dial for maximum meter reading.
11. Turn LEVEL control cw for meter reading of 9/10 full scale.
12. Read sampling frequency f_1 on Counter and record.
13. a. Omit this step if input frequency f_x is known within the sampling frequency f_1, step 12.

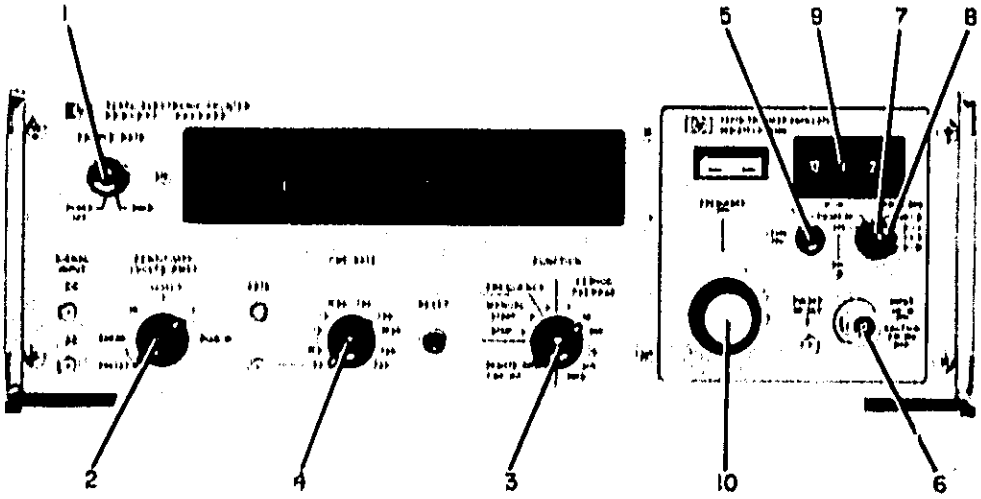
    b. When f_x falls outside the limits of step 12, find adjacent zerobeat to calculate N. Tune FREQUENCY dial higher or lower to adjacent zerobeat and carefully tune for maximum meter reading. Read Counter and record this second frequency f_2.
14. Calculate N (Paragraph 3-26)*. With slide rule accuracy:

    a. Input frequency f_x known within sampling frequency: Divide f_x by f_1 to obtain N: $N = f_x/f_1$.

    b. Input frequency f_x not known within sampling frequency: Find difference between f_1 and f_2. Divide f_1 by the difference to obtain N: $N = f_1/(f_2 - f_1)$ or $N = f_1/(f_1 - f_2)$.
15. Set N switches to calculated N number and read input frequency on Counter.
16. Verify N. Turn N switches up one unit (e.g., 080 to 081) or down one unit (e.g., 080 to 079).
17. Tune FREQUENCY dial for adjacent zero beat (indicated by peak on meter) corresponding to the direction N switches were turned in step 16, (lower for N + 1) and (higher for N - 1). Counter should display the same frequency as step 15.

* Maximum N setting is typically 144 from 15 to 18 GHz and 225 from .05-15 GHz, Paragraph 3-25.

Figure 3-10. CW and FM Measurement



CAUTION: Do not apply more than +10 dBm (2 V peak-to-peak) to 5257A to INPUT connector.

1. Turn power on by turning SAMPLE RATE control cw out of POWER OFF.
2. Set switch on Counter to PLUG-IN.
3. Set switch on Counter to FREQUENCY.
4. Set switch on Counter to 0.1 ms. Note: Other gate times may be used.
5. Turn 5257A LEVEL control fully cw, then back off one turn.
6. Connect signal to be counted to 5257A INPUT.
7. Set MODE switch to PULSED RF.
8. Set RANGE switch to correct range for input frequency (f_x).
9. Set N switches to 001.
10. Tune FREQUENCY dial for maximum meter reading.
11. Turn LEVEL control cw for a meter reading of 9/10 full scale.
12. Set MODE switch to APC. Note that meter will read near mid-scale between phase-lock points and Counter will display all zeros.
13. Tune FREQUENCY dial for phase lock. Meter now reads about mid-scale ± phase error and Counter displays the sampling frequency.
14. Tune FREQUENCY dial for zero phase error (exactly mid-scale on meter).
15. Read sampling frequency f_1 on Counter and record.
16. a. Omit this step if input frequency f_x is known to be within the sampling frequency f_1, step 15 above.

    b. When f_x falls outside the limits of step 15 above, find adjacent phase lock point to calculate N. Tune FREQUENCY dial higher or lower to adjacent phase lock point and adjust for zero phase error. Read Counter and record this second frequency f_2.
17. Calculate N (Paragraphs under 3-26)*. With slide rule accuracy:

    a. Input frequency f_x known within sampling frequency: Divide f_x by f_1 to obtain N: $N = f_x/f_1$.

    b. Input frequency f_x not known within sampling frequency: Find difference between f_1 and f_2. Divide f_1 by the difference to obtain N. $N = f_1/(f_2 - f_1)$ or $N = f_1/(f_1 - f_2)$.
18. Set N switches to calculated N number and read input frequency on Counter.
19. Verify N. Set N switches up one unit (e.g., 080 to 081) or down one unit (e.g., 080 to 079).
20. Tune FREQUENCY dial to adjacent phase lock point corresponding to the direction N switches were turned in step 19, (lower for N + 1) and (higher for N - 1). Counter should display the same frequency as step 18 above.

* Maximum N setting is typically 144 from 15 to 18 GHz and 225 from .05-15 GHz, Paragraph 3-25.

NOTE

For additional measurement techniques, request Application Note 141, "AM, FM Measurements with the Transfer Oscillator." This publication is available upon request through your nearest Hewlett-Packard Sales and Service Office.

THEORY

SECTION IV

THEORY OF OPERATION

4-1. GENERAL

4-2. The Model 5257A is a plug-in transfer oscillator for use with Hewlett-Packard 5245L, 5245M, 5246L, and the 5247M counters. It includes gate time presetting circuits for display on the counter of the actual measured frequency. This section describes operation of the Model 5257A system in Paragraphs 4-3 through 4-12 and its individual circuits in Paragraphs 4-14 through 4-58.

NOTE

After installing plug-in unit and turning power on; depress counter RESET button to ensure valid count or measurement.

4-3. FUNCTIONAL BLOCK DIAGRAM

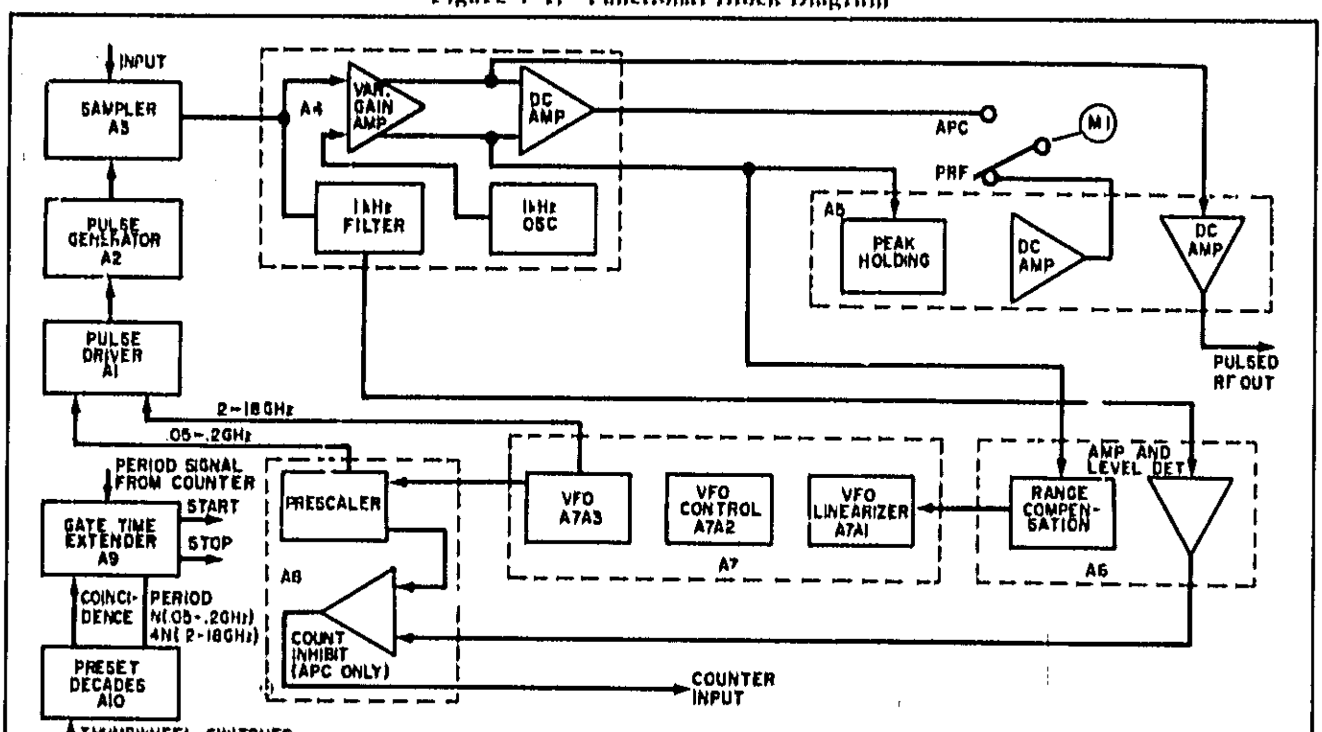
4-4. There are ten functional sections to the Model 5257A. These are shown connected as a system in the functional block diagram of Figure 4-1. For circuit details refer to schematic diagrams in Figures 8-3 through 8-15.

4-5. The frequency to be measured is applied to wideband sampler A3. The sampler is switched by pulse generator A2 at a rate determined by internal VFO A7A3. The sampler output represents phase difference between the sampler switching time and the input frequency. If the internal VFO harmonic is phase locked to the input frequency, the sampler output will be a dc voltage proportional to phase error.

4-6. There are many harmonics of frequencies tunable within the internal VFO range that will zero beat or phase lock with an input signal. In operation, the internal VFO can be tuned to any one of these. The sampler output is amplified in the variable gain and dc amplifiers of A4. The gain is set by front panel LEVEL ADJ control. The output of A4 goes to A5 and A6 assemblies. A5 dc amplifier provides the sampler output waveform at front panel jack J2. A5 peak holding circuit develops a dc voltage proportional to the amplitude of the beat signal from the sampler with pulsed rf input signals. This level is amplified and applied to meter M1 when operating in PULSED RF MODE. In the APC mode the meter is switched directly to A4 dc amplifier for reading the phase error of the phase-lock loop.

4-7. The variable-gain amplifier in A4 includes a reference voltage to establish 0 phase error in the phase-lock error voltage loop. In the APC mode, a 1 kHz oscillator is turned on and its signal is injected into the phase-lock loop at the reference mode. The 1 kHz signal appears at the output of sampler A3 and is taken from this point by a 1 kHz filter, located in A4, for amplification and level detection in assembly A6. If phase-lock has not occurred, this signal is below the required detection level and the signal to the counter is inhibited by the inhibit amplifier in A8. Therefore, the counter readout is all zeros. When phase-lock is achieved, the 1 kHz signal is above the required level, and the inhibit to the counter is removed for a frequency readout. In the PULSED RF mode the inhibit amplifier is biased to continually pass the counter input signal.

Figure 4-1. Functional Block Diagram



4-8. The feedback loop output of the variable gain amplifier goes through a range compensation circuit in A6, which connects to VFO linearizer A7A1. Range compensation is varied in steps with the range switch for optimum phase-locking from 0.05 to 18 GHz. The linearizer compensates for the non-linear VFO gain characteristics over the tuning range. In the PULSED R? mode, the feedback loop is disabled in the linearizer. Linearizer output is a dc voltage applied to VFO control A7A2. Voltage controlled capacitors in VFO control A7A2 hold the VFO frequency in phase lock when in the APC mode. Thus, the APC loop is completed.

4-9. VFO A7A3 is tunable between 66.7 to 133.3 MHz and its output goes to two buffers. The first buffer provides input to pulse driver A1 when the Model 5257A is switched to the frequency ranges above 200 MHz. The second buffer provides VFO input to a divide-by-four prescaler A8. Output C of the prescaler goes to pulse driver A1 when the Model 5257A is switched to the 50 to 200 MHz range. This gives a tunable sampling rate from 16.7 to 33.3 MHz. The other prescaler output, if passed by the inhibit amplifier, goes to the counter input gate on line A for frequency counting on all ranges. Thus on the lowest range, counter prescale is N and on the three highest ranges the counter prescale is 4N.

4-10. The thumbwheel switches, A8 preset decades, and A9 gate-time extender control the counter's start-stop and are separate from the transfer oscillator portion. The thumbwheels are set to the transfer oscillator (VFO) harmonic number N which zero beats with the input signal being measured. The thumbwheels activate switches which set the conditions of the three binary decades of A8 in units, tens, and hundreds. The decades start counting at start and provide a coincidence gating pulse to the gate time extender when the count period is completed for stop. In this way, gate time extender A9 controls the counter's start-stop time so the readout is the actual measured frequency. Range switch S1 turns off divide-by-four in A9 for the 50 to 200 MHz range and turns it on in the other ranges to give a correct count when A8 prescaler is switched. Therefore, when the thumbwheels are set at 001 the counter will display the sampling frequency to pulse driver A1 in all ranges.

4-11. COMPONENT IDENTIFICATION

4-12. The complete reference designator for a component mounted on an assembly consists of the assembly designation plus the designator number of the component in that assembly. Components that are not part of any assembly (chassis parts) are identified by component numbers only. For example, A7A1R1 refers to resistor (R1) in the VFO linearizer subassembly (A1) which is part of the VFO assembly (A7). A resistor numbered R1 mounted on the chassis is simply designated R1.

4-13. Complete reference designators will be used in this manual only when necessary to avoid confusion with other components or assemblies having similar designators. For a complete reference designator where an abbreviated one is used in the text, add the designator for the assembly as given in the heading immediately preceding that paragraph.

4-14. PULSE DRIVER A1

4-15. VFO buffer output from A3P3 is applied to the input switching network consisting of CR1, CR2 and CR3. When switch S1 is in the three highest ranges for frequencies from 200 MHz to 18 GHz, a -15 volt bias is applied to turn CR2 off and CR1 and CR3 on so that the VFO signal drives transistor Q1 of the driver amplifier. The prescaled, divided-by-four, VFO signal from prescaler A8(C) is applied to switching diodes CR4 and CR5. In the three highest frequency ranges, CR5 clamps the input to ground and CR4 is virtually an open circuit so that the prescaled input is prevented from appearing at Q1 base. When S1 is switched to the 50 to 200 MHz range, the -15 volts is removed from CR1, CR2, and CR3. This opens the signal path and clamps it to ground. This action turns off the input from A3P3. At the same time, the -15 volts turns CR4 on and CR5 off so the prescaled VFO signal appears at Q1 base.

4-16. Amplifiers Q1 and Q2 are feedback amplifiers for low impedance drive to Q3. Q3 and Q4 raise the level of VFO signals and drive the Q5 and Q6 wideband driver stage which is essentially a current mode switch configuration. This high level Q5 and Q6 driver turns on and off at the frequency of the input signal forming steep sloped square waves for driving stripline pulse generator A2. Auto transformers T1 and T2 couple between Q4 and Q5, and Q6 and pulse generator A2, respectively. Because of the high frequency pulse components generated in this assembly, both the +13 volt and -15 volt dc power lines are isolated by pi filter networks consisting of bypass capacitors and a filter coil.

4-17. PULSE GENERATOR A2

4-18. CR1 in a strip line assembly is driven by pulse amplifier A1 through C1. C1 is independently mounted between the assemblies. CR1 is a step recovery diode which has the unique property of conducting for a few nanoseconds after the driving signal reverse biases the diode junction and then turning off sharply. This characteristic generates the pulses for sampler drive. They go through R1 to A3 sampler assembly.

4-19. SAMPLER A3

4-20. The sampler is designed for harmonic mixing of very high frequency and microwave signals. The assembly consists of a 6 dB attenuator for the input signal, hot carrier diodes CR1 and CR2, sampling capacitors C1 and C2, and shorted stubs. The pulse train, representing the VFO harmonics from pulse generator A2, switch diodes CR1 and CR2 on and off with a 180° phase difference. The hot carrier diodes have picosecond switching times and can sample signals as high as 18 GHz. A driving pulse closes switch CR1 and a sample is taken. C1 charges to some fraction of the input voltage according to the phase relationship of the input signal with the sampling pulse. CR2 switching out-of-phase with CR1 charges C2 in the opposite polarity from C1. Thus, phase detection results when the two outputs are combined at the input to automatic phase control assembly A4.

4-21. AUTOMATIC PHASE CONTROL ASSEMBLY A4

4-22. VARIABLE GAIN AMPLIFIER. The outputs from sampler A3 through isolation resistors R1 and R2 are combined at the gate of Q2A. The Q2A gate input is the summing junction for the two sides of the sampler and the resultant voltage is the algebraic sum of the voltages on A3C1 and A3C2. Q2A and Q2B are a matched pair of field effect transistors (FET's) packaged in a single can. FET Q2A is a source-follower (comparable to an emitter-follower transistor circuit) which presents a high input impedance for minimal loading on the sampler. Bipolar transistor Q3 is in an emitter-follower circuit which feeds back an in-phase signal voltage from Q2A's source to its drain for effective reduction of Q2A's gate-to-drain capacitance. FET Q2B provides a dc reference level to variable gain amplifier at Q5 base. The reference level is adjusted with front-panel APC BAL control R2.

4-23. The reference dc voltage and a 1 kHz signal are amplified by Q5 while the sampler output from Q2A is amplified by Q7, the opposite side of the A4 balanced variable-gain amplifier. Q6A and Q6B are current sources for Q5 and Q7, respectively, and provide dc stability. Q5 and Q7 emitters are bridged by LEVEL ADJ, R1 (chassis part), to adjust amplifier gain for wide variations in input signal levels and frequency range. Lower values of R1 reduce the emitter resistance of Q5 and Q7 and increase gain, and vice versa. Ac and dc gain are both varied yet dc balance between the two sides of the amplifier is maintained.

4-24. 1 kHz OSCILLATOR. The 1 kHz oscillator includes Q1, Q4, and Q10, and is switched on in the APC Mode by removing the ground from the 1000 ohm RC feedback circuit. The RC feedback consists of C6, R25, R22, C5, and R16. Q4 has a split load. Collector resistor R12 is of low value to provide a low amplitude 1 kHz output signal going through C4 to the reference node at Q2B. C1 and C3 bypass high frequencies to improve the 1 kHz sinewave. Q4 emitter load resistor R8 couples the feedback signal to Q1 emitter. Q1 is a common-base stage which drives Q10. Q10 is a common-emitter amplifier which completes the oscillator loop.

4-25. DC AMPLIFIER. Q8-Q11A is the upper section and Q9-Q11B the lower section of a balanced dc amplifier. Due to coupling of the emitters between sections, the outputs of the upper and lower halves are equal and out of phase. Q8 and Q9 are emitter-followers for both the dc error voltage on the APC loop and the ac beat frequencies in the PULSED RF MODE. From Q8, ac beat frequencies are applied to A5 (8) through A4 (3) for input to the pulsed rf output amplifier. From Q9, ac beat frequencies are applied to A5 (10) through A4 (6) for the peak holding circuit which drives the meter in the PULSED RF MODE. Input to A6 (10) range compensation is also taken from Q9. Q11A is the dc amplifier for meter drive in the APC Mode. Q11B provides circuit balance.

4-26. REGULATOR AND PULSED RF OUTPUT ASSEMBLY A5

4-27. PULSED RF OUT. Terminal A5 (8) connects the base input of amplifier Q10 to the upper section of the dc amplifier in APC assembly A4. Q10 is an emitter follower and its output is ac coupled through C10 to the BNC jack labeled PULSED RF OUT.

4-28. PEAK HOLDING CIRCUIT. Terminal A5 (10) connects the base input of Q1 to the lower section of the dc amplifier in assembly A4. Q1 and Q2 are an ac amplifier for the beat frequency signal. They provide a peak-to-peak signal of sufficient amplitude for peak holding circuit operation. The peak holding circuit consists of Q3A, Q3B, Q4, Q5, Q6, and Q7. The collector of Q3A couples the signal to the base of Q7 which, in turn, drives Q6. Q6 is an emitter-follower which charges C2. The long time constant of C2 and R9 holds the dc level developed between pulses. Q4 and Q5 are a Darlington pair with a high input impedance so that the loading on R9, C2 is minimal. The resultant voltage on the emitter of Q4 and the bases of Q3B and Q8A is the dc level across R9, C2 plus the base-emitter drops of Q4 and Q5. Q3A and Q3B are emitter coupled so this dc voltage is compared with the peak ac voltage on the base of Q3A. The difference is fed back through Q7 until the loop is stabilized at the peak ac voltage.

4-29. DC AMPLIFIER. Q8A and Q8B are a dc amplifier to drive the meter. The dc voltage level from the peak holding circuit is applied to the base of Q8A. This voltage is negative going with increasing amplitude. With no signal input Q8A is conducting heavily. Q8B is biased slightly negative by voltage divider R17 and R16 and is virtually held off. Meter current derived from the voltage drop across R15 is negligible. With increasing input signal the base-emitter bias on Q8A drops, its conduction decreases, and its emitter voltage goes negative. This increases the conduction of Q8B, the voltage across R15 increases, and the meter deflection rises.

4-30. +13 VOLT REGULATOR. The series regulator for +13 volts consists of Q14 as the series regulating device, Q12 voltage feedback amplifier, and CR1 combined with amplifier Q9 as a reference voltage. The unregulated +20 volt input is dropped by R28 and Q14, and appears on the +13 volt output line. Voltage divider R29 and R30 samples the output voltage and applies 9 volts to the base of Q12. Zener diode CR1 holds the base of Q9 to 9 volts to set a fixed voltage for the emitters of Q9 and Q12. If the output voltage tends to rise over 13 volts, the base bias on Q12 increases, Q12 conduction increases and its collector drops in voltage. This decreases the base bias, and thus conduction of Q14, so that the output voltage on the +13 volt line decreases to remain constant. For a decrease in output voltage the opposite action takes place. C13 prevents transients in the load from affecting regulator operation.

4-31. -10 VOLT REGULATOR. Q16 is the series regulating device whose bias is controlled by Q15. Q11 and Q12 are a differential pair. CR2 establishes a reference voltage at the base of Q11 and the voltage at the base of Q13, derived from voltage divider R32 and R33 across the -10 volt output, must equal the reference. Any change in output voltage tending to change this balance will be corrected by a change in bias on Q15 which changes the conduction of Q16.

4-32. AUTOMATIC PHASE CONTROL ASSEMBLY A6

4-33. RANGE COMPENSATION. APC loop compensation for each of the four ranges of 0.05-0.2, 0.2-1.0, 1.0-4.0, and 4.0-18 GHz is provided across the signal line from APC No. 1, A4 (6), to VFO linearizer input P3 (A). The circuit consists of Q1 amplifier accepting the input signal and a series of switched loads for Q1. The loads are Q4, Q6, Q9, and Q12 with their associated resistors and capacitors. Diodes connected to these transistors (e.g., CR1, CR2) switch the loads for Q1 either on or off according to range switch S1 setting. As an example, the operation of Q4 load is described; the others are identical. Initially, CR1 is biased on from +13 volts through R4 to -10 volts through R9. The base of PNP transistor Q4 is then slightly positive due to the voltage divider ratio of R9/R8, and CR2 is off as well as Q4. When range switch S1 is set to .05-.2 GHz: CR1 is biased off by the -10 volts applied to R3, Q4 base goes negative to turn on Q4 which acts as an emitter follower to the output line, and CR2 goes on which connects Q1 to this load. C6 and R11 furnish the required loop compensation for the 0.05 to 0.2 GHz range.

4-34. AMPLIFIER AND LEVEL DETECTOR. Transistors Q2 and Q3 are a feedback amplifier for the 1 kHz inhibit signal from APC No. 1, A4 (1). Q2 is a common emitter, NPN transistor amplifier with feedback coupling resistor R8 in the emitter circuit. The collector signal of Q2 drives PNP transistor Q3. Q3 collector connects through R10 to Q2 emitter completing the negative feedback loop. Q3 output signal is coupled to Q5A through C7.

4-35. Transistors Q5, Q7, and Q8 are a peak holding circuit for the 1 kHz inhibit signal which appears at phase-lock in the APC mode. When the signal is absent, the base of Q5A and Q5B are at 0 volt. Since R14 goes to ground, the transistors are mutually coupled by their emitters. A 1 kHz input signal is amplified by Q5A and Q8, and C10 is charged negatively through CR7. R24 gives a long time constant. PNP transistor Q7 is an emitter-follower. The C10 charge plus Q7 base-emitter voltage appears on the base of Q5B. Through the coupling to Q5A, the voltage on Q5B base goes negative up to the peak amplitude of the input signal and remains constant at that voltage.

4-36. The level detector consists of PNP transistors Q10 and Q11. With mode switch S1 set to PULSED RF, +13 volts is applied to R36 and Q11 is biased off to disable the circuit. In the APC position of S1, -15 volts is applied to Q11 and it turns on. Q11 then supplies bias current to the inhibit signal output going to the prescaler and inhibit assembly A8 (D) when the input to the level detector is 0 volts. Q10 is biased off until its base voltage goes more negative in response to an input signal to the peak holding circuit. This turns Q10 on which moves the emitter of Q10 and Q11 in the negative direction and Q11 turns off. Thus, the bias current to the inhibit signal output line to A8 (D) is applied.

4-37. VARIABLE FREQUENCY OSCILLATOR ASSEMBLY A7

4-38. LINEARIZER A7A1. Input to the linearizer at P3 (A) comes from APC No. 2. The input signal is the APC error at phase lock in the APC mode and the sampler beat frequencies in the PULSED RF mode. The input is applied to the base of Q1. Q1 and Q3 are a balanced pair with Q2A and Q2B current sources in their emitter circuits. Q3 base is at ground and Q1 base is 0 volt, plus or minus the APC error voltage. The emitters of Q1 and Q3 are bridged by R4 plus resistance R8 through R17. These resistors are switched sequentially by S1 with the VFO FREQUENCY MHz control, to compensate feedback loop gain for the decreasing VFO gain as it is tuned from high to lower frequencies. The total resistance is maximum at the highest frequency of 133 MHz for lowest gain and resistance is minimum at the lowest frequency of 67 MHz for highest gain. Q4 is an emitter-follower for isolation of Q1 voltage amplifier and the VFO voltage control circuit. In the PULSED RF mode, -15 volts is applied through R7 turning off Q2, Q1, and Q3 to disable the APC loop. Base bias is applied to Q4 in the PULSED RF mode from divider R6 and R3 by turning on CR1 through part of mode switch S1.

4-39. VFO CONTROL A7A2. CR1 and CR2 are voltage controlled capacitor diodes which shunt the VFO tuning capacitor to ground through C1. The diodes are reverse biased such that an increase in bias decreases capacitance and vice versa. Network CR3, R4, and C2 sets the limits of swing on the VFO and provide an improved sinusoidal waveshape at the VFO output. The anode of CR3 is approximately -2 volts and prevents the signal on the cathode of CR3 from going more negative than -2.7 volts.

4-40. VARIABLE FREQUENCY OSCILLATOR A7A3. Q1 and Q2 are a modified Colpitts oscillator circuit with a tank consisting of tuning inductor L1, special air dielectric tuning capacitor C2, and feedback capacitors C4 and C5. Q2 adds current gain in the feedback loop to Q1 emitter and raises the Q of the tank circuit because of the high impedance of Q2 base. Q3 is a buffer to reduce the effect of load variations upon the oscillator. Buffer amplifiers Q4-Q6 and Q5-Q7 are identical. These are feedback type circuits to drive the 50-ohm output lines through transformers T1 and T2.

4-41. PRESCALER AND INHIBIT ASSEMBLY A8

4-42. DIFFERENTIAL AMPLIFIER AND SCHMITT TRIGGER. The prescaler input is a 67 to 133 MHz signal from the VFO assembly A7A3. This signal is capacitively coupled through C2 into differential amplifier Q1 and Q2. CR1 and Q3 provide a current source for the differential amplifier. The output of Q1 is input to integrated circuit Schmitt-trigger U1. R8 provides a broad bias adjustment for U1.

4-43. BINARIES, LEVEL SHIFT AND OUTPUT AMPLIFIER. Binary counter integrated circuits U2 and U3 accept the direct-coupled positive spikes from the Schmitt-trigger. The Q and $\bar{Q}$ outputs of U3 are square waves of opposite polarity between 16.7 and 33 MHz, which is the input frequency divided by 4. Q5 and Q6 are emitter-follower level shifters to the output amplifiers Q4 and Q7, which also provide isolation of the two prescaler outputs.

4-44. INHIBIT AMPLIFIER. The Inhibit input from A6 is applied to the base of Q8. In the Pulsed RF mode, there is bias current through R2 and Q8 is cut off. No inhibit signal is present and the prescaler output is applied to the counter. In the APC mode, the inhibit signal is present; Q8 is turned on, and the output signal at Q7C is shorted to ground through low impedance bypass Q8. When phase-lock occurs in the APC mode, the inhibit signal again goes low, Q8 is turned off and the prescaler output signal is applied to the counter.

4-45. GATE TIME EXTENDER A9 *

4-46. Enable voltage (plug-in bias) is applied to Q1 base when the counter FUNCTION switch is turned to PLUG IN. Q1 conducts and its collector voltage rises to -15 volts. The -15 volts is the supply for Q9 and Q10. CR1 turns on and applies -15 volts to gate-inhibit line P6 (23).

4-47. Waveforms at key points in the gate time extender are shown in Figure 4-2. Waveform numbers refer to circled points in A9 schematic, Figure 8-9.

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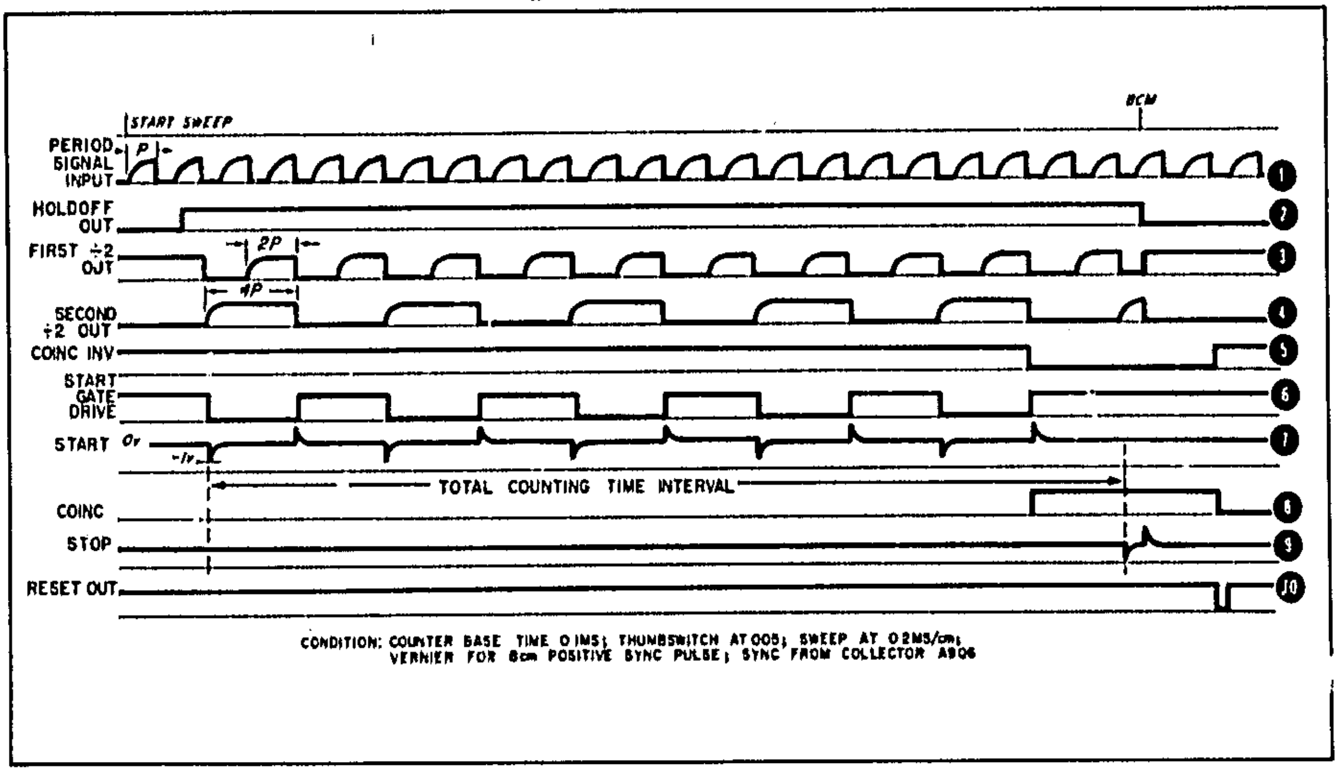
* High and low are logic designations for a positive voltage (high) of 4 volts and zero voltage (low) representing logic 1 and logic 0, respectively.

Figure 4-2. Waveforms



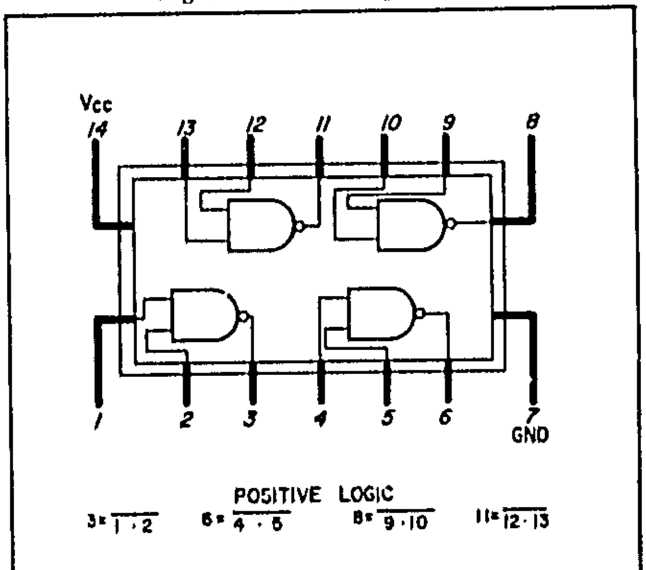
The counter period signal has a time interval P determined by the counter TIME BASE selector. This signal is applied to PNP transistor Q4 base which amplifies and inverts the signal. When the input square wave goes positive, Q4 turns off. CR2 prevents Q7 base from swinging below ground. Q7 amplifies again, inverts period P signal, and shifts the signal level to be compatible with the logic states (0 to 4.0 volts).

4-48. A schematic of IC logic parts is shown in Figure 4-3. Frequency division is performed by integrated circuit flip-flops IC1 and IC4. Between counting periods the hold-off pulse from the counter is a positive level applied through R9 to Q6 base. Q6 inverts the input so its output is low (near 0 volts). This voltage applied to IC1 (S_D) sets IC1 output (Q) high or logical "1". This high applied to IC4 (C_D) sets IC2 output (Q) low or logical "0". When the hold-off input goes low (0 volts), the count period begins. Q6 output rises positive to enable gates IC2A(2) and IC3A(1) and removes the 0 volt set level from IC1 (S_D) and IC4 (C_D). They can now change their binary states with changing input levels.

4-49. One-half cycle of a period after the end of hold-off period P signal goes low at IC1 (CP) and Q output of IC1 goes low. Immediately output Q of IC4 goes high. Two half-cycles of the input signal later output Q of IC1 again changes state and goes high. Thus it divides the input pulse frequency by two to give a period of 2P. Output Q of IC4 remains high and does not change state until the 2P input from IC1 (CP, clock pulse) goes negative one-half cycle later. Thus IC4 divides its 2P input by two for a total division of four. The new time interval at the Q output of IC4 is 4P, where P is the input time interval from the counter at P6 (48).

4-50. IC3A, B, C, D, and IC2D perform control logic for start and stop gates Q9 and Q10. Initially their conduction is low due to positive levels from IC3C and IC2D, respectively. Hold-off (see Paragraph 4-49) enabled IC3C through IC3A with inversion by IC3B.

Figure 4-3. IC Logic Gate



Thus, the leading edge of new period 4P from IC4 (Q) appears at IC3C (9) and IC3C (8) abruptly goes low. This generates a sharp negative pulse output from Q9 to P6 (21) and the counter start circuit. The 4P signal also goes to IC2D (10), but IC2D (9) is low so there is no change in IC2D (8). At the end of count time, determined by preset decade A10, a coincidence pulse appears at IC2D (9) and inverter IC3D (12). IC2D is enabled so that when IC2 (Q) goes high one-half cycle 4P later, output IC2D (8) abruptly changes from high to low. As a result, Q10 generates a negative stop pulse to P6 (22) and the counter stop circuit. Less than 150 microseconds later the hold-off pulse from the counter appears and disables these gates and resets the IC's for the next counting period. Note that the coincidence pulse which enabled the stop circuit through gate IC2D also disabled the start gate IC3C through inverter IC3D and gate IC3A.

4-51. When range switch S1 is placed in the 50 to 200 MHz position, IC4 (C2) is grounded to eliminate the 4P period. The ground is applied to IC2B (12) inverter and its output (11) goes high. This allows period P signal from IC2A to be inverted by IC2C and provides a signal of period P to preset decade A10. Output pulses from IC2C are applied to start-stop gates IC3C and IC2D. Their operation is as previously described in Paragraph 4-51 for the 4P period.

4-52. RESET AMPLIFIER. PNP transistor Q8 is driven at its base with a negative spike from the counter at P6 (44). Q8 base voltage is unclamped from the +4 volt supply by CR3 and gives an output pulse. The output pulse goes to the thumbwheel switches to reset the preset decade assembly at the end of sampling time.

4-53. +4 VOLT POWER SUPPLY. The +13 volt line is dropped to +4 volts by R7 and Q5. Voltage divider R1 and R3 places +2 volts on Q2 base. Voltage divider R12 and R15 places +2 volts on Q3 base when the output voltage is +4 volts. Q2 and Q3 form a differential amplifier which controls the voltage on Q5 base to a level that satisfies these conditions. Changes in output load which would change the +4 volts are cancelled out by a corresponding increase or decrease in conductance of Q3 which adjusts the bias of Q5. This changes the series resistance of the circuit to provide voltage regulation.

4-54. PRESET DECADE ASSEMBLY A10

4-55. Figure 4-5 shows block diagrams for the IC's and an IC decade. The dividers are preset by the thumbwheel "N" switch shown in Figure 4-4. This decade divider is an arrangement of four binary integrated circuit (IC) flip-flops which give an output pulse for every ten input pulses. During its operation a decade divider would ordinarily pass through ten different operating states. A10 preset divider is a modified decade divider which is preset by thumbwheel switches to give a coincident output when it reaches a selected number. The divider logic states of a decade for the thumbwheel settings are shown in Table 4-1.

Figure 4-4. "N" Switch Diagram

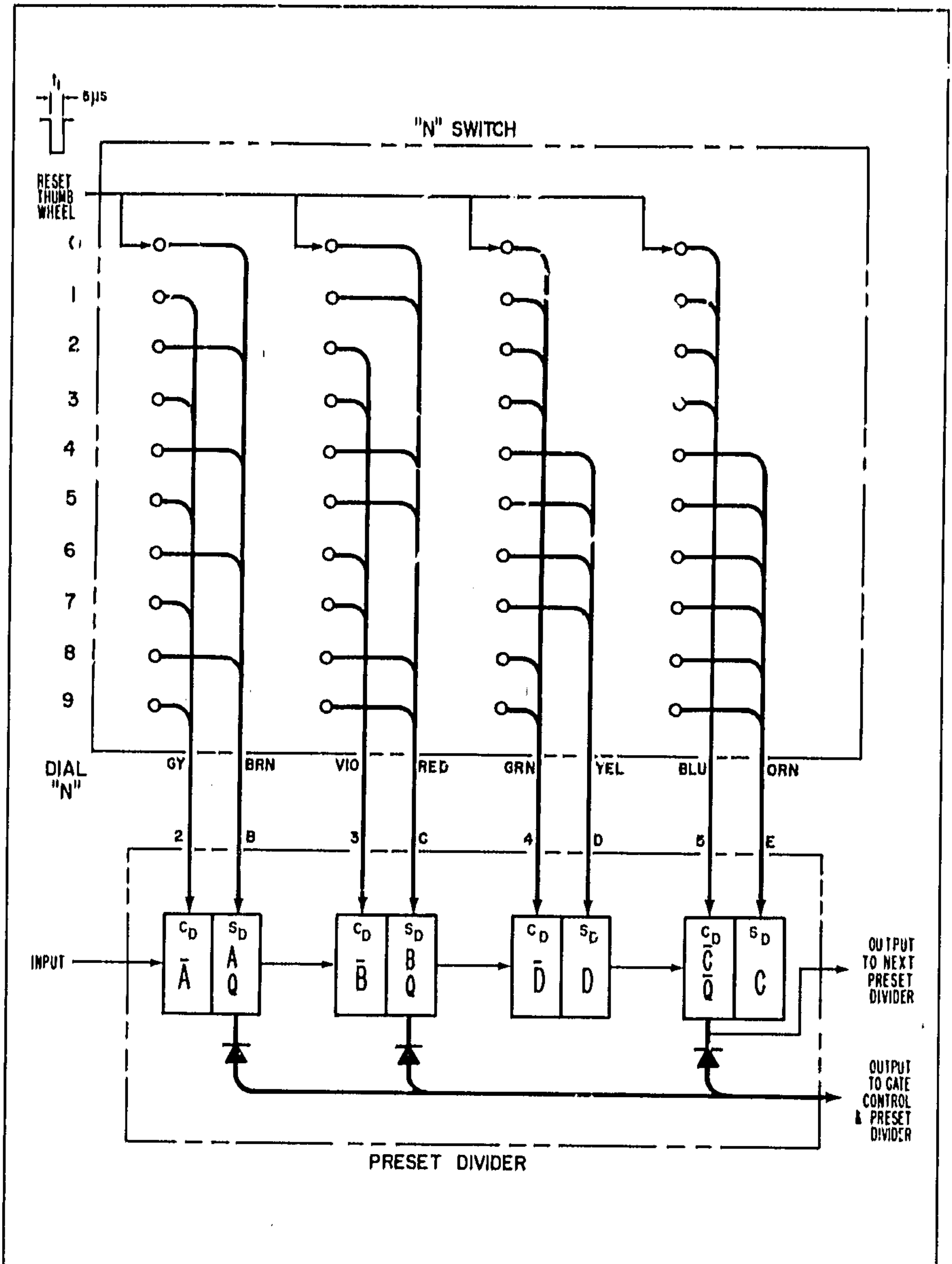


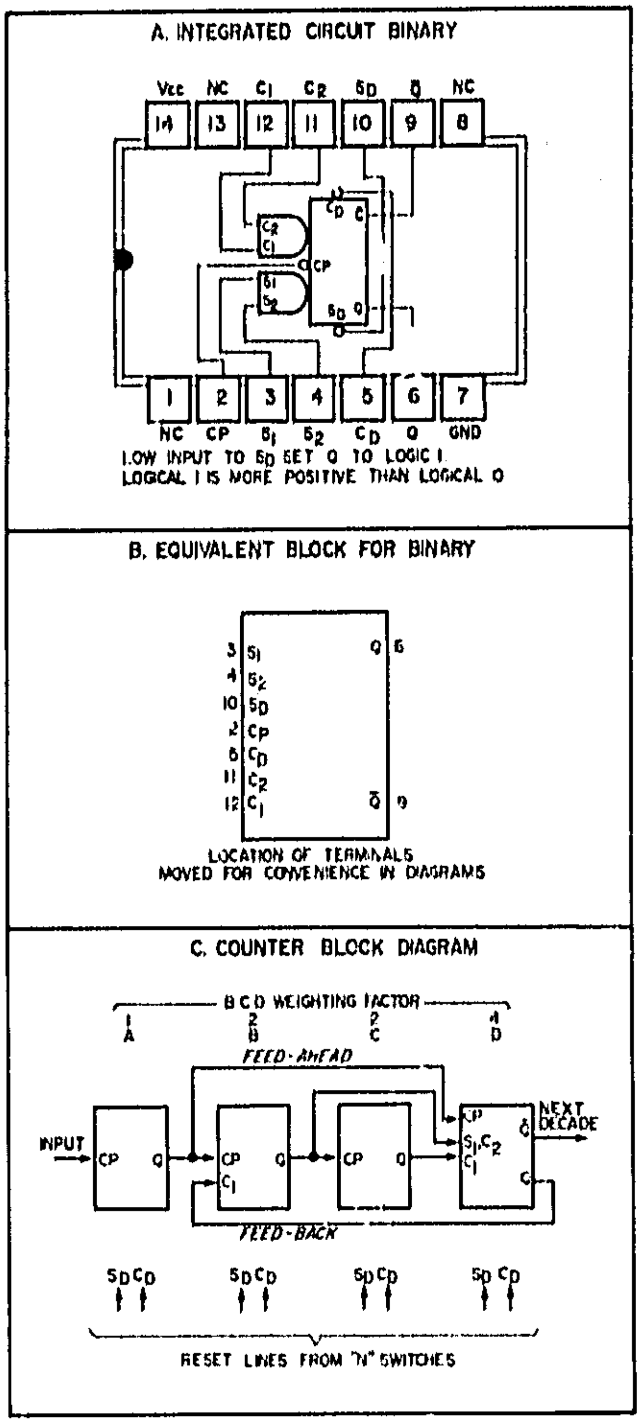
Table 4-1. Truth Table

"N" Switch	A	B	D	C
0	1	1	0	0
1	0	1	0	0
2	1	0	0	0
3	0	0	0	0
4	1	1	1	1
5	0	1	1	1
6	1	0	1	1
7	0	0	[illegible]	1
8	1	1	0	1
9	0	1	0	1

4-56 The logic states of the divider flip-flops are sensed by the diode in the Q or $\bar{Q}$ output lines of the binaries. When all the diodes reach the same potential, or "coincidence" state of the preset divider, this information is passed along to gate extender at A0 (15) as a positive pulse.

4-57. For example, if a coincidence output is desired after four counts, 004 is preset into thumbwheel switches S2 to set the dividers. After four input pulses the divider reaches the full count and a coincidence pulse results. If a coincidence pulse is desired after 11 counts, the thumbwheels are set to read 011. After one input pulse the first preset divider is in its coincidence state, but there is no coincidence pulse at this time because the second preset divider has a count preset into it and is out of coincidence. The first preset divider must count 10 more pulses before a pulse will be sent to the second preset divider. The 10th input pulse sends a carry pulse to the second preset divider and brings it to coincidence state. The 11th pulse brings the first divider back to coincidence state and the output line to A0 goes high because all binary outputs are at coincidence. This action generates the coincidence gating pulse in A0 gate extender assembly.

Figure 4-5. Preset Divider



MAINTENANCE

TROUBLE-SHOOTING

SECTION V

MAINTENANCE AND TROUBLESHOOTING

5-1. INTRODUCTION

5-2. This section gives maintenance, adjustment, and troubleshooting information for the Model 5257A Transfer Oscillator.

5-3. ASSEMBLY CONNECTION AND IDENTIFICATION

5-4. Throughout the manual, connections to printed circuit assemblies are referred to in abbreviated form. For example, the connection to pin 12 of assembly A4 is A4(12).

5-5. ASSEMBLY DESIGNATIONS

5-6. A list of assemblies is given in Table 5-1.

5-7. RECOMMENDED TEST EQUIPMENT

5-8. Recommended test equipment is listed in Table 5-2. Test instruments other than those listed may be used if their specifications equal the required characteristics.

5-9. IN-CABINET PERFORMANCE CHECK

5-10. An in-cabinet performance check is given in Table 5-3.

Table 5-1. Assembly Designations

Assembly Number and Description		HP Part No.
A1	Pulse Driver	05257-60008
A2	Stripline Pulse Generator	05257-60211
A3	Sampler Attenuator	1901-0573 05255-6031
A4	APC No. 1	05257-60038
A5	Regulator & Pulsed RF	05257-60007
A6	APC No. 2	05257-60006
A7 A7A1 A7A2 A7A3	Var. Freq. Oscillator VFO Linearizer VFO Control VFO	05257-60044 05257-60004 05257-60012 05257-60003
A8	Prescaler and Inhibit	05257-60039
A9	Gate Time Extender	05257-60002
A10	Preset Decade	05257-60001
A11	Power Supply	05257-60031
A12	Master Interconnector	05257-60032
A13	Thumbwheel Cable	05257-60033

5-11. TROUBLESHOOTING

5-12. Troubleshooting aids are given in Paragraphs 5-15 through 5-37.

5-13. GEAR TRAIN REMOVAL AND REPLACEMENT

5-14. Instructions on gear train removal and replacement are given in Paragraphs 5-38 through 5-43.

5-15. TROUBLESHOOTING AIDS

5-16. If instrument is not operating properly refer to troubleshooting chart Table 5-4 and perform the following checks as necessary. Also refer to schematic diagrams and waveforms given in Section VIII. Use extender to make waveform and voltage checks on circuit boards that plug in to 12 and 15 pin connectors.

5-17. Gate Extender Check

5-18. A7 VFO assembly and A8 prescaler assembly must be operating to complete this test.

a. Set Counter controls as follows:

SENSITIVITY . . . . PLUG-IN
TIME BASE . . . . 0.1 ms
FUNCTION . . . . FREQUENCY

b. Set 5257A controls as follows:

FREQUENCY . . . . 100 MHz
MODE . . . . PULSED RF
thumbwheels 001
RANGE . . . any range above .05-.2 GHz

5-19. With controls set as in 5-18a and b, adjust thumbwheels from 001 to 009 (001, 002, etc.). Counter should read 100 MHz to 900 MHz in steps of 100 MHz.

a. Adjust thumbwheels from 010 to 090. Counter should read 1000 MHz to 9000 MHz in steps of 1000 MHz.

b. Adjust thumbwheels from 100 to 300. Counter should read 10000 MHz to 30000 MHz in steps of 10000 MHz.

c. Repeat the above steps with the 5257A RANGE switch in the .05 to .2 GHz position. Counter readout should be 1/4 the readings shown above.

5-20. If the readings in the previous test are correct A7 (Q5 and Q6), A7 VFO, A8, A9, A10, and thumbwheels are operating properly.

a. If only some thumbwheel settings are correct, check A10 and wiring to thumbwheels.

b. If the previous check can be made in the .05-.2 GHz range or any range above .05-.2 GHz but not in all ranges, check A9.

c. If there is no readout, check to see that Gate light is cycling.

d. If Gate light is cycling it is a good indication that A9 and A10 are operating. Make sampling test to determine that VFO is operating.

e. If Gate light is not cycling, A9, A10, or Counter is defective. Suggested checks for Counter are: 1) self check, 2) sensitivity check and adjustment if necessary, 3) 50 MHz response check, and 4) check power supply voltages with 5257A plugged in.

5-21. Sampling Check

5-22. This check is made by observing the output of the PULSED RF OUT connector on the front panel with an oscilloscope.

a. Set 5257A controls as follows:
LEVEL ADJ . . . . clockwise
MODE . . . . APC

b. Observe the 1 kHz inhibit signal. A level of 400 to 500 mV peak-to-peak indicates correct sampling. If the level is 5 to 6 V peak-to-peak no sampling is

Table 5-2. Recommended Test Equipment

Instrument	Characteristics	Recommended Type
Oscilloscope	50 MHz bandwidth with external sync capability	HP 180A with 1801A and 1825A plug-ins
Divider Probe	10:1, 10 pF dc to 50 MHz	HP 10004A
RF Millivoltmeter	Voltage Range: 10 mV to 10 V rms Frequency Range: 500 kHz to 1 GHz	HP 411A
DC VTVM	Range: 1 mV to 1 kV; Impedance: 200 Megohms	HP 412A
Power Meter	Range: 10 μW to 10 mW	HP 431C
Thermistor Mounts	Frequency Range: 12.4 to 18 GHz; Max SWR: 1.5:1	HP P486A
VHF Signal Generator	Range: 10 MHz to 480 MHz	HP 608C/D/E/F
UHF Signal Generator	Range: .8 GHz to 2.1 GHz	HP 614A
SHF Signal Generator	Range: 7 GHz to 11 GHz, capable of pulsed output Pulse Rate: 400 sec; Pulse Width: .5 μs to 10 μs	HP 620B
Electronic Counter	Range: dc to 50 MHz (serial no. 402 or above)	HP 5245L
Cable	BNC connectors on both ends 48 inches long	HP 10503A
Extender Cable	50 Pin male to 50 Pin female	HP 10506B
Cable	Type N male connector on both ends 6 feet long	HP 11500A
BNC "T"		HP 1250-0781
Adapter	Waveguide to APC-7 female	HP P281B
Adapter	BNC female to Type N	HP 1250-0780
SHF Signal Generator	Range: 15 to 21 GHz	HP 628A
UHF Signal Generator	Range: 1.8 to 4.2 GHz	HP 616B
Adapter	APC-7 male to Type N male	HP 1250-0749
Coupler	3 dB Directional coupler P band	HP P752A
Waveguide	Flexable waveguide P band	HP 11503A
Extender Board	15 Pin male to 15 Pin female	HP 5060-0049
Extender Board	12 Pin male to 12 Pin female	HP 5060-0092

taking place. Possible causes are: 1) A2CR1 open, 2) shorted stripline. See waveforms and notes on assembly A1 and A2 in Section VIII. Sampling and non-sampling waveforms for A5 are found in Section VIII.

c. There will be no signal present if A3CR1 is open.

d. If 1 kHz osc. is bad (on A4) this test will not work.

The above test has checked the following assemblies and components: A3 attenuator, A4Q11, Q5, and A6. A7Q5 and Q7, A8Q8 were checked in .05-.2 GHz range only.

5-23. PRF With Fx Input Check

5-24. This test requires an input of 0 dBm. Adjust FREQUENCY control and set LEVEL control for 9/10 full scale on meter. Set RANGE switch to appropriate range for input frequency used. Set thumbwheels to 001 and observe zero beat on oscilloscope. If no meter reading is obtained with zero beat on oscilloscope, A5 and meter should be checked.

5-25. If there is no indication on meter or oscilloscope Fx is not getting through. With an HP 412A measure the resistance from the center of the INPUT connector to ground. It should be 50Ω ±2Ω. An incorrect reading here indicates a sampler or attenuator problem and a factory repair will be required.

5-26. APC With Fx Input Check

5-27. In the APC mode all circuits in the 5257A are being used except A5 peak holding circuit.

5-28. Set LEVEL control clockwise with no input signal. Check to see that meter is at midscale. If meter is not at midscale adjust A4R10 (refer to APC adjustment Page 5-4). Apply input signal and adjust LEVEL control for 9/10 full scale on meter. Set MODE to APC, select the appropriate range for input frequency used and set FREQUENCY for lock. If phase lock cannot be obtained check A4 and A6.

5-29. A1 and A2 Check

5-30. If there is no sampling, check A1 and A2. Remove side cover for access to these assemblies. Refer to Section VIII for waveforms. This is a critical area and is often the cause of no sampling. Obtain sampling before continuing tests. Remember that a shorted stripline cannot be detected by a waveform. An open step recovery diode can be found and replaced. Note that the diode is spring loaded and the sliding contact over the spring is cut to fit. Do not exert too much pressure on plastic screw as diode may crack. Apply just enough to obtain the desired waveform. Do not attempt to solder or unsolder parts on A2.

5-31. Input Resistance Check

5-32. Check the resistance from the center of the INPUT connector to ground. This should be 50Ω ±2Ω. See A3CR1 and CR2 check Paragraph 5-33.

5-33. A3CR1 and A3CR2 Check

CAUTION

The sampler diodes can be damaged by either 0.2 erg (static discharge or leakage current) or 5 volts reverse-bias.

5-34. To prevent damage to diodes when working in the sampler circuits:

a. Ground probes before making measurements.

b. Avoid strong RF fields. A cable attached to the INPUT connector or diodes may act as an antenna, and pick up enough RF energy to damage the diodes.

c. Avoid static discharges through the diodes. Touch 5257A casing before touching diodes.

d. To prevent leakage currents that might damage the diodes, unplug soldering iron before working in this part on the circuit.

5-35. Remove the 5257A from the counter and be sure no leads are connected to it. Remove A4 from its connector to expose the two white leads connected to A4R1 and A4R2 (see A4 schematic). Unsolder one of these white leads. Using an HP 412A on the 10K range, measure from the center conductor of the INPUT connector to one of the white leads. Reverse ohmmeter leads and repeat. Perform same procedure for the other white lead. A ratio of infinity to 10KΩ is normal.

5-36. Sensitivity Check

5-37. Refer to performance check, Table 5-3.

5-38. GEAR TRAIN

CAUTION

Gear train alignment is critical. Individual gear replacement or adjustment is not recommended. The gear train should be replaced as a complete unit (HP Part No. 05257-60019).

5-39. Removal

a. Remove "fine adj" FREQUENCY knob and the retainer ring behind it.

b. Remove screws holding side brackets to front panel.

c. Remove the two screws holding the side brackets to the plug-in guide.

d. Remove right rear side bracket.

e. Disconnect Winchester connector (P3-J3) from VFO housing.

f. Remove the four screws holding the VFO housing to the main housing.

Table 5-3. In-Cabinet Performance Check

FREQUENCY DIAL CHECK

1. With Counter OFF connect 5257A to Counter plug-in compartment using 10506B cable.

2. Turn Counter ON and set controls on Counter as follows:

SENSITIVITY	PLUG IN
TIME BASE	0.1 ms
FUNCTION	FREQUENCY

3. Set controls on 5257A as follows:

thumbwheels	001
MODE	PULSED RF
RANGE	.2-1 GHz
FREQUENCY	100 MHz

4. Counter should read approximately 100.00 MHz.

COUNTER GATE EXTENSION

1. With controls set as above adjust thumbwheels from 001 to 009 (001, 002, etc.).

2. Counter should read 100 MHz to 900 MHz in steps of 100 MHz.

3. Adjust thumbwheels from 010 to 090.

4. Counter should read 1000 MHz to 9000 MHz in steps of 1000 MHz.

5. Adjust thumbwheels from 100 to 300.

6. Counter should read 10000 MHz to 30000 MHz in steps of 10000 MHz.

APC ADJUSTMENT

Set 5257A MODE to APC and LEVEL ADJ fully clockwise. The 5257A meter should read center scale. If meter reading is incorrect turn Counter off and remove 5257A from plug-in compartment. Connect 10506B extender cable to 5257A and jack in Counter plug-in compartment. Turn Counter on. With 5257A controls set as above, adjust front-panel APC BAL control for center reading on meter. Turn Counter off and remove extender cable. Plug 5257A into Counter and turn Counter on. Set FREQUENCY MHz dial to 100 and allow 10 min. warmup.

50 MHz CHECK

1. Connect Signal Generator and RF Millivoltmeter to 5257A INPUT through BNC "T" and BNC female to type N adapter.

2. Connect Oscilloscope to 5257A PULSED RF OUT.

3. Set Oscilloscope to 0.1 V/cm (vertical) and 1 ms/cm (horizontal).

4. Set 5257A controls as follows:

thumbwheels	001
MODE	APC
RANGE	.05-.2 GHz

5. Set Signal Generator output to 50 MHz at -50 dBm and adjust 5257A LEVEL ADJ for 0.35 V peak-to-peak (1 kHz) on Oscilloscope.

6. Set 5257A MODE to PULSED RF and increase Signal Generator output to -25 dBm.

PERFORMANCE CHECK TEST CARD

Hewlett-Packard Model 5257A Transfer Oscillator Serial No. ____ - ________	Tests Performed By ______________
DESCRIPTION	**CHECK**
First Check	Date ______________
FREQUENCY Dial Check	Counter reads 100 MHz ☐
Counter Gate Extension	OK ☐
50 MHz Check	Meter reads 9/10 with -7 dBm input ☐
200 MHz Check	Meter reads 9/10 with -7 dBm input ☐
1 GHz Check	Meter reads 9/10 with -7 dBm input ☐
4 GHz Check	Meter reads 9/10 with -7 dBm input ☐
8 GHz Check	Meter reads 9/10 with -7 dBm input ☐
Pulsed Carrier Check	Meter reads 5/10 with .5 μs pulse ☐
15 GHz Check	Meter reads 9/10 with -4 dBm input ☐
18 GHz Check	Meter reads 9/10 with -4 dBm input ☐
Oscillator Stability Check	Deviation less than 2 kHz in 3 minutes ☐
Second Check	Date ______________
FREQUENCY Dial Check	Counter reads 100 MHz ☐
Counter Gate Extension	OK ☐
50 MHz Check	Meter reads 9/10 with -7 dBm input ☐
200 MHz Check	Meter reads 9/10 with -7 dBm input ☐
1 GHz Check	Meter reads 9/10 with -7 dBm input ☐
4 GHz Check	Meter reads 9/10 with -7 dBm input ☐
8 GHz Check	Meter reads 9/10 with -7 dBm input ☐
Pulsed Carrier Check	Meter reads 5/10 with .5 μs pulse ☐
15 GHz Check	Meter reads 9/10 with -4 dBm input ☐
18 GHz Check	Meter reads 9/10 with -4 dBm input ☐
Oscillator Stability Check	Deviation less than 2 kHz in 3 minutes ☐

PERFORMANCE CHECK TEST CARD

DESCRIPTION	CHECK	
Third Check	Date ______________	
FREQUENCY Dial Check	Counter reads 100 MHz	☐
Counter Gate Extension	OK	☐
50 MHz Check	Meter reads 9/10 with -7 dBm input	☐
200 MHz Check	Meter reads 9/10 with -7 dBm input	☐
1 GHz Check	Meter reads 9/10 with -7 dBm input	☐
4 GHz Check	Meter reads 9/10 with -7 dBm input	☐
8 GHz Check	Meter reads 9/10 with -7 dBm input	☐
Pulsed Carrier Check	Meter reads 5/10 with .5 μs pulse	☐
15 GHz Check	Meter reads 9/10 with -4 dBm input	☐
18 GHz Check	Meter reads 9/10 with -4 dBm input	☐
Oscillator Stability Check	Deviation less than 2 kHz in 3 minutes	☐
Fourth Check	Date ______________	
FREQUENCY Dial Check	Counter reads 100 MHz	☐
Counter Gate Extension	OK	☐
50 MHz Check	Meter reads 9/10 with -7 dBm input	☐
200 MHz Check	Meter reads 9/10 with -7 dBm input	☐
1 GHz Check	Meter reads 9/10 with -7 dBm input	☐
4 GHz Check	Meter reads 9/10 with -7 dBm input	☐
8 GHz Check	Meter reads 9/10 with -7 dBm input	☐
Pulsed Carrier Check	Meter reads 5/10 with .5 μs pulse	☐
15 GHz Check	Meter reads 9/10 with -4 dBm input	☐
18 GHz Check	Meter reads 9/10 with -4 dBm input	☐
Oscillator Stability Check	Deviation less than 2 kHz in 3 minutes	☐

Table 5-3. In-Cabinet Performance Check Cont'd.

50 MHz CHECK Cont'd.

7. Adjust 5257A FREQUENCY for maximum meter deflection with Counter reading close to 16.7 MHz.
8. Adjust Signal Generator output for 9/10 full scale on 5257A meter.
9. RF Millivoltmeter should read -7 dBm or less.
10. Set 5257A MODE to APC and adjust FREQUENCY for phase lock (observe zero beat on Oscilloscope).

200 MHz CHECK

1. Set Signal Generator to 200 MHz at -50 dBm.
2. Adjust 5257A LEVEL ADJ for 0.35 V peak-to-peak on Oscilloscope.
3. Set 5257A MODE to PULSED RF and increase Signal Generator output to -25 dBm.
4. Adjust 5257A FREQUENCY for maximum meter deflection with Counter reading close to 33.3 MHz.
5. Adjust Signal Generator output for 9/10 full scale on 5257A meter.
6. RF Millivoltmeter should read -7 dBm or less.
7. Set 5257A MODE to APC and adjust FREQUENCY for phase lock (observe zero beat on Oscilloscope).

1 GHz CHECK

1. Remove RF Millivoltmeter and coaxial adapters used in the preceding steps and connect Signal Generator directly to 5257A INPUT.
2. Set Signal Generator output to 1 GHz at -25 dBm.
3. Set 5257A RANGE to .2-1 GHz and adjust LEVEL ADJ for 0.35 V peak-to-peak on Oscilloscope.
4. Set 5257A MODE to PULSED RF and adjust FREQUENCY for maximum deflection with Counter reading close to 71.5 MHz.
5. Adjust Signal Generator output for 9/10 full scale on 5257A meter.
6. Signal Generator output should be -7 dBm or less.
7. Set 5257A MODE to APC and adjust FREQUENCY for phase lock (observe zero beat on Oscilloscope).

4 GHz CHECK

1. Set Signal Generator output to 4 GHz at -25 dBm.
2. Set 5257A RANGE to 1-4 GHz and adjust LEVEL ADJ for 0.35 V peak-to-peak on Oscilloscope.
3. Set 5257A MODE to PULSED RF and adjust FREQUENCY for maximum meter deflection with Counter reading close to 70 MHz.

Table 5-3. In-Cabinet Performance Check Cont'd.

4 GHz CHECK Cont'd.

4. Adjust Signal Generator output for 9/10 full scale on 5257A meter.
5. Signal Generator output should be -7 dBm or less.
6. Set 5257A MODE to APC and adjust FREQUENCY for phase lock (observe zero beat on Oscilloscope).

8 GHz CHECK

1. Set Signal Generator to 8 GHz at -25 dBm.
2. Set 5257A RANGE to 4-18 GHz and adjust LEVEL ADJ for 0.35 V peak-to-peak on Oscilloscope.
3. Set 5257A MODE to PULSED RF and adjust FREQUENCY for maximum meter deflection with Counter reading close to 68 MHz.
4. Adjust Signal Generator for 9/10 full scale on 5257A meter.
5. Signal Generator output should be -7 dBm or less.
6. Set 5257A MODE to APC and adjust FREQUENCY for phase lock (observe zero beat on Oscilloscope).

PULSED CARRIER CHECK

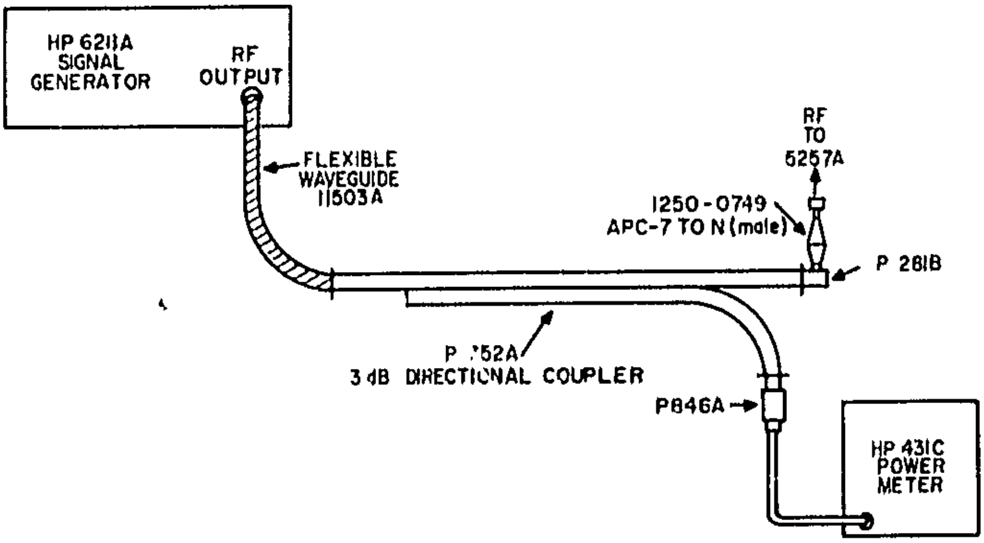
1. Set 5257A MODE to PULSED RF.
2. Adjust Signal Generator output for pulsed RF output as follows: pulse width 10 μs and rate 400/sec.
3. Adjust 5257A FREQUENCY for zero beat on Oscilloscope.
4. Adjust 5257A LEVEL ADJ for 9/10 full scale on 5257A meter.
5. Set Signal Generator pulse width to 0.5 μs.
6. 5257A meter should still read 5/10 full scale or more.

15 GHz CHECK

1. Connect 15 GHz at -16 dBm and Power Meter to 5257A INPUT as shown in Figure 5-1.
2. Set 5257A MODE to APC and adjust LEVEL ADJ for 0.35 V peak-to-peak on Oscilloscope.
3. Set 5257A MODE to PULSED RF and adjust FREQUENCY for maximum meter deflection with Counter reading close to 68 MHz.
4. Adjust Signal Generator for 9/10 full scale on 5257A meter.
5. Power Meter should read -4 dBm or less.
6. Set 5257A MODE to APC and adjust FREQUENCY for phase lock (observe zero beat on Oscilloscope).

Table 5-3. In-Cabinet Performance Check Cont'd.

Figure 5-1. 15-18 GHz Check



18 GHz CHECK

1. With test equipment connected as above, set Signal Generator frequency to 18 GHz at -16 dBm.
2. Adjust LEVEL ADJ for 0.35 V peak-to-peak on Oscilloscope.
3. Set 5257A MODE to PULSED RF and adjust FREQUENCY for maximum meter deflection with Counter reading close to 125 MHz.
4. Adjust Signal Generator output for 9/10 full scale on 5257A meter.
5. Power Meter should read -4 dBm or less.
6. Set 5257A MODE to APC and adjust FREQUENCY for phase lock (observe zero beat on Oscilloscope).

OSCILLATOR STABILITY

1. Set Counter TIME BASE to .1 sec.
2. Set 5257A MODE to PULSED RF and adjust FREQUENCY for 100 MHz.
3. Record Counter readings at intervals of one minute for three minutes.
4. Frequency change should not be greater than ±2 kHz.
5. Temperature should be constant at a value between 0° and +55°C.

Figure 5-2. Top, Bottom, and Side Internal Views

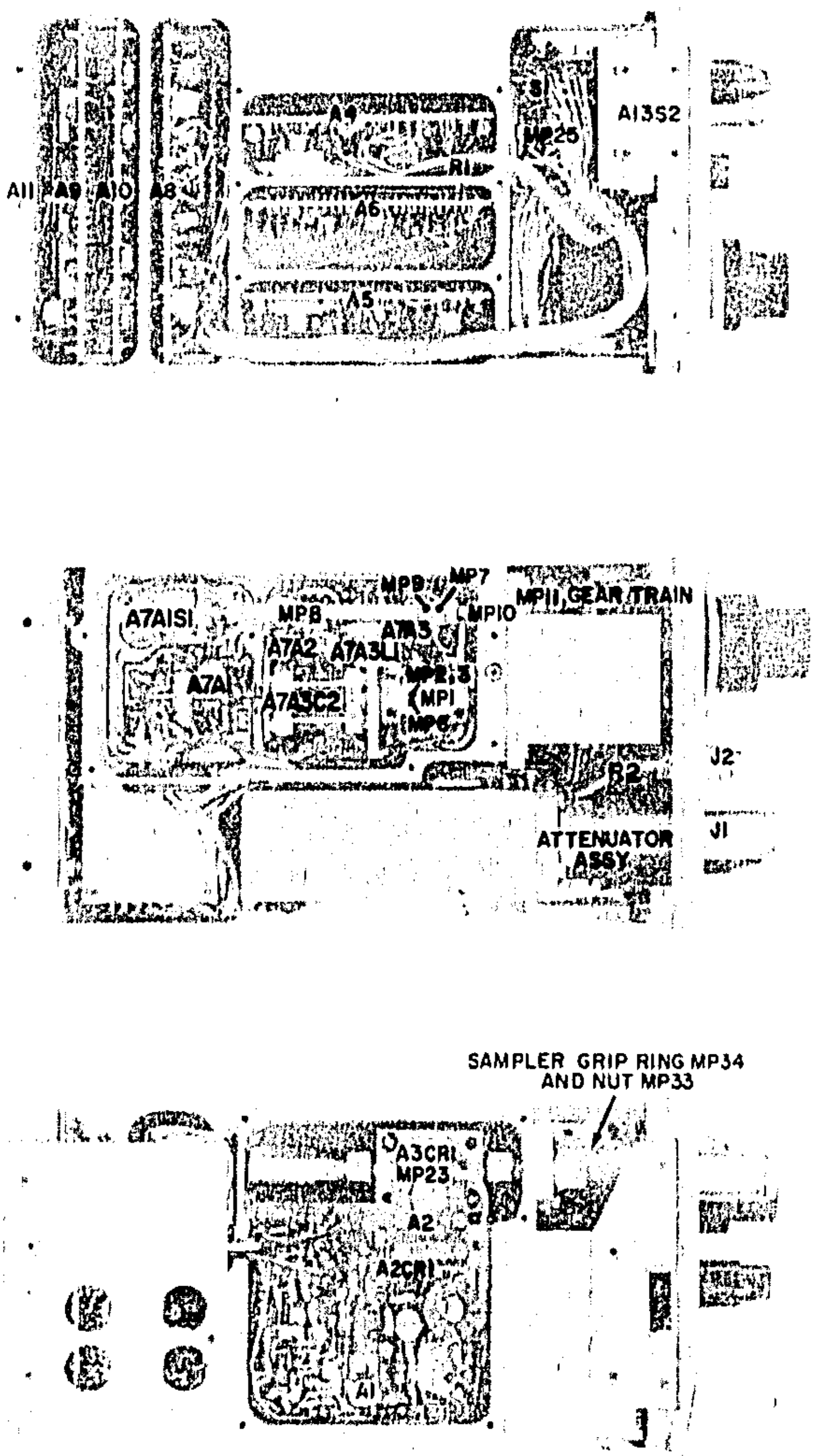
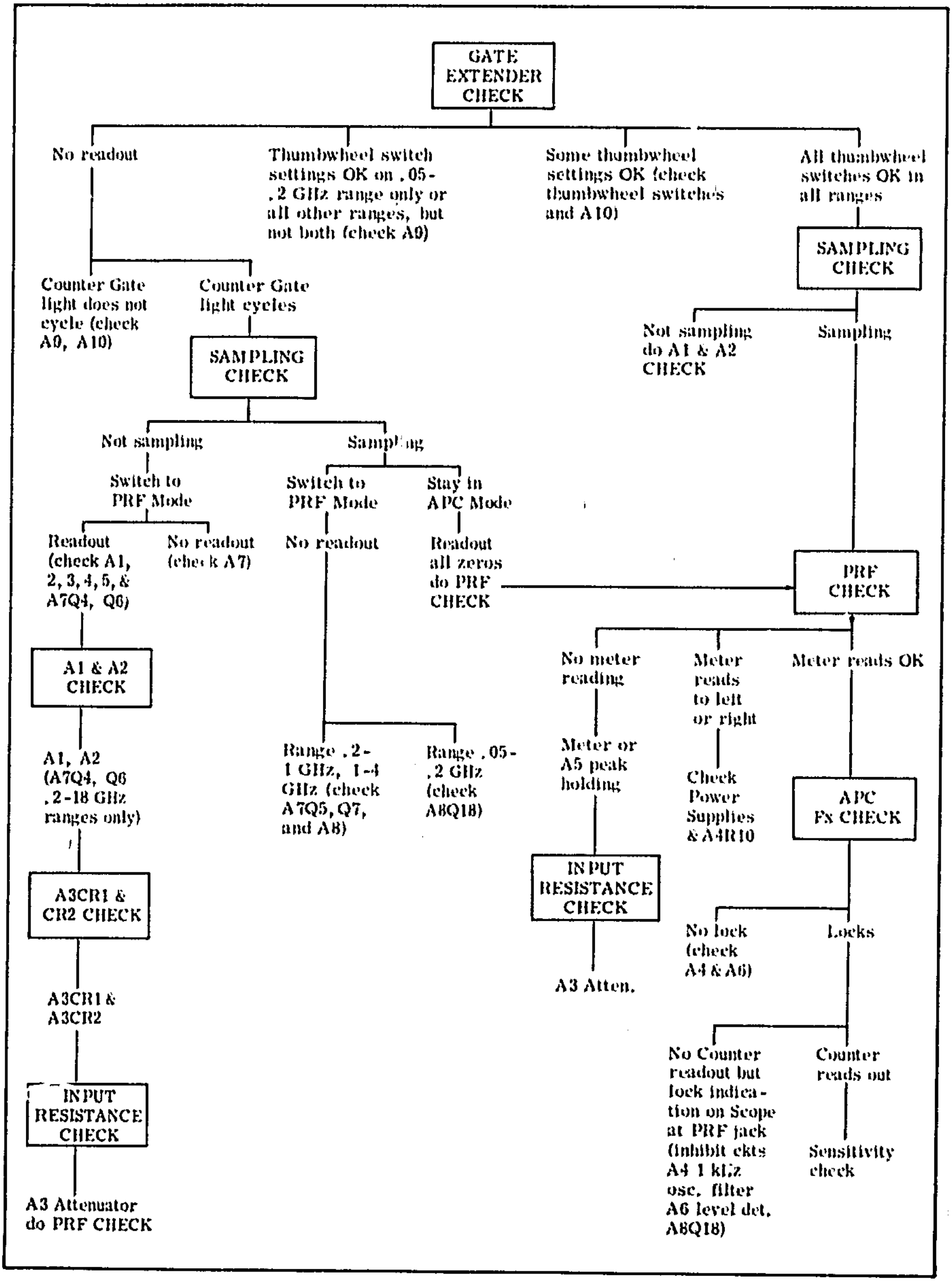


Table 5-4. Troubleshooting Chart



g. Set instrument up-side down on bench and carefully pull front panel out far enough to free VFO tuning drive shaft from the panel.

h. Carefully position plastic plug-in guide to allow removal of VFO gear train. Do not bend out plug-in guide more than absolutely necessary as cables connected to the power supply filter board can be broken easily.

i. Carefully lift out the VFO gear train by lifting gear train end far enough for rear protion of the assembly to clear that part of the main housing containing the sampler.

CAUTION

When removing this assembly be careful not to bump housing against sampler diode protruding through side of main housing. Also do not scrape gears against any portion of main housing.

j. After the gear train is removed set it down in such a way as to prevent any damage to gear teeth.

5-40. Gear Train Replacement

5-41. Reverse disassembly procedure after doing the following:

a. Check main housing wiring for shorts, broken wires, etc. Make sure cables are dressed properly so they will not be pinched during assembly.

b. Install paper insulators over exposed main housing connector. Make sure paper stays in place when installing gear train.

5-42. During assembly, while fitting front panel over gear train, check that LEVEL ADJ shaft is correctly inserted in hole on main casting. Also make sure gears on gear train clear the gears on main housing.

5-43. After assembly, the FREQUENCY dial will have to be repositioned for correct reading. Refer to FREQUENCY dial check Table 5-3.

PARTS LIST

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replacement parts. Table 6-1 lists parts in alpha-numerical order of their reference designators and indicates the description and HP part number of each part, together with any applicable notes. Table 6-2 lists parts in alpha-numerical order of their HP part number and provides the following information on each part.

a. Description of the part (see list of abbreviations below).

b. Typical manufacturer of the part in a five-digit code; see list of manufacturers in Table 6-3.

c. Manufacturer's part number.

d. Total quantity used in the instrument (TQ column).

6-3. Miscellaneous parts are listed at the end of Table 6-1.

6-4. ORDERING INFORMATION

6-5. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Sales and Service office (see lists at rear of this manual for addresses). Identify parts by their Hewlett-Packard part numbers.

6-6. To obtain a part that is not listed, include:

a. Instrument model number.

b. Instrument serial number.

c. Description of the part.

d. Function and location of the part.

REFERENCE DESIGNATORS

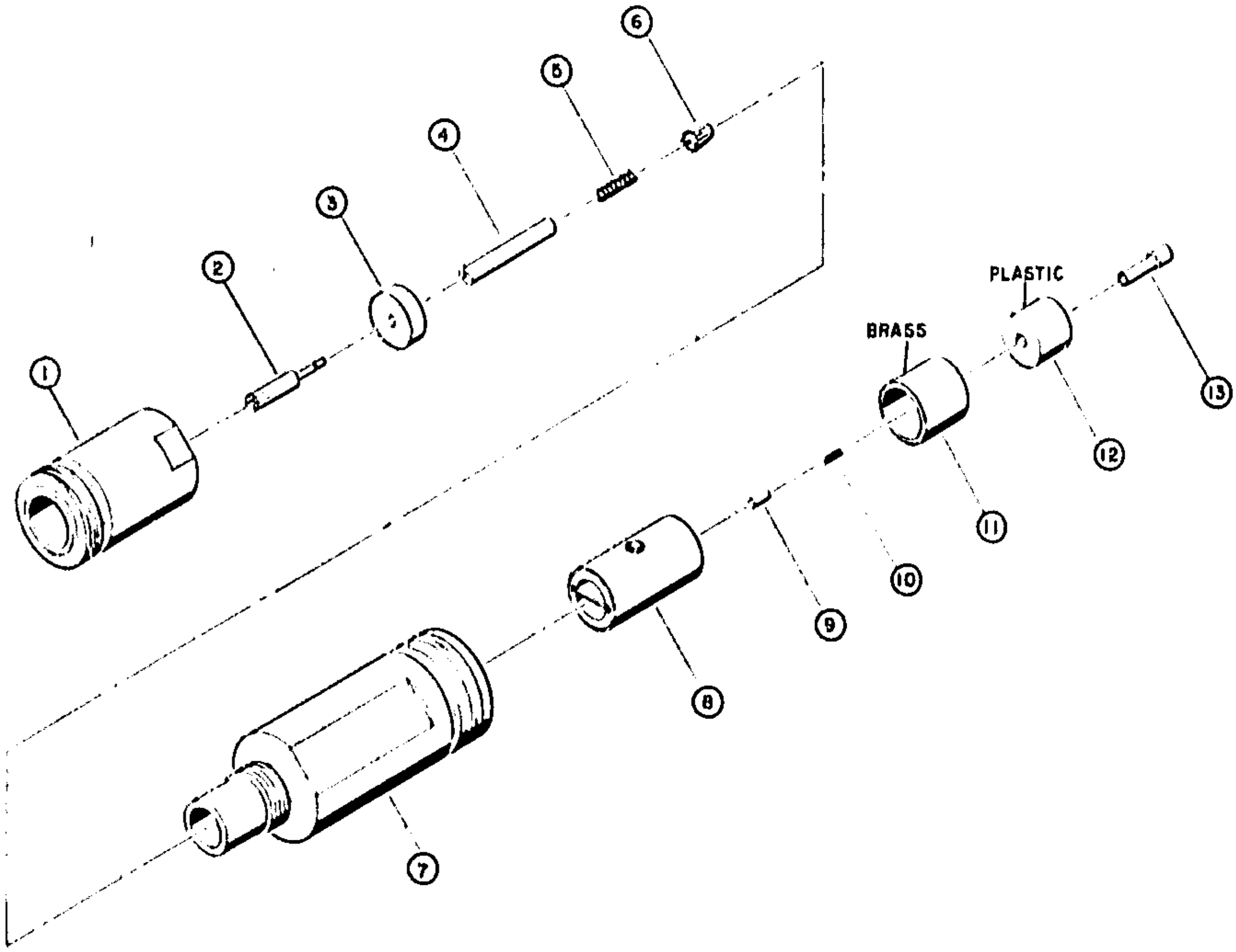
A	= assembly
B	= motor
BT	= battery
C	= capacitor
CP	= coupler
CR	= diode
DL	= delay line
DS	= device signaling (lamp)
E	= misc electronic part
F	= fuse
FL	= filter
IC	= integrated circuit
J	= jack
K	= relay
L	= inductor
LS	= loud speaker
M	= meter
MK	= microphone
MP	= mechanical part
P	= plug
Q	= transistor
R	= resistor
RT	= thermistor
S	= switch
T	= transformer
TB	= terminal board
TP	= test point
V	= vacuum, tube, neon bulb, photocell, etc.
VR	= voltage regulator
W	= cable
X	= socket
Y	= crystal
Z	= tuned cavity, network

ABBREVIATIONS

A	= amperes
AFC	= automatic frequency control
AMPL	= amplifier
BFO	= beat frequency oscillator
BE CU	= beryllium copper
BH	= binder head
BP	= bandpass
BRS	= brass
BWO	= backward wave oscillator
CCW	= counter-clockwise
CER	= ceramic
CMO	= cabinet mount only
COEF	= coefficient
COM	= common
COMP	= composition
COMPL	= complete
CONN	= connector
CP	= cadmium plate
CRT	= cathode-ray tube
CW	= clockwise
DEPC	= deposited carbon
DR	= drive
ELECT	= electrolytic
ENCAP	= encapsulated
EXT	= external
F	= farads
FH	= flat head
FIL H	= fillister head
FXD	= fixed
G	= giga (10^9)
GE	= germanium
GL	= glass
GRD	= ground(ed)
H	= henries
HDW	= hardware
HEX	= hexagonal
HG	= mercury
HR	= hour(s)
HZ	= hertz
IF	= intermediate freq
IMPG	= impregnated
INCD	= incandescent
INCL	= include(s)
INS	= insulation(ed)
INT	= internal
K	= kilo = 1000
LH	= left hand
LIN	= linear taper
LK WASH	= lock washer
LOG	= logarithmic taper
LPF	= low pass filter
M	= milli = 10^{-3}
MEG	= meg = 10^6
MET FLM	= metal film
MET OX	= metallic oxide
MFR	= manufacturer
MHZ	= mega hertz
MINAT	= miniature
MOM	= momentary
MTG	= mounting
MY	= "mylar"
N	= nano (10^{-9})
N/C	= normally closed
NE	= neon
NI PL	= nickel plate
N/O	= normally open
NPO	= negative positive zero (zero temperature coefficient)
NPN	= negative-positive-negative
NRFR	= not recommended for field replacement
NSR	= not separately replaceable
OBD	= order by description
OH	= oval head
OX	= oxide
P	= peak
PC	= printed circuit
PF	= picofarads = 10^{-12} farads
PH BRZ	= phosphor bronze
PHL	= Phillips
PIV	= peak inverse voltage
PNP	= positive-negative-positive
P/O	= part of
POLY	= polystyrene
PORC	= porcelain
POS	= position(s)
POT	= potentiometer
PP	= peak-to-peak
PT	= point
PWV	= peak working voltage
RECT	= rectifier
RF	= radio frequency
RH	= round head or right hand
RMO	= rack mount only
RMS	= root-mean square
RWV	= reverse working voltage
S-B	= slow-blow
SCR	= screw
SE	= selenium
SECT	= section(s)
SEMICON	= semiconductor
SI	= silicon
SIL	= silver
SL	= slide
SPG	= spring
SPL	= special
SST	= stainless steel
SR	= split ring
STL	= steel
TA	= tantalum
TD	= time delay
TGL	= toggle
THD	= thread
TI	= titanium
TOL	= tolerance
TRIM	= trimmer
TWT	= traveling wave tube
U	= micro = 10^{-6}
VAR	= variable
VDCW	= dc working volts
W/	= with
W	= watts
WIV	= working inverse voltage
WW	= wirewound
W/O	= without

01194-13

Figure 6-1. 5257A Input Connector and Attenuator



"N" (Standard)	APC-7 (Option 001)	"N" (Standard)	APC-7 (Option 001)
1. BODY - RF CONNECTOR 1250-0914	(1250-0816)	8. ATTENUATOR ASSEMBLY 6 db - 05255-6031	←
2. CONTACT - RF CONN. 1250-0915	(1250-0909)	9. CONTACT - SLIDING REAR 05255-2020	←
3. INSULATOR 5040-0306	←	10. SPRING - COMPRESSION 1460-0268	←
4. CENTER CONDUCTOR 05257-20030	←	11. SLEEVE 05257-20055	←
5. SPRING COMPRESSION 1460-0298	←	12. BEAD 08740-2100	←
6. CONTACT - SLIDING 5020-3297	←	13. CENTER CONDUCTOR, REAR - 05257-20061	←
7. HOLDER - PAD 05257-20026	←		

Table 6-1. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	05257-60008	1	BOARD ASSEMBLY, DRIVER	28480	05257-60008
A1C1	0160-2143	24	CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C2	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C3	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C4	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C5	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C6	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C7	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C8	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C9	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C10	0150-0011	2	CAPACITOR-FXD 1.5PF +-20% 500WVDC	55121	TYPE CC
A1C11	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C12	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C13	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C14	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C15	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C16	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C17	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C18	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C19	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C20	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C21			NOT ASSIGNED		
A1C22	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C23	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C24	0160-2143		CAPACITOR-FXD .002UF +80-20% 1000WVDC	28480	0160-2143
A1C25	0150-0021	1	CAPACITOR-FXD 2PF +-5% 500WVDC FACTORY SELECTED PART	55121	TYPE CC
A1CR1	1901-0179	7	DIODE-SWITCHING SI 15V MAX VRM 50MA	28480	1901-0179
A1CR2	1901-0179		DIODE-SWITCHING SI 15V MAX VRM 50MA	28480	1901-0179
A1CR3	1901-0179		DIODE-SWITCHING SI 15V MAX VRM 50MA	28480	1901-0179
A1CR4	1901-0179		DIODE-SWITCHING SI 15V MAX VRM 50MA	28480	1901-0179
A1CR5	1901-0179		DIODE-SWITCHING SI 15V MAX VRM 50MA	28480	1901-0179
A1E1	9170-0029		CORE, MAG, SHIELDING BEAD, .138 OD .047	02114	56-590-65A2/4A
A1L1	9140-0158	2	COIL, FXD, MOLDED RF CHOKE, 1UH 10%	24226	10/101
A1L2	9140-0138	12	COIL, FXD, MOLDED RF CHOKE, 100UH 5%	24226	15/103
A1L3	9140-0138		COIL, FXD, MOLDED RF CHOKE, 100UH 5%	24226	15/103
A1L4	9140-0138		COIL, FXD, MOLDED RF CHOKE, 100UH 5%	24226	15/103
A1L5	9140-0138		COIL, FXD, MOLDED RF CHOKE, 100UH 5%	24226	15/103
A1L6	9140-0158		COIL, FXD, MOLDED RF CHOKE, 1UH 10%	24226	10/101
A1Q1	1854-0236	2	TRANSISTOR NPN 2N3933 SI PD=200MW	04713	2N3933
A1Q2	1854-0236		TRANSISTOR NPN 2N3933 SI PD=200MW	04713	2N3933
A1Q3	1854-0071	1	TRANSISTOR NPN SI PD=200MW FT=750MHZ	28480	1854-0071
A1Q4	1854-0220	1	TRANSISTOR NPN 2N3959 SI PD=400MW	04713	2N3959
A1Q5	1854-0273	2	TRANSISTOR SI NPN	28480	1854-0273
A1Q6	1854-0273		TRANSISTOR SI NPN	28480	1854-0273
	1205-0011	1	HEAT-DISSIPATOR, SGL, TO-5 PKG	28480	1205-0011
A1R1	0757-0395	1	RESISTOR-FXD 51 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-51R0-G
A1R2	0698-3161	2	RESISTOR-FXD 11K 5% .125W CC TUBULAR	01121	BB1135
A1R3	0698-5179	2	RESISTOR-FXD 1.8K 5% .125W CC TUBULAR	01121	BB1825
A1R4	0698-3161		RESISTOR-FXD 11K 5% .125W CC TUBULAR	01121	BB1135
A1R5	0698-5179		RESISTOR-FXD 1.8K 5% .125W CC TUBULAR	01121	BB1825
A1R6	0675-3321	1	RESISTOR-FXD 3.3K 10% .125W CC TUBULAR	01121	BB3321
A1R7	0757-0552	7	RESISTOR-FXD 15K 2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A1R8	0757-0545	3	RESISTOR-FXD 7.5K 2% .125W F TUBULAR	24546	C4-1/8-T0-7501-G
A1R9	0757-0956	1	RESISTOR-FXD 82 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-82R0-G
A1R10	0698-1242	2	RESISTOR-FXD 1.2K 5% .125W CC TUBULAR	01121	BB1225
A1R11	0757-0940	5	RESISTOR-FXD 1.2K 2% .125W F TUBULAR	24546	C4-1/8-T0-1201-G
A1R12	0757-0914	4	RESISTOR-FXD 390 OHM 2% .125W F	24546	C4-1/8-T0-391-G
A1R13	0698-1242		RESISTOR-FXD 1.2K 5% .125W CC TUBULAR	01121	BB1225
A1R14	0757-0915	2	RESISTOR-FXD 430 OHM 2% .125W F	24546	C4-1/8-T0-431-G
A1R15	0698-5997	1	RESISTOR-FXD 12K 5% .125W CC TUBULAR	01121	BB1235
A1R16	0698-5993	1	RESISTOR-FXD 8.2K 5% .125W CC TUBULAR	01121	BB8225
A1R17	0757-0855	1	RESISTOR-FXD 62 OHM 2% .125W F TUBULAR FACTORY SELECTED PART	24546	C4-1/8-T0-62R0-G
A1R18	0757-0915		RESISTOR-FXD 430 OHM 2% .125W F	24546	C4-1/8-T0-431-G
A1R19	0757-0917	5	RESISTOR-FXD 510 OHM 2% .125W F	24546	C4-1/8-T0-511-G
A1R20	0757-0337	1	RESISTOR-FXD 432 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-432R-F
A1R21	0757-0917		RESISTOR-FXD 510 OHM 2% .125W F	24546	C4-1/8-T0-511-G
A1R22	0760-0022	2	RESISTOR-FXD 330 OHM 2% 1W MO TUBULAR	FR003	C32
A1R23	0760-0022		RESISTOR-FXD 330 OHM 2% 1W MO TUBULAR	FR003	C32
A1R24	0757-0346	1	RESISTOR-FXD 10 OHM 1% .125W F TUBULAR FACTORY SELECTED PART	24546	C4-1/8-T0-10R0-F

See introduction to this section for ordering information

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1T1	05257-60015	1	TRANSFORMER ASSY:PULSE DRIVE	28480	05257-60015
A1T2	05257-60014	1	TRANSFORMER ASSY:PULSE DRIVE	28480	05257-60014
A2	05257-60211	1	BOARD ASSY:PULSE GENERATOR	28480	05257-60211
A2C1	0150-0122	1	CAPACITOR:FXD: .0020UF+-20% 500WVDC	28480	0150-0122
A2CR1	1901-0567	1	DIODE: STEP RCVRY	28480	1901-0567
A2R1	0698-5666	1	RESISTOR: FXD: 20 OHMS% .1W AC STRIP	28480	0698-5666
A3	1901-0573	1	SAMPLER ASSY WITH MATCHED DIODES	28480	1901-0573
A3CR1			N S R PART OF A3		
A3CR2			N S R PART OF A3		
A4	05257-60038	1	BOARD ASSY:AFC #1	28480	05257-60038
A4C1	0160-3060	6	CAPACITOR,FXD, .1UF+-20% 25WVDC	28480	0160-3060
A4C2	0160-3060		CAPACITOR,FXD, .1UF+-20% 25WVDC	28480	0160-3060
A4C3	0160-0100	1	CAPACITOR-FXD, 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A4C4	0160-3060		CAPACITOR,FXD, .1UF+-20% 25WVDC	28480	0160-3060
A4C5	0160-0194	3	CAPACITOR:FXD: .015UF+-10% 200WVDC	56289	292P15352
A4C6	0160-0194		CAPACITOR:FXD: .015UF+-10% 200WVDC	56289	292P15352
A4C7	0160-0218	1	CAPACITOR-FXD, .15UF+-10% 35VDC TA	56289	150D154X9035A2
A4C8	0160-0194		CAPACITOR:FXD: .015UF+-10% 200WVDC	56289	292P15352
A4C9	0160-0128	1	CAPACITOR:FXD: 2.2UF+-20% 25WVDC	28480	0160-0128
A4Q1	1854-0071	5	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A4Q2	1855-0020	1	FET:TRIS: DUAL FET N CHANNEL	15818	2N3922
A4Q3	1853-0036	15	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A4Q4	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A4Q5	1854-0215	16	TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A4Q6	1854-0221	6	TRANSISTOR, BIPOL, SI, NPN DUAL	28480	1854-0221
A4Q7	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A4Q8	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A4Q9	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A4Q10	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A4Q11	1854-0221		TRANSISTOR, BIPOL, SI, NPN DUAL	28480	1854-0221
A4Q12	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A4R1	0757-0953	5	RESISTOR: FXD: 16K2% .125W F TUBULAR	24546	C4-1/8-T0-1602-G
A4R2	0757-0953		RESISTOR: FXD: 16K2% .125W F TUBULAR	24546	C4-1/8-T0-1602-G
A4R3	0757-0948	14	RESISTOR: FXD: 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A4R4	0757-0938	6	RESISTOR: FXD: 3.9K2% .125W F TUBULAR	24546	C4-1/8-T0-3901-G
A4R5	0757-0953		RESISTOR: FXD: 16K2% .125W F TUBULAR	24546	C4-1/8-T0-1602-G
A4R6	0757-0927	4	RESISTOR: FXD: 1.3K2% .125W F TUBULAR	24546	C4-1/8-T0-1301-G
A4R7	0757-0952		RESISTOR: FXD: 15K2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A4R8	0757-0940	3	RESISTOR: FXD: 4.7K2% .125W F TUBULAR	24546	C4-1/8-T0-4701-G
A4R9	0757-0975	1	RESISTOR: FXD: 130K2% .125W F TUBULAR	24546	C4-1/8-T0-1302-G
A4R10	0757-0964	2	RESISTOR: FXD: 47K2% .125W F TUBULAR	24546	C4-1/8-T0-4702-G
A4R11	0757-0972	4	RESISTOR: FXD: 100K2% .125W F TUBULAR	24546	C4-1/8-T0-1003-G
A4R12	0698-6081	1	RESISTOR: FXD: 9.1 OHMS% .125W CC	01121	BB91G5
A4R13	0757-0927		RESISTOR: FXD: 1.3K2% .125W F TUBULAR	24546	C4-1/8-T0-1301-G
A4R14	0757-0938		RESISTOR: FXD: 3.9K2% .125W F TUBULAR	24546	C4-1/8-T0-3901-G
A4R15	0757-0953		RESISTOR: FXD: 16K2% .125W F TUBULAR	24546	C4-1/8-T0-1602-G
A4R16	0757-0948		RESISTOR: FXD: 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A4R17	0757-0942	4	RESISTOR: FXD: 5.6K2% .125W F TUBULAR	24546	C4-1/8-T0-5601-G
A4R18	0698-3113	1	RESISTOR: FXD: 100 OHMS% .125W CC	01121	BB1015
A4R19	0757-0941	7	RESISTOR: FXD: 5.1K2% .125W F TUBULAR	24546	C4-1/8-T0-5101-G
A4R20	0757-0941		RESISTOR: FXD: 5.1K2% .125W F TUBULAR	24546	C4-1/8-T0-5101-G
A4R21	0757-0942		RESISTOR: FXD: 5.6K2% .125W F TUBULAR	24546	C4-1/8-T0-5601-G
A4R22	0757-0941		RESISTOR: FXD: 5.1K2% .125W F TUBULAR	24546	C4-1/8-T0-5101-G
A4R23	0757-0924	7	RESISTOR: FXD: 1K2% .125W F TUBULAR	24546	C4-1/8-T0-1001-G
A4R24	0757-0952		RESISTOR: FXD: 15K2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A4R25	0757-0941		RESISTOR: FXD: 5.1K2% .125W F TUBULAR	24546	C4-1/8-T0-5101-G
A4R26	0757-0948		RESISTOR: FXD: 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A4R27	0757-0964		RESISTOR: FXD: 47K2% .125W F TUBULAR	24546	C4-1/8-T0-4702-G
A4R28	0757-0924		RESISTOR: FXD: 1K2% .125W F TUBULAR	24546	C4-1/8-T0-1001-G
A4R29	0757-0924		RESISTOR: FXD: 1K2% .125W F TUBULAR	24546	C4-1/8-T0-1001-G
A4R30	0757-0952		RESISTOR: FXD: 15K2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A4R31	0698-5999	1	RESISTOR: FXD: 4.7K5% .125W CC TUBULAR	01121	BB4725
A4R32	0757-0955	8	RESISTOR: FXD: 20K2% .125W F TUBULAR	24546	C4-1/8-T0-2002-G
A4R33	0757-0924		RESISTOR: FXD: 1K2% .125W F TUBULAR	24546	C4-1/8-T0-1001-G

See introduction to this section for ordering information

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4R34	0757-0935	5	RESISTOR; FXD; 3K2% .125W F TUBULAR	24546	C4-1/8-T0-3001-G
A4R35	0757-0921	6	RESISTOR; FXD; 750 OHM2% .125W F	24546	C4-1/8-T0-751-G
A4R36	0757-0921		RESISTOR; FXD; 750 OHM2% .125W F	24546	C4-1/8-T0-751-G
A4R37	0757-0951		RESISTOR; FXD; 16K2% .125W F TUBULAR	24546	C4-1/8-T0-1602-G
A5	05257-60007	1	BOARD ASSY;REGULATOR PULSED RF	28480	05257-60007
A5C1	0180-0387	5	CAPACITOR-FXD; 47UF+-5% 20VDC TA-SOLID	56289	150D476X5020R2
A5C2	0160-3060		CAPACITOR;FXD; .1UF+-20% 25WVDC	28480	0160-3060
A5C3	0180-0116	11	CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C4	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C5	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C6	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C7	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C8	0150-0093	10	CAPACITOR;FXD; .01UF+80-20% 100WVDC	28480	0150-0093
A5C9	0150-0093		CAPACITOR;FXD; .01UF+80-20% 100WVDC	28480	0150-0093
A5C10	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C11	0150-0093		CAPACITOR;FXD; .01UF+80-20% 100WVDC	28480	0150-0093
A5C12	0150-0093		CAPACITOR;FXD; .01UF+80-20% 100WVDC	28480	0150-0093
A5C13	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5C14	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A5CR1	1902-0665	1	DIODE; ZENER; 5V VZ; .5W MAX PD	04713	SZ 12169
A5CR2	1902-0666	1	DIODE; ZENER; 6.2V VZ; .4W MAX PD	04713	1N825
A5L1	9140-0138		COIL; FXD; MOLDED RF CHOKE; 180UH 5%	24226	15/183
A5L2	9140-0138		COIL; FXD; MOLDED RF CHOKE; 180UH 5%	24226	15/183
A5L3	9140-0138		COIL; FXD; MOLDED RF CHOKE; 180UH 5%	24226	15/183
A5Q1	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A5Q2	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A5Q3	1854-0221		TRANSISTOR; BIPOL; SI; NPN DUAL	28480	1854-0221
A5Q4	1853-0020	5	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A5Q5	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A5Q6	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A5Q7	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A5Q8	1854-0221		TRANSISTOR; BIPOL; SI; NPN DUAL	28480	1854-0221
A5Q9	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q10	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q11	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A5Q12	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q13	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A5Q14	1854-0053	2	TRANSISTOR NPN 2N2218 SI PD=800MW	04713	2N2218
A5Q15	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A5Q16	1853-0010	1	TRANSISTOR PNP SI PD=360MW FT=250MHZ	28480	1853-0010
A5R1	0757-0936		RESISTOR; FXD; 3.9K2% .125W F TUBULAR	24546	C4-1/8-T0-3901-G
A5R2	0757-0948		RESISTOR; FXD; 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A5R3	0757-0944	3	RESISTOR; FXD; 6.8K2% .125W F TUBULAR	24546	C4-1/8-T0-6801-G
A5R4	0757-0948		RESISTOR; FXD; 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A5R5	0757-0948		RESISTOR; FXD; 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A5R6	0757-0944		RESISTOR; FXD; 6.8K2% .125W F TUBULAR	24546	C4-1/8-T0-6801-G
A5R7	0757-0940		RESISTOR; FXD; 4.7K2% .125W F TUBULAR	24546	C4-1/8-T0-4701-G
A5R8	0757-0972		RESISTOR; FXD; 100K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A5R9	0683-1065	1	RESISTOR; FXD; 10M5% .25W CC TUBULAR	01121	CB1065
A5R10	0757-0935		RESISTOR; FXD; 3K2% .125W F TUBULAR	24546	C4-1/8-T0-3001-G
A5R11	0757-0941		RESISTOR; FXD; 5.1K2% .125W F TUBULAR	24546	C4-1/8-T0-5101-G
A5R12	0757-0917		RESISTOR; FXD; 510 OHM2% .125W F	24546	C4-1/8-T0-511-G
A5R13	0757-0946	3	RESISTOR; FXD; 8.2K2% .125W F TUBULAR	24546	C4-1/8-T0-8201-G
A5R14	0757-0917		RESISTOR; FXD; 510 OHM2% .125W F	24546	C4-1/8-T0-511-G
A5R15	0757-0935		RESISTOR; FXD; 3K2% .125W F TUBULAR	24546	C4-1/8-T0-3001-G
A5R16	0757-0935		RESISTOR; FXD; 3K2% .125W F TUBULAR	24546	C4-1/8-T0-3001-G
A5R17	0757-0965	1	RESISTOR; FXD; 51K2% .125W F TUBULAR	24546	C4-1/8-T0-5102-G
A5R18	0757-0917		RESISTOR; FXD; 510 OHM2% .125W F	24546	C4-1/8-T0-511-G
A5R19	0757-0926		RESISTOR; FXD; 1.2K2% .125W F TUBULAR	24546	C4-1/8-T0-1201-G
A5R20	0757-0934	8	RESISTOR; FXD; 2.7K2% .125W F TUBULAR	24546	C4-1/8-T0-2701-G
A5R21	0757-0921		RESISTOR; FXD; 750 OHM2% .125W F	24546	C4-1/8-T0-751-G
A5R22	0757-0921		RESISTOR; FXD; 750 OHM2% .125W F	24546	C4-1/8-T0-751-G
A5R23	0757-0934		RESISTOR; FXD; 2.7K2% .125W F TUBULAR	24546	C4-1/8-T0-2701-G
A5R24	0757-0930	2	RESISTOR; FXD; 1.8K2% .125W F TUBULAR	24546	C4-1/8-T0-1801-G
A5R25	0757-0934		RESISTOR; FXD; 2.7K2% .125W F TUBULAR	24546	C4-1/8-T0-2701-G
A5R26	0757-0893		RESISTOR; FXD; 51 OHM2% .125W F TUBULAR	24546	C4-1/8-T0-51R0-G
A5R27	0757-0929	1	RESISTOR; FXD; 1.6K2% .125W F TUBULAR	24546	C4-1/8-T0-1601-G
A5R28	0757-0900	1	RESISTOR; FXD; 100 OHM2% .125W F	24546	C4-1/8-T0-101-G
A5R29	0757-0942		RESISTOR; FXD; 5.6K2% .125W F TUBULAR	24546	C4-1/8-T0-5601-G
A5R30	0757-0950	6	RESISTOR; FXD; 12K2% .125W F TUBULAR	24546	C4-1/8-T0-1202-G
A5R31	0757-0893		RESISTOR; FXD; 51 OHM2% .125W F TUBULAR	24546	C4-1/8-T0-51R0-G
A5R32	0757-0043	2	RESISTOR,FXD, 6.2K2% .125W F TUBULAR	24546	C4-1/8-TO-6201-G
A5R33	0757-0048		RESISTOR,FXD, 10K2% .125W F TUBULAR	24546	C4-1/8-TO-1002-G

See introduction to this section for ordering information

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A6	05257-60006	1	BOARD ASSY:AFC #2	28480	05257-60006
A6C1	0180-0291	6	CAPACITOR-FXD, 1UF+-10% 35VDC TA-SOLID	56289	150D105X9035A2
A6C2	0160-0174	2	CAPACITOR;FXD; .47UF+80-20% 25WVDC	28480	0160-0174
A6C3	0180-0367		CAPACITOR-FXD, 47UF+-5% 20VDC TA-SOLID	56289	150D476X5020R2
A6C4	0180-0228	1	CAPACITOR-FXD, 22UF+-10% 15VDC TA-SOLID	56289	150D226X9015B2
A6C5	0140-0192	1	CAPACITOR;FXD; 68PF+-5% 300WVDC	72136	DM15F680J0300WV1CR
A6C6	0160-2205	1	CAPACITOR;FXD; 120PF+-5% 300WVDC	28480	0160-2205
A6C7	0160-0174		CAPACITOR;FXD; .47UF+80-20% 25WVDC	28480	0160-0174
A6C8	0180-0195	1	CAPACITOR-FXD, .33UF+-20% 35VDC TA	56289	150D334X0035A2
A6C9	0160-0939	1	CAPACITOR;FXD; 430PF+-5% 300WVDC	28480	0160-0939
A6C10	0160-3060		CAPACITOR,FXD, .1UF+-20% 25WVDC	28480	0160-3060
A6C11	0180-0367		CAPACITOR-FXD, 47UF+-5% 20VDC TA-SOLID	56289	150D476X5020R2
A6C12	0160-0147	1	CAPACITOR;FXD; .0025UF+-2% 300WVDC	28480	0160-0147
A6C13	0160-0207	1	CAPACITOR;FXD; .01UF+-5% 200WVDC	56289	292P10352
A6C14	0160-0156	1	CAPACITOR;FXD; 26PF+-5% 300WVDC	28480	0160-0156
A6CR1	1901-0040	21	DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6CR2	1901-0040		DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6CR3	1901-0040		DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6CR4	1901-0040		DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6CR5	1901-0040		DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6CR6	1901-0040		DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6CR7	1901-0040		DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6CR8	1901-0040		DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6CR9	1901-0040		DIODE; SWITCHING; SI ; 30V MAX VRM 50MA	28480	1901-0040
A6L1	9140-0138		COIL; FXD; MOLDED RF CHOKE; 180UH 5%	24226	15/181
A6Q1	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A6Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A6Q3	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A6Q4	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A6Q5	1854-0221		TRANSISTOR, BIPOL, SI, NPN DUAL	28480	1854-0221
A6Q6	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A6Q7	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A6Q8	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A6Q9	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A6Q10	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A6Q11	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
A6Q12	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A6R1	0757-0957	3	RESISTOR; FXD; 24K2% .125W F TUBULAR	24546	C4-1/8-T0-2402-G
A6R2	0757-0954	1	RESISTOR; FXD; 18K2% .125W F TUBULAR	24546	C4-1/8-T0-1802-G
A6R3	0757-0939	5	RESISTOR; FXD; 4.3K2% .125W F TUBULAR	24546	C4-1/8-T0-4301-G
A6R4	0757-0950		RESISTOR; FXD; 12K2% .125W F TUBULAR	24546	C4-1/8-T0-1202-G
A6R5	0757-0950		RESISTOR; FXD; 12K2% .125W F TUBULAR	24546	C4-1/8-T0-1202-G
A6R6	0757-0948		RESISTOR; FXD; 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A6R7	0757-0951	1	RESISTOR; FXD; 13K2% .125W F TUBULAR	24546	C4-1/8-T0-1302-G
A6R8	0757-0893		RESISTOR; FXD; 51 OHM2% .125W F TUBULAR	24546	C4-1/8-T0-51R0-G
A6R9	0757-0955		RESISTOR; FXD; 20K2% .125W F TUBULAR	24546	C4-1/8-T0-2002-G
A6R10	0757-0948		RESISTOR; FXD; 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A6R11	0757-0952		RESISTOR; FXD; 15K2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A6R12	0757-0941		RESISTOR; FXD; 5.1K2% .125W F TUBULAR	24546	C4-1/8-T0-5101-G
A6R13	0757-0957		RESISTOR; FXD; 24K2% .125W F TUBULAR	24546	C4-1/8-T0-2402-G
A6R14	0757-0948		RESISTOR; FXD; 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A6R15	0757-0939		RESISTOR; FXD; 4.3K2% .125W F TUBULAR	24546	C4-1/8-T0-4301-G
A6R16	0757-0950		RESISTOR; FXD; 12K2% .125W F TUBULAR	24546	C4-1/8-T0-1202-G
A6R17	0757-0944		RESISTOR; FXD; 6.8K2% .125W F TUBULAR	24546	C4-1/8-T0-6801-G
A6R18	0757-0945		RESISTOR; FXD; 7.5K2% .125W F TUBULAR	24546	C4-1/8-T0-7501-G
A6R19	0757-0955		RESISTOR; FXD; 20K2% .125W F TUBULAR	24546	C4-1/8-T0-2002-G
A6R20	0757-0931	2	RESISTOR; FXD; 2K2% .125W F TUBULAR	24546	C4-1/8-T0-2001-G
A6R21	0757-0972		RESISTOR; FXD; 100K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A6R22	0757-0939		RESISTOR; FXD; 4.3K2% .125W F TUBULAR	24546	C4-1/8-T0-4301-G
A6R23	0757-0950		RESISTOR; FXD; 12K2% .125W F TUBULAR	24546	C4-1/8-T0-1202-G
A6R24	0683-1055	1	RESISTOR; FXD; 1M5% .25W CC TUBULAR	01121	CB1055
A6R25	0757-0955		RESISTOR; FXD; 20K2% .125W F TUBULAR	24546	C4-1/8-T0-2002-G
A6R26	0757-0914		RESISTOR; FXD; 390 OHM2% .125W F	24546	C4-1/8-T0-391-G
A6R27	0757-0935		RESISTOR; FXD; 3K2% .125W F TUBULAR	24546	C4-1/8-T0-3001-G
A6R28	0757-0945		RESISTOR; FXD; 7.5K2% .125W F TUBULAR	24546	C4-1/8-T0-7501-G
A6R29	0757-0939		RESISTOR; FXD; 4.3K2% .125W F TUBULAR	24546	C4-1/8-T0-4301-G
A6R30	0757-0950		RESISTOR; FXD; 12K2% .125W F TUBULAR	24546	C4-1/8-T0-1202-G
A6R31	0757-0936	1	RESISTOR; FXD; 3.3K2% .125W F TUBULAR	24546	C4-1/8-T0-3301-G
A6R32	0757-0955		RESISTOR; FXD; 20K2% .125W F TUBULAR	24546	C4-1/8-T0-2002-G
A6R33	0757-0809	1	RESISTOR; FXD; 91 OHM2% .125W F TUBULAR	24546	C4 1/8 TO 91R0 G
A6R34	0757-0924		RESISTOR; FXD; 1K2% .125W F TUBULAR	24546	C4 1/8 TO 1001 G
A6R35	0757-0957		RESISTOR; FXD; 24K2% .125W F TUBULAR	24546	C4 1/8 TO 2402 G

See introduction to this section for ordering information

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7	05257-60044	1	OSCILLATOR ASSY, VARIABLE FREQUENCY WITH A7A1, A7A2, A7A3 AND W11.	28480	05257-60044
A7A1	05257-60004	1	BOARD ASSY-FVO LINEARIZER	28480	05257-60004
A7A1C1	0180-0291		CAPACITOR-FXD; 1UF+-10% 35VDC TA-SOLID	56289	150D105X9035A2
A7A1C2	0180-0291		CAPACITOR-FXD; 1UF+-10% 35VDC TA-SOLID	56289	150D105X9035A2
A7A1C3	0180-0291		CAPACITOR-FXD; 1UF+-10% 35VDC TA-SOLID	56289	150D105X9035A2
A7A1C4	0180-0100	1	CAPACITOR-FXD; 22UF+-20% 35VDC TA-SOLID	56289	150D226X0035R2
A7A1C5	0180-0291		CAPACITOR-FXD; 1UF+-10% 35VDC TA-SOLID	56289	150D105X9035A2
A7A1CR1	1901-0040		DIODE-SWITCHING SI ; 30V MAX VRM 50MA	28480	1901-0040
A7A1L1	9140-0130		COIL; FXD; MOLDED RF CHOKE; 180UH 5%	24226	15/183
A7A1Q1	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A7A1Q2	1854-0221		TRANSISTOR, DIPOL, SI, NPN DUAL	28480	1854-0221
A7A1Q3	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A7A1Q4	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A7A1R1	0757-0934		RESISTOR; FXD; 2.7K2% .125W F TUBULAR	24546	C4-1/8-T0-2701-G
A7A1R2	0757-0972		RESISTOR; FXD; 100K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A7A1R3	0757-0937	3	RESISTOR; FXD; 3.6K2% .125W F TUBULAR FACTORY SELECTED PART	24546	C4-1/8-T0-3601-G
A7A1R4	0757-0920	1	RESISTOR; FXD; 680 OHM2% .125W F	24546	C4-1/8-T0-681-G
A7A1R5	0757-0963	1	RESISTOR; FXD; 43K2% .125W F TUBULAR	24546	C4-1/8-T0-4302-G
A7A1R6	0757-0934		RESISTOR; FXD; 2.7K2% .125W F TUBULAR	24546	C4-1/8-T0-2701-G
A7A1R7	0757-0938		RESISTOR; FXD; 3.9K2% .125W F TUBULAR	24546	C4-1/8-T0-3901-G
A7A1R8	0698-3375	1	RESISTOR; FXD; 33 OHM5% .125W CC	01121	BB3305
A7A1R9	0698-3379	2	RESISTOR; FXD; 68 OHM5% .125W CC	01121	BB6805
A7A1R10	0698-3379		RESISTOR; FXD; 68 OHM5% .125W CC	01121	BB6805
A7A1R11	0698-5562	1	RESISTOR; FXD; 120 OHM5% .125W CC	01121	BB1215
A7A1R12	0698-5076	1	RESISTOR; FXD; 130 OHM5% .125W CC	01121	BB1315
A7A1R13	0698-5174	1	RESISTOR; FXD; 200 OHM5% .125W CC	01121	BB2015
A7A1R14	0698-3114	1	RESISTOR; FXD; 300 OHM5% .125W CC	01121	BB3015
A7A1R15	0698-6645	1	RESISTOR; FXD; 390 OHM5% .125W CC	01121	BB3915
A7A1R16	0698-6646	2	RESISTOR; FXD; 620 OHM5% .125W CC	01121	BB6215
A7A1R17	0698-6646		RESISTOR; FXD; 620 OHM5% .125W CC	01121	BB6215
A7A1R18	0757-0452		RESISTOR; FXD; 15K2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A7A1R19	0757-0934		RESISTOR; FXD; 2.7K2% .125W F TUBULAR	24546	C4-1/8-T0-2701-G
A7A1R20	0757-0988		RESISTOR; FXD; 10K2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A7A1R21	2100-1773	1	RESISTOR, VAR, TRMR, 1KOHM 5% WW	28480	2100-1773
A7A1S1	05257-60021	1	SWITCH ASSY WITH A7A1R8-R17	28480	05257-60021
A7A1S1	3100-2420	1	SWITCH ROTARY (LESS RESISTORS)	28480	3100-2420
A7A2	05257-60012	1	BOARD ASSY-FVO CONTROL	28480	05257-60012
A7A2					
A7A2					
A7A2C1	0160-0183	2	CAPACITOR-FXD; 130PF+-5% 300WVDC	28480	0160-0183
A7A2C2	0160-2327	15	CAPACITOR-FXD; .001UF+-20% 100WVDC	28480	0160-2327
A7A2CR1	0122-0301	2	C-VOLTAGE VAR 6.8 PF 10%	28480	0122-0301
A7A2CR2	0122-0301		C-VOLTAGE VAR 6.8 PF 10%	28480	0122-0301
A7A2CR3	1901-0179		DIODE-SWITCHING ; 15V MAX VRM 50MA	28480	1901-0179
A7A2R1	0757-0482	2	RESISTOR; FXD; 511K1% .125W F TUBULAR	28480	0757-0482
A7A2R2	0757-0446		RESISTOR; FXD; 8.2K2% .125W F TUBULAR	24546	C4-1/8-T0-8201-G
A7A2R3	0757-0482		RESISTOR; FXD; 511K1% .125W F TUBULAR	28480	0757-0482
A7A2R4	0757-0932	1	RESISTOR; FXD; 2.2K2% .125W F TUBULAR	24546	C4-1/8-T0-2201-G
A7A3	05257-60003	1	BOARD ASSY-FVO	28480	05257-60003
A7A3C1	0160-3060		CAPACITOR-FXD; .1UF+-20% 25WVDC	28480	0160-3060
A7A3C2	0121-0405	1	C-VAR 3.5-53.5 PF	28480	0121-0405
A7A3C3	0160-2327		CAPACITOR-FXD; .001UF+-20% 100WVDC	28480	0160-2327
A7A3C4	0150-0031		CAPACITOR-FXD; 2PF+-5% 500WVDC	95121	TYPE CC
A7A3C5	0150-0034	1	CAPACITOR-FXD; 3.9PF+-10% 500WVDC	95121	TYPE CC
A7A3C6	0160-2327		CAPACITOR-FXD; .001UF+-20% 100WVDC	28480	0160-2327
A7A3C7	0160-2327		CAPACITOR-FXD; .001UF+-20% 100WVDC	28480	0160-2327
A7A3C8	0160-0183		CAPACITOR-FXD; 130PF+-5% 300WVDC	28480	0160-0183
A7A3C9	0150-0011		CAPACITOR-FXD; 1.5PF+-20% 500WVDC FACTORY SELECTED PART	95121	TYPE CC

See Introduction to this section for ordering information

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7A3C10	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C11	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C12	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C13	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C14	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C15	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C16	0150-0029	2	CAPACITOR-FXD 1PF +-10% 500WVDC	55121	TYPE CL
A7A3C17	0150-0029		CAPACITOR-FXD 1PF +-10% 500WVDC	55121	TYPE CL
A7A3C18	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C19	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C20	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3C21	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A7A3L1	05257-60022	1	COIL ASSY-VFC	28480	05257-60022
A7A3Q1	1854-0345	2	TRANSISTOR NPN 2N5179 SI PD=200MW	04713	2N5179
A7A3Q2	1854-0345		TRANSISTOR NPN 2N5179 SI PD=200MW	04713	2N5179
A7A3Q3	1854-0238		TRANSISTOR NPN 2N3933 SI PD=200MW	04713	2N3933
A7A3Q4	1854-0238		TRANSISTOR NPN 2N3933 SI PD=200MW	04713	2N3933
A7A3Q5	1854-0238		TRANSISTOR NPN 2N3933 SI PD=200MW	04713	2N3933
A7A3Q6	1854-0238		TRANSISTOR NPN 2N3933 SI PD=200MW	04713	2N3933
A7A3Q7	1854-0238		TRANSISTOR NPN 2N3933 SI PD=200MW	04713	2N3933
A7A3R1	0757-0379	1	RESISTOR-FXD 12.1 OHM 1% .125W F	30983	MF4C1/8-T0-12R1-F
A7A3R2	0757-0446		RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A7A3R3	0757-0441		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A7A3R4	0757-0442		RESISTOR-FXD 5.62K 1% .125W F TUBULAR	24546	C4-1/8-T0-5621-F
A7A3R5	0757-0931		RESISTOR-FXD 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A7A3R6	0757-0446		RESISTOR-FXD 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F
A7A3R7	0757-0924		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A7A3R8	0757-0926		RESISTOR-FXD 1.2K 1% .125W F TUBULAR	24546	C4-1/8-T0-1201-F
A7A3R9	0757-0926		RESISTOR-FXD 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1211-F
A7A3R10	0757-0930		RESISTOR-FXD 1.62K 1% .125W F TUBULAR	24546	C4-1/8-T0-1621-F
A7A3R11	0757-0955		RESISTOR-FXD 20K 1% .125W F TUBULAR	24546	C4-1/8-T0-2002-F
A7A3R12	0757-0955		RESISTOR-FXD 20K 1% .125W F TUBULAR	24546	C4-1/8-T0-2002-F
A7A3R13	0698-5994	4	RESISTOR-FXD 6.8K 5% .125W CC TUBULAR	01121	BB6825
A7A3R14	0698-5994		RESISTOR-FXD 6.8K 5% .125W CC TUBULAR	01121	BB6825
A7A3R15	0757-0905	2	RESISTOR-FXD 160 OHM 1% .125W F	24546	C4-1/8-T0-161-F
A7A3R16	0757-0922	1	RESISTOR-FXD 820 OHM 1% .125W F	24546	C4-1/8-T0-821-F
A7A3R17	0757-0905		RESISTOR-FXD 160 OHM 1% .125W F	24546	C4-1/8-T0-161-F
A7A3R18	0698-5177	1	RESISTOR-FXD 820 OHM 5% .125W CC	01121	BB8215
A7A3R19	0757-0914		RESISTOR-FXD 390 OHM 1% .125W F	24546	C4-1/8-T0-391-F
A7A3R20	0757-0914		RESISTOR-FXD 390 OHM 1% .125W F	24546	C4-1/8-T0-391-F
A7A3R21	0698-5565	2	RESISTOR-FXD 2.2K 5% .125W CC TUBULAR	01121	BB2225
A7A3R22	0698-5565		RESISTOR-FXD 2.2K 5% .125W CC TUBULAR	01121	BB2225
A7A3R23	0757-0927		RESISTOR-FXD 1.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-1301-F
A7A3R24	0757-0927		RESISTOR-FXD 1.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-1301-F
A7A3T1	05257-60017	2	TRANSFORMER ASSY-VFO	28480	05257-60017
A7A3T2	05257-60017		TRANSFORMER ASSY-VFO	28480	05257-60017
A8	05257-60039	1	BOARD ASSY-PRESCALER	28480	05257-60039
A8C1	0160-2327		CAPACITOR-FXD .001UF +-20% 100WVDC	28480	0160-2327
A8C2	0150-0093		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0150-0093
A8C3	0150-0093		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0150-0093
A8C4	0160-2143	1	CAPACITOR-FXD 33PF +-10% 200WVDC	28480	0160-2143
A8C5	0160-3277	2	CAPACITOR-FXD .01UF +-20% 50WVDC	28480	0160-3277
A8C6	0160-3277		CAPACITOR-FXD .01UF +-20% 50WVDC	28480	0160-3277
A8C7	0150-0093		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0150-0093
A8C8	0150-0093		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0150-0093
A8C9	0150-0093		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0150-0093
A8C10	0150-0093		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0150-0093
A8CR1	1902-3104	1	DIODE-ZENER 5.62V VZ .4W MAX PD	04713	SZ 10939-110
A8CR2	1901-0179		DIODE-SWITCHING SI 15V MAX VRM 50MA	28480	1901-0179
A8IC1	1820-0286	1	IC:SCHMITT	28480	1820-0286
A8IC2	1820-0712	2	IC:BINARY	28480	1820-0712
A8IC3	1820-0712		IC:BINARY	28480	1820-0712
A8Q1	1854-0048	2	TRANSISTOR NPN 2N2857 SI PD=200MW	04713	2N2857
A8Q2	1854-0048		TRANSISTOR NPN 2N2857 SI PD=200MW	04713	2N2857
A8Q3	1854-0039	1	TRANSISTOR NPN 2N3053 SI PD=1W	04713	2N3053
A8Q4	1853-0034	4	TRANSISTOR PNP SI PD=360MW FT=400MHZ	28480	1853-0034
A8Q5	1853-0034		TRANSISTOR PNP SI PD=360MW FT=400MHZ	28480	1853-0034
A8Q6	1853-0034		TRANSISTOR PNP SI PD=360MW FT=400MHZ	28480	1853-0034
A8Q7	1853-0034		TRANSISTOR PNP SI PD=360MW FT=400MHZ	28480	1853-0034
A8Q8	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611

See introduction to this section for ordering information

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8R1	0683-2025	2	RESISTOR: FXD: 2K 5% .25W CC TUBULAR	01121	CB2025
A8R2	0683-2025		RESISTOR: FXD: 2K 5% .25W CC TUBULAR	01121	CB2025
A8R3	0698-3374	1	RESISTOR: FXD: 20 OHM 5% .125W CC	01121	BB2005
A8R4			NOT ASSIGNED		
A8R5	0698-5556	3	RESISTOR: FXD: 560 OHM 5% .125W CC	01121	BB5615
A8R6	0698-5556		RESISTOR: FXD: 560 OHM 5% .125W CC	01121	BB5615
A8R7	0757-0428	1	RESISTOR: FXD: 1.5K 2% .125W F TUBULAR	24546	C4-1/8-T0-1501-G
A8R8	2100-2621	1	RESISTOR, VAR, TRMR, 2KOHM 10% C	19701	ET50X202
A8R9	0698-3378	3	RESISTOR: FXD: 51 OHM 5% .125W CC	01121	BB5105
A8R10	0698-3111	1	RESISTOR: FXD: 30 OHM 5% .125W CC	01121	BB3005
A8R11	0757-0418	2	RESISTOR: FXD: 560 OHM 2% .125W F	24546	C4-1/8-T0-561-G
A8R12	0698-5556		RESISTOR: FXD: 560 OHM 5% .125W CC	01121	BB5615
A8R13	0757-0493		RESISTOR: FXD: 51 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-51R0-G
A8R14	0766-0024	2	RESISTOR: FXD: 100 OHM 5% .25W F TUBULAR	24546	C5-1/4-T0-101-J
A8R15	0766-0024		RESISTOR: FXD: 100 OHM 5% .25W F TUBULAR	24546	C5-1/4-T0-101-J
A8R16	0757-0426		RESISTOR: FXD: 1.2K 2% .125W F TUBULAR	24546	C4-1/8-T0-1201-G
A8R17	0757-0437		RESISTOR: FXD: 3.6K 2% .125W F TUBULAR	24546	C4-1/8-T0-3601-G
A8R18	0698-3378		RESISTOR: FXD: 51 OHM 5% .125W CC	01121	BB5105
A8R19	0757-0493		RESISTOR: FXD: 51 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-51R0-G
A8R20	0757-0423	1	RESISTOR: FXD: 910 OHM 2% .125W F	24546	C4-1/8-T0-911-G
A8R21			NOT ASSIGNED		
A8R22	0698-3378		RESISTOR: FXD: 51 OHM 5% .125W CC	01121	BB5105
A8R23	0757-0909	1	RESISTOR: FXD: 240 OHM 2% .125W F	24546	C4-1/8-T0-241-G
A8R24	0757-0937		RESISTOR: FXD: 3.6K 2% .125W F TUBULAR	24546	C4-1/8-T0-3601-G
A9	05257-60002	1	BOARD ASSY: GATE EXTENDER	28480	05257-60002
A9C1	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A9C2	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A9C3	0180-0230	1	CAPACITOR-FXD; 1UF+-20% 50VDC TA-SOLID	56289	150D105X0050A2
A9C4	0160-2055	3	CAPACITOR, FXD, .01UF+80-20% 100WVDC	28480	0160-2055
A9C5	0160-2055		CAPACITOR, FXD, .01UF+80-20% 100WVDC	28480	0160-2055
A9C6	0160-2055		CAPACITOR, FXD, .01UF+80-20% 100WVDC	28480	0160-2055
A9C7	0180-0116		CAPACITOR-FXD; 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A9C8	0140-0198	2	CAPACITOR: FXD: 200PF+-5% 300WVDC	72136	DM15F201J0300WV1CR
A9C9	0140-0198		CAPACITOR: FXD: 200PF+-5% 300WVDC	72136	DM15F201J0300WV1CR
A9CR1	1901-0040		DIODE: SWITCHING: SI : 30V MAX VRM 50MA	28480	1901-0040
A9CR2	1901-0040		DIODE: SWITCHING: SI : 30V MAX VRM 50MA	28480	1901-0040
A9CR3	1901-0040		DIODE: SWITCHING: SI : 30V MAX VRM 50MA	28480	1901-0040
A9IC1	1820-0399	12	INTEGRATED CIRCUIT	28480	1820-0399
A9IC2	1820-0094	2	IC: DCTL: GATE DTL QUAD 2 INPUT NAND	04713	MC846P
A9IC3	1820-0094		IC: DCTL: GATE DTL QUAD 2 INPUT NAND	04713	MC846P
A9IC4	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A9L1	9140-0138		COIL: FXD: MOLDED RF CHOKE: 180UH 5%	24226	15/183
A9L2	9140-0138		COIL: FXD: MOLDED RF CHOKE: 180UH 5%	24226	15/183
A9Q1	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A9Q2	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A9Q3	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A9Q4	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9Q5	1854-0053		TRANSISTOR NPN 2N2218 SI PD=800MW	04713	2N2218
A9Q6	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A9Q7	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A9Q8	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9Q9	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9Q10	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9R1	0757-0200	1	RESISTOR: FXD: 5.62K 1% .125W F TUBULAR	24546	C4-1/8-T0-5621-F
A9R2	0757-0440		RESISTOR: FXD: 4.7K 2% .125W F TUBULAR	24546	C4-1/8-T0-4701-G
A9R3	0757-0280	2	RESISTOR: FXD: 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A9R4	0757-0425	1	RESISTOR: FXD: 1.1K 2% .125W F TUBULAR	24546	C4-1/8-T0-1101-G
A9R5	0757-0921		RESISTOR: FXD: 750 OHM 2% .125W F	24546	C4-1/8-T0-751-G
A9R6	0757-0906	1	RESISTOR: FXD: 180 OHM 2% .125W F	24546	C4-1/8-T0-181-G
A9R7	0761-0042	1	RESISTOR: FXD: 68 OHM 5% 1W MO TUBULAR	24546	FP32-1-T00-68R0-J
A9R8	0757-0921		RESISTOR: FXD: 750 OHM 2% .125W F	24546	C4-1/8-T0-751-G
A9R9	0757-0960	1	RESISTOR: FXD: 33K 2% .125W F TUBULAR	24546	C4-1/8-T0-3302-G
A9R10	0757-0955		RESISTOR: FXD: 20K 2% .125W F TUBULAR	24546	C4-1/8-T0-2002-G
A9R11	0757-0948		RESISTOR: FXD: 10K 2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A9R12	0757-0424	1	RESISTOR: FXD: 1.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1101-F
A9R13	0757-0943		RESISTOR: FXD: 6.2K 2% .125W F TUBULAR	24546	C4-1/8-T0-6201-G
A9R14	0757-0948		RESISTOR: FXD: 10K 2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A9R15	0757-0280		RESISTOR: FXD: 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A9R16	0757-0952		RESISTOR: FXD: 15K 2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A9R17	0757-0938		RESISTOR: FXD: 3.9K 2% .125W F TUBULAR	24546	C4-1/8-T0-3901-G
A9R18	0757-0938		RESISTOR: FXD: 3.9K 2% .125W F TUBULAR	24546	C4-1/8-T0-3901-G

See introduction to this section for ordering information

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9R19	0757-0424		RESISTOR; FXD; 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A9R20	0757-0458	1	RESISTOR; FXD; 27K 1% .125W F TUBULAR	24546	C4-1/8-T0-2702-F
A9R21	0757-0434		RESISTOR; FXD; 2.7K 1% .125W F TUBULAR	24546	C4-1/8-T0-2701-F
A9R22	0757-0434		RESISTOR; FXD; 2.7K 1% .125W F TUBULAR	24546	C4-1/8-T0-2701-F
A9R23	0757-0439		RESISTOR; FXD; 4.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-4301-F
A9R24	0757-0439		RESISTOR; FXD; 4.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-4301-F
A10	05257-60001	1	BOARD ASSY:PRESET DECADE	28480	05257-60001
A10CR1	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A10CR2	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A10CR3	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A10CR4	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A10CR5	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A10CR6	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A10CR7	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A10CR8	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A10IC1	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC2	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC3	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC4	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC5	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC6	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC7	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC8	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC9	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10IC10	1820-0399		INTEGRATED CIRCUIT	28480	1820-0399
A10R1	0757-0418		RESISTOR; FXD; 560 OHM 2% .125W F	24546	C4-1/8-T0-561-F
A11	05257-60031	1	BOARD ASSY:POWER SUPPLY FILTER	28480	05257-60031
A11C1	0180-0057	1	CAPACITOR-FXD; 47UF+-10% 35VDC TA-SOLID	56289	150D476X9035S2
A11C2	0160-2143		CAPACITOR; FXD; .002UF+80-20% 1000WVDC	28480	0160-2143
A11C3	0160-2143		CAPACITOR; FXD; .002UF+80-20% 1000WVDC	28480	0160-2143
A11C4	0180-0387		CAPACITOR-FXD; 47UF+-5% 20VDC TA-SOLID	56289	150D476X5020R2
A11C5	0180-0387		CAPACITOR-FXD; 47UF+-5% 20VDC TA-SOLID	56289	150D476X5020R2
A11C6	0180-0291		CAPACITOR-FXD; 1UF+-10% 35VDC TA-SOLID	56289	150D105X9035A2
A11L1	9140-0096	2	COIL, FXD, MOLDED RF CHOKE, 1UH 10%	24226	15/101
A11L2	9140-0096		COIL, FXD, MOLDED RF CHOKE, 1UH 10%	24226	15/101
A11L3	9140-0138		COIL; FXD; MOLDED RF CHOKE; 180UH 5%	24226	15/183
A11P6	1251-2564	1	CONNECTOR, 50 CONT, MALE, DUAL INLINE	71785	57-10500-27
A12	05257-60032	1	BOARD ASSY:INTERCONNECTOR	28480	05257-60032
A12XA4	1251-1631	1	CONNECTOR, PC EDGE, 10 CONT, INLINE	71785	252-10-30-310
A12XA5	1251-1633	4	CONNECTOR, PC EDGE, 15 CONT, INLINE	71785	252-15-30-310
A12XA6	1251-1633		CONNECTOR, PC EDGE, 15 CONT, INLINE	71785	252-15-30-310
A12XA8	1251-2035	3	CONNECTOR, PC EDGE, 30 CONT, DUAL INLINE	71785	252-15-30-300
A12XA9	1251-1633		CONNECTOR, PC EDGE, 15 CONT, INLINE	71785	252-15-30-310
A12XA10	1251-2035		CONNECTOR, PC EDGE, 30 CONT, DUAL INLINE	71785	252-15-30-300
A12XA11	1251-1633		CONNECTOR, PC EDGE, 15 CONT, INLINE	71785	252-15-30-310
A12XA13	1251-2035		CONNECTOR, PC EDGE, 30 CONT, DUAL INLINE	71785	252-15-30-300
A13	05257-60033	1	CABLE ASSY:THUMBWHEEL	28480	05257-60033
A13P1	05257-60066	1	PLUG,CKT BD,MALE, 30-PIN DUAL IN LINE	28480	05257-60066
A13S2	3100-2409	1	SWITCH:THUMBWHEEL	28480	3100-2409
			CHASSIS PARTS		
J1	1250-0914	1	CONNECTOR-COAX, APC-N, SHELL	28480	1250-0914
J1	1250-0915	1	CONTACT, RF CONNECTOR, FEMALE CENTER	71785	131-149
J2	1250-0102	1	CONNECTOR-COAX, BNC, SHELL	28480	1250-0102
J2	1250-0051	2	CONTACT:RF CONNECTOR BNC SERIES FEMALE	02660	31-2109
M1	1120-1495	1	METER:0-1MA	28480	1120-1495

See introduction to this section for ordering information

Table 6-1. Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
MP1	1500-0314	1	DRIVE, SFT CPLR .25 ID .56 OD BELLOWS	28480	1500-0314
MP2	2190-0325	2	WASHER, FLAT, 3/4 .26 ID .5 OD	28480	2190-0325
MP3	2190-0325		WASHER, FLAT, 3/4 .26 ID .5 OD	28480	2190-0325
MP4			NOT ASSIGNED		
MP5			NOT ASSIGNED		
MP6	5330-3236	1	SPRING WASHER	28480	5000-6206
MP7	5040-0157	1	SHAFT DRIVE COUPLER NYLON FLOATING	28480	5040-0157
MP8	05257-20047	1	SHAFT, SWITCH DRIVE	28480	05257-20047
MP9	00107-2001	[illegible]	HUB SHAFT COUPLER NYLON	28480	00107-2001
MP10	00107-2001		HUB SHAFT COUPLER NYLON	28480	00107-2001
MP11	05257-60015	1	GEAR RCK ASSY	28480	05257-60015
MP12	0370-0472	1	KNOB:BAR W/ARROW 0.500" DIA	28480	0370-0472
MP13	0370-0135	1	KNOB:ROUND FOR 0.125" DIA SHAFT	28480	0370-0135
MP14	0370-0463	1	KNOB:BLACK ROUND	28480	0370-0463
MP15	0370-0464	1	KNOB:BLACK ROUND	28480	0370-0464
MP16	0370-0479	1	KNOB:BLACK POINTER	28480	0370-0479
MP17	5020-3257	1	CONTACT SLIDING (FOR A26R1)	28480	5020-3257
MP18	05260-2016	1	SEAL:CUTSIDE	28480	05260-2016
MP19			NOT ASSIGNED		
MP20	05257-00004	1	RETAINER:DIAL	28480	05257-00004
MP21	05257-20085	1	PANEL:FRONT, MINT GRAY(STANDARD)	28480	05257-20085
MP22	05257-20024	1	MOLDED:STRIP LINE	28480	05257-20024
MP23	1251-1511	1	CONNECTOR:CLIP FEMALE CLIP	28480	1251-1511
MP24	8160-0055	1	GASKET MATL:RF(I) RING NICKEL ALLOY	07700	DIE NO. 404
MP25	05257-20054	2	GEAR:FACE DRIVE	28480	05257-20054
MP26	05257-20080	1	HOUSING:TRANS OSC.	28480	05257-20080
MP27	05257-00023	1	COVER:TOP	28480	05257-00023
MP28	05255-2047	1	GUIDE:REAR PLASTIC FRAME	28480	05255-2047
MP29	05257-00005	1	PLATE:LEFT SIDE	28480	05257-00005
MP30	05257-00006	1	PLATE:RIGHT SIDE	28480	05257-00006
MP31	05257-00007	1	PLATE:RIGHT SIDE, REAR	28480	05257-00007
MP32	05257-00008	1	COVER:PULSE GENERATOR	28480	05257-00008
MP33	05257-20059	1	NUT:SAMPLER	28480	05257-20059
MP34	0510-0079	1	RETAINER, GRIP RING, 6 DIA, CAD PLT STL	97464	3103-50-ST-CD
R1	2100-2075	1	RESISTOR, VAR, WW, LINEAR, 5K 3% 1W	28480	2100-2075
R2	2100-1655	1	RESISTOR, VAR, WW 5K OHM 10% 1W	32997	3057P-1-502
S1	3100-2406	1	SWITCH:ROTARY	28480	3100-2406
W1	05257-60041	1	CABLE ASSY:MAIN	28480	05257-60041
W1J1	1251-0155	1	CONNECTOR, PC EDGE, 30 CONT, DUAL INLINE	71785	251-15-30-261
	8120-0085	1	CABLE, SHLD 4-COND 26AWG	28480	8120-0085
	8120-0097	1	CABLE, SHLD 2 COND 26AWG (30 INCHES)	28480	8120-0097
	8120-1121	1	CABLE, COAX, 50 OHM, GREEN, 9 3/4"	28480	8120-1121
	8120-1124	1	CABLE, COAX, 50 OHM, WHITE, 11 1/2"	28480	8120-1124
	8120-1125	1	CABLE, COAX, 50 OHM, WHT BLK, 14"	28480	8120-1125
W1J2	1250-0050	1	NUT:RF CONNECTOR BNC SERIES	02660	31-2125-2
W1J2	1250-0051		CONTACT:RF CONNECTOR BNC SERIES	02660	31-2105
W2	05257-60042	1	CABLE ASSY:RF	28480	05257-60042
W2J1	1251-2500	1	CONNECTOR, PC EDGE, 12 CONT, DUAL INLINE	71785	251-06-30-403
	8120-1118	1	CABLE, COAX, 50 OHM, BROWN, 10-3/4"	28480	8120-1118
	8120-1128	1	CABLE, COAX, 50 OHM, WHT BRN, 8"	28480	8120-1128
	8120-1129	1	CABLE, COAX, 50 OHM, WHT YEL, 4"	28480	8120-1129
	8120-1130	1	CABLE, COAX, 50 OHM, WHT GRN, 6-1/4"	28480	8120-1130
			OPTION 001		
J1	1250-0909	1	CONNECTOR-COAX, APC-7, 50 OHM BODY	28480	1250-0909
J1	1250-0816	1	CONTACT:RF CONNECTOR FOR APC-7 CONNECTOR	02660	131-1054

See introduction to this section for ordering information

Table 6-2. Manufacturers Code List

MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
01121	ALLEN BRADLEY CO.	MILWAUKEE, WIS.	53204
02114	FERROXCUBE CORP.	SAUGERTIES, N.Y.	12477
02660	AMPHENOL CORP.	BROADVIEW, ILL.	60153
04713	MOTOROLA SEMICONDUCTOR PROD.INC.	PHOENIX, ARIZ.	85008
07263	FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV.	MOUNTAIN VIEW, CALIF.	94040
07700	TECHNICAL WIRE PROD. INC.	CRANFORD, N.J.	07016
14655	CORNELL DUBLIER ELECT. DIV.FEDERAL PACIFIC ELECT. CO.	NEWARK, N.J.	07105
15818	TELEDYNE INC. SEMICONDUCTOR DIV.	MOUNTAIN VIEW, CALIF.	94042
28480	HEWLETT-PACKARD CO. CORPORATE HQ	YOUR NEAREST HP OFFICE	
56289	SPRAGUE ELECTRIC CO.	N. ADAMS, MASS.	01247
71785	CINCH MFG. CO. DIV TRW INC.	ELK GROVE VILLAGE, ILL.	
72136	ELECTRO MOTIVE MFG. CO. INC.	WILLIMANTIC, CONN.	06226
72982	ERIE TECHNOLOGICAL PROD. INC.	ERIE, PA.	16512
78488	STACKPOLE CARBON CO.	ST. MARYS, PA.	15857
79136	WALDES KOHINOOR INC.	LONG IS. CITY, N.Y.	11101
80031	MEPCO DIV. SESSIONS CLOCK CO.	MORRISTOWN, N.J.	07960
80131	ELECTRONIC INDUSTRIES ASSOCIATION	WASHINGTON D.C.	20006
91418	RADIO MATERIALS CO.	CHICAGO, ILL.	60646
96733	SAN FERNANDO ELECT. MFG. CO.	SAN FERNANDO, CALIF.	91341
99800	DELEVAN ELECTRONICS CORP.	E. AURORA, N.Y.	14052

BACK DATING
MANUAL
CHANGES

SECTION VII
MANUAL CHANGES

7-1. MANUAL CHANGES

7-2. Current Instruments

7-3. This manual applies directly to standard Model 5257A Transfer Oscillator having serial prefix number 1348A (refer to Paragraph 1-10).

7-4. Newer Instruments

7-5. As changes are made, newer instruments may have serial prefixes that are not listed in this manual. The manuals for these instruments are supplied with a manual change sheet, containing the required information. If this sheet is missing, contact the nearest Hewlett-Packard Sales and Service Office for information.

7-6. Older Instruments

7-7. To adapt this manual to instruments having a serial prefix prior to 1348A, perform the backdating that applies to your instrument's serial prefix, as listed in the table below.

For serial prefix...	Perform change...
748	1,2,3,4,5,6,7
804	2,3,4,5,6,7
820	3,4,5,6,7
928	4,5,6,7
976	5,6,7
1104	6,7
1124A	7

CHANGE 1 Page 6-10, Table 6-1;
Change MP12 part number from 0370-0472 to 0370-0102.

Page 6-17, Table 6-2;
Change 0370-0472 to 0370-0102.

CHANGE 2 Page 8-5, Figure 8-3, A1 schematic;
Make the following changes:
A1R19 to 680 ohms.
A1Q4 to 2N2857; change series number to 744.

Page 6-3, Table 6-1;
Change A1R19 to 0757-0920 R:FXD MET FLM 680 OHM 2% 1/4W
Change A1Q4 to HP Part No. 1854-0048.

CHANGE 2 (Cont'd)

Page 7-8, Figure 7-6, A8 schematic:
Make the following changes:
A8C4 to 82 PF
Add A8C8 0.01 UF; connected from Q3 emitter to ground.
Change A8C3, 5, and 10 to 1000 PF
Change A8R5 to 30 ohms
Remove asterisk from A8R12
Change A8R14, 18, 25, and 29 to 910 ohms
Change A8R16, 20, 27, and 31 to 1100 ohms
Change A8Q1, 7, and 8 to 1854-0323
Change A8Q3 to 1854-0073
Change series number to 744

Page 7-10 and 7-11, Table 7-1:
Change A8C4 to 0140-0193 C:FXD MICA 82 PF 5% 300 VDCW
Add A8C8 0150-0093 C:FXD CER 0.01 UF +80-20 100 VDCW
Change A8C3, 5, and 10 to 0160-2337 C:FXD CER 1000 PF 20% 75 VDCW
Change A8R5 to 0698-3111 R:FXD COMP 30 OHM 5% 1/8W
Change A8Q3 to HP Part No. 1854-0073
Change A8Q1, 7, and 8 to 1854-0323
Change A8R14, 18, 25, and 29 to: 0757-0923 R:FXD MET FLM 910 OHM 2% 1/4W
Change A8R16, 20, 27, and 31 to: 0757-0925 R:FXD MET FLM 1100 OHM 2% 1/4W

CHANGE 3 Page 6-3, Table 6-1:
Add A1C21 0160-2143 C:FXD 2000 PF +80-20% 1000 VDCW
Delete A1C25 0150-0031 C:FXD TI 2 PF 5% 500 VDCW

Page 6-6, Table 6-1:
Change A7A1R3 to 0757-0939 R:FXD MET FLM 4300 OHM 2% 1/4W

Page 8-5, Figure 8-3:
Add A1C21; connect from junction R22, R23, L5 to ground
Delete A1C25
Change series number to 820

Page 8-13, Figure 8-7:
Change A7A1R3 to 4300 ohms; connect R3 in parallel with C4.
Change series number to 744
Delete R21 from A7A1 component locator and schematic.

CHANGE 4

Page 6-4, Table 6-1:
Change A2 from 05257-60211 to 05257-60009
Change 05257-20211 to 05257-20009

Page 8-5, Figure 8-3:
Change part number on A2 schematic to 05257-60009

Page 4-3, Paragraph 4-22, last sentence:
Change to read: The reference level is adjusted with APC ADJ, A4R10 (screw driver control)

Page 5-4, Table 5-3, APC ADJUSTMENT, 4th sentence:
Change to read: With 5257A controls set as above, adjust A4R10 (through top cover) for center reading on meter.

Page 5-8:
Delete Figure 5-2; add Figure 7-1 Top, Bottom, and Side Internal Views

Page 6-3, Table 6-1:
Change A4 part number from 05257-60038 to 05257-60005
Change Blank board number from 05257-20038 to 05257-20005

Page 8-4, Table 6-1:
Change A4R10 to 2100-1760, R:VAR WW 5K OHM 10% LIN 1/2W

Page 8-7, Figure 8-4:
Replace A4 schematic with Figure 7-2
Replace A4 component locator with Figure 7-3

Page 6-6, Table 6-1:
Change part number of A7 VFO LINEARIZER ASSY from 05257-60044 to 05257-60018

Page 6-7, Table 6-1:
Change A7A3C9 to read: 0150-0029, C:FXD 1 PF 10% 500 VDCW

Page 8-13, Figure 8-7:
Change part number of A7 VFO ASSY from 05257-60044 to 05257-60018 (top of schematic)
Change value of A7A3C9 to 1 PF

Page 6-9, Table 6-1:
Change part number of A11 Board Assy from 05257-60031 to 05257-60011
Delete A11P6, 1251-0099 connector: RF 50 pin.

Page 8-9, Figure 8-5:
Replace A11 schematic with Figure 7-7
Replace A11 component locator with Figure 7-4

CHANGE 4 (Cont'd)

Page 6-3, Table 6-1:
Change A1R17 to 07..-0808, 82 ohms

Page 8-5, Figure 8-3:
Change value of A1R17 to 32 ohms

Page 8-6, 5th Paragraph:
Change to read: APC adjustment A4R10 is accessible through the top cover plate. This control is set to give mid-scale meter reading, in the APC mode with the VFO at 100 MHz, LEVEL Control full cw, and no input signal.
Change A4 APC No. 1 block diagram to indicate that the potentiometer referenced as R2 (APC BAL) is now A4R10.

Page 6-9 and 6-10, Table 6-1:
Delete: A12 05257-60032 Board Assy: Master Interconnector
A13 05257-60033 Cable Assy: Thumbwheel
R2 2100-1659 R:Var 5K (APC Pot)
Brkt. — APC Pot 05257-00015
Housing-Tran. Osc. 05257-20089
Front Panel 05257-20082
W1 Cable Assy — Main 05257-60041
W2 Cable Assy — VFO 05257-60042
Cover-top 05257-00023

Add:
P6 1251-0099 Connector 50 pin
XA4 1251-0382 Connector 12 pin
XA5, XA6, XA9 1251-0160 Connector 15 pin
XA8, XA10 1251-0159 Connector 30 pin
Jackscrew Cont. 1251-1913, 2 ea.
P3 1251-1914 Body:R&P Connecor 14 pin
J3 1251-1915 Body:R&P Connector 14 pin
Housing-Trans Osc 05257-20020
Panel:Front 05257-20023
Cable Assy-Thumbwheel 05257-60020
W1 Cable Assy-Main 05257-60024
Cable Assy-Jumper 05257-60027
Cover-Top 05257-00011

Page 5-1, Table 5-1:
Change part number of assemblies as follows:
A2 to 05257-60009
A4 to 05257-60005
A7 Var. Freq. Oscillator to 05257-60018
A11 to 05257-60011
A13 to 05257-60020

Delete: A12 Master Interconnector 05257-60032

CHANGE 5 Page 6-11, Table 6-1:
Replace A8 parts list with Table 7-1. A8 part number is now 05257-60013.

Page 8-15, Figure 8-8:
Replace A8 component locator with Figure 7-5.
Replace A8 schematic with Figure 7-6.

Page 5-1, Table 5-1:
Change A8 assembly part number to: 05257-60013.

CHANGE 6 Page 6-10, Table 6-1:
Delete 05257-20085 Panel:Front, Standard (Mint Gray).

Add 05257-20082 Panel:Front, Standard (Light Gray)

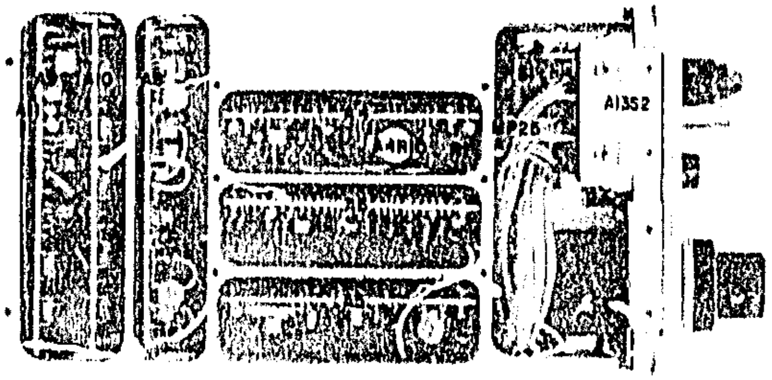
CHANGE 7 Page 6-3, Table 6-1:
Change A1R24 from HP Part No. 2100-1985 to 0757-0346; Description R:FXD MET FLM 10 OHM 1% 1/8W (FACTORY SELECTED PART); Mfr. Part No. 0757-0346.

Page 8-5, Figure 8-3:
Change "SERIES 1348" at top of A1 diagram to "SERIES 848".

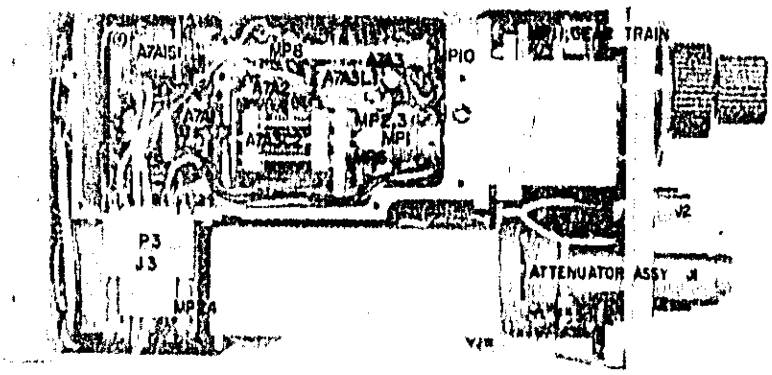
Change variable resistor A1R24 to a fixed 10 ohm resistor and "R24" to "R24*".

Figure 7-1. Top, Bottom, and Side Internal Views

TOP



BOTTOM



RIGHT SIDE

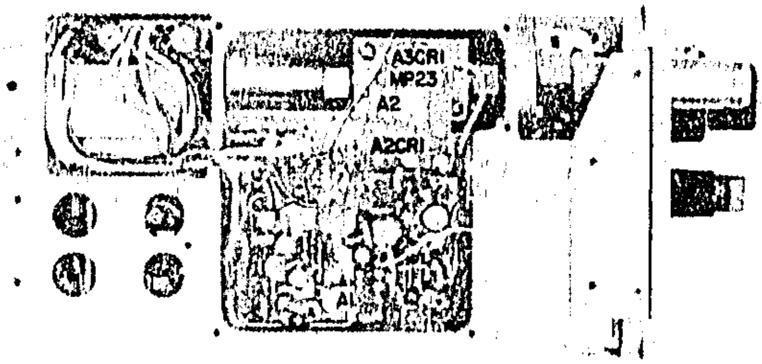


Figure 7-2. A3/A4 Assembly Schematic

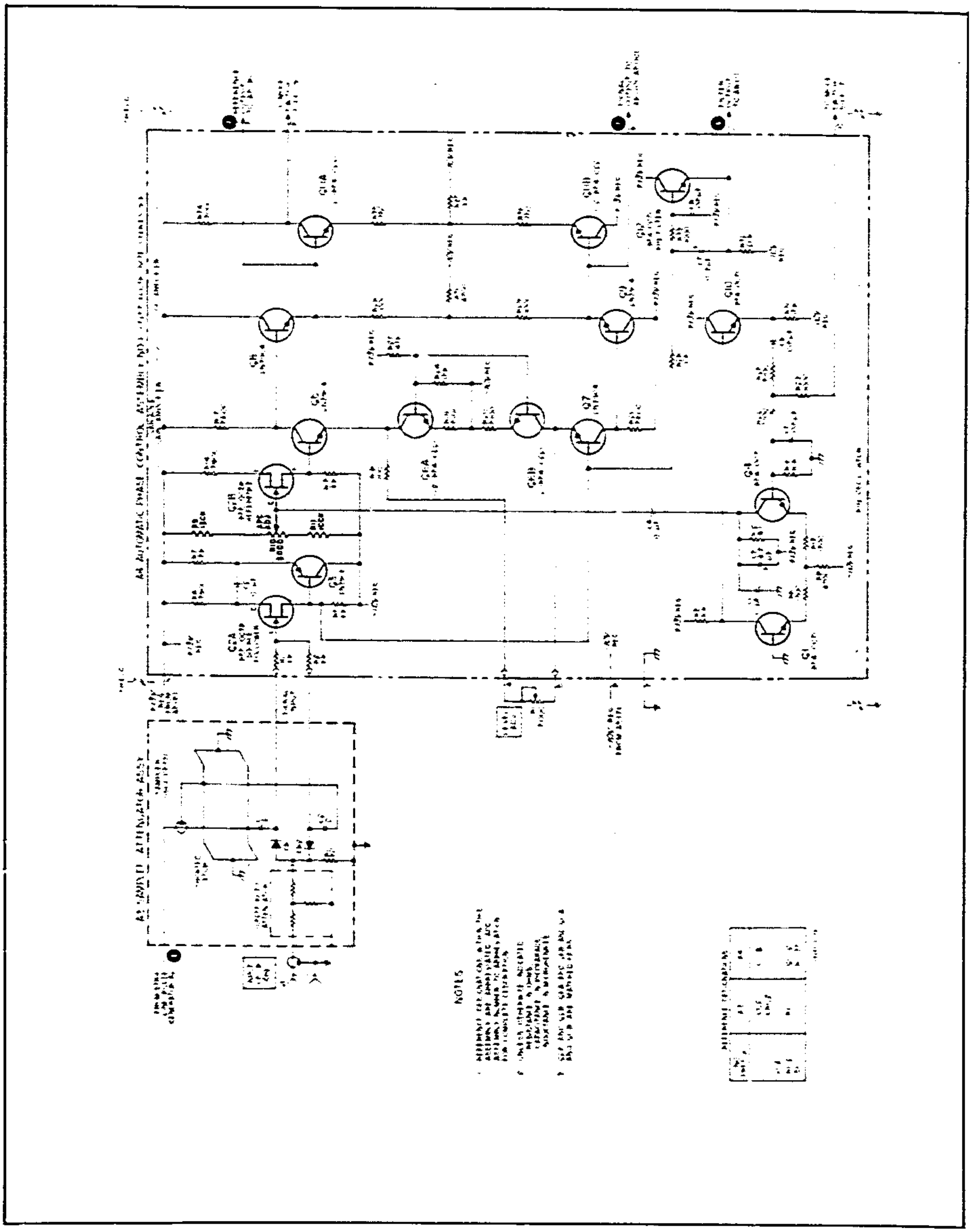


Figure 7-3. A4 Component Locator

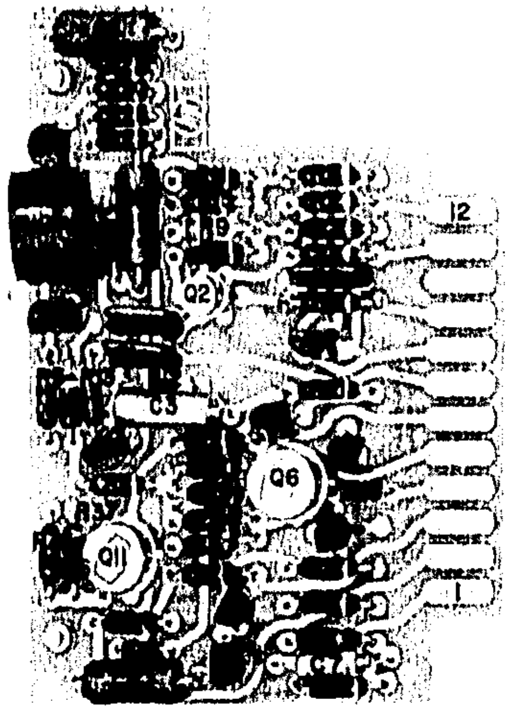


Figure 7-4. A11 Component Locator

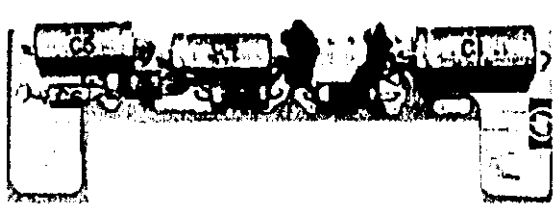


Figure 7-5. A8 Component Locator

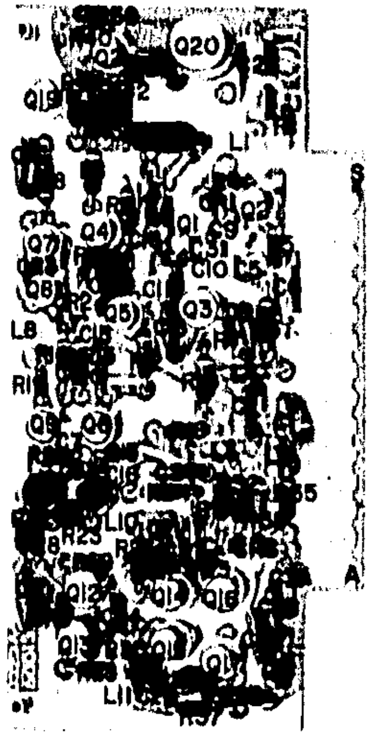


Figure 7-6. A8 Schematic

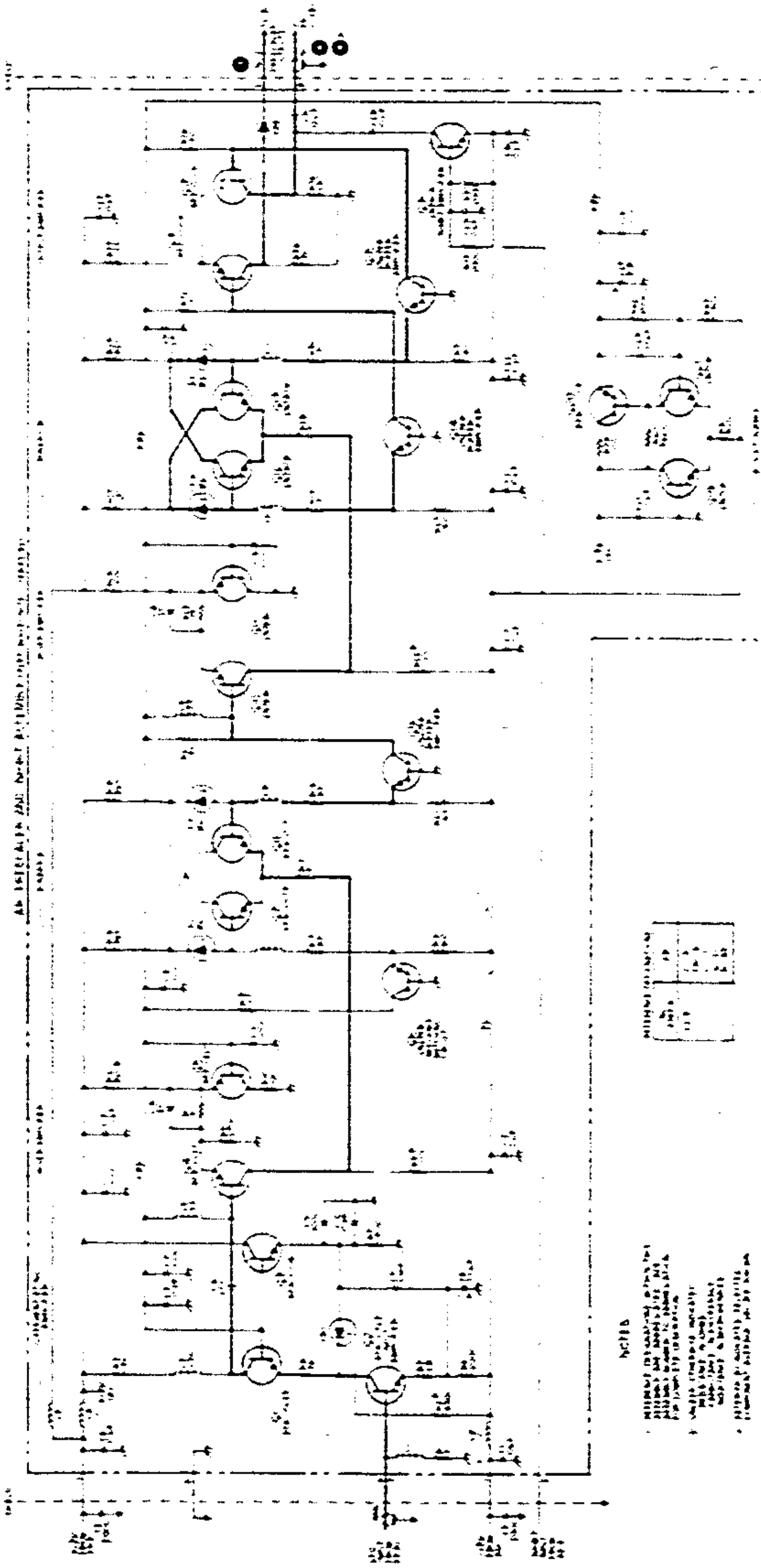


Figure 7-7. A11 Schematic

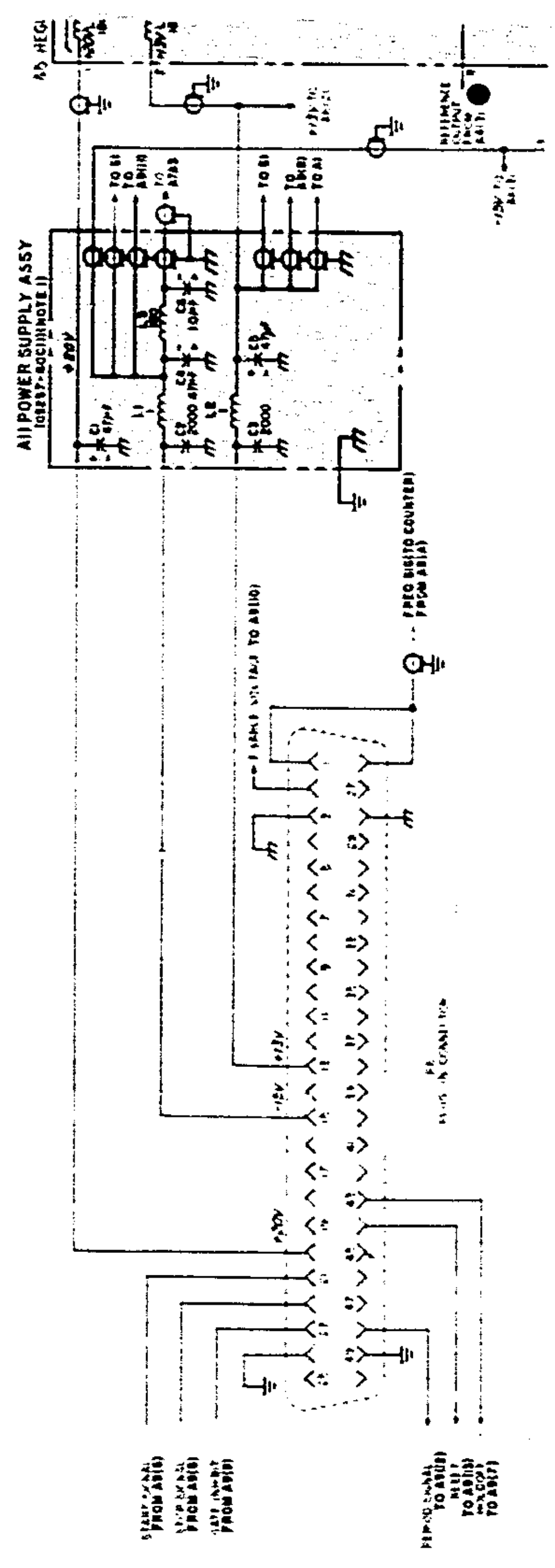


Table 7-1. A8 Prescaler Assembly (05257-60013)

Reference Designation	ⓗ Part No.	Description #	Note
A8C1			
A8C2	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C3	0160-3277	C:FXD CER .01 UF 20% 50VDCW	
A8C4	0140-0220	C:FXD MICA 200 PF 5% 300VDCW	
A8C5	0160-3277	C:FXD CER .01 UF 20% 50VDCW	
A8C6	0180-0230	C:FXD ELECT 1.0 UF 20% 50VDCW	
A8C7	0160-2327	C:FXD CER 1000 PF 20% 75VDCW	
A8C8			
A8C9	0160-2327	C:FXD CER 1000 PF 20% 75VDCW	
A8C10	0160-3277	C:FXD CER .01 UF 20% 50VDCW	
A8C11	0160-2327	C:FXD CER 1000 PF 20% 75VDCW	
A8C12	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C13	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C14	0150-0061	C:FXD CER 20 PF 10% 100VDCW	
A8C15	0160-2327	C:FXD CER 1000 PF 20% 75VDCW	
A8C16	0160-2327	C:FXD CER 1000 PF 20% 75VDCW	
A8C17	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C18	0150-0035	C:FXD CER 20 PF 10% 600VDCW	
A8C19	0160-2327	C:FXD CER 1000 PF 20% 75VDCW	
A8C20	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C21	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C22	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C23	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C24	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C25	0180-0116	C:FXD ELECT 6.8 UF 10% 35VDCW	
A8C26	0160-2327	C:FXD CER 1000 PF 20% 75VDCW	
A8C27	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C28	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C29	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C30	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8C31	0150-0093	C:FXD CER 0.01 UF +80-20% 100VDCW	
A8CR1	05379-60014	DIODE GERMANIUM TUNNEL:10MA	
A8CR2	1902-3079	DIODE BREAKDOWN:SILICON 4.53V	
A8CR3	1902-3079	DIODE BREAKDOWN:SILICON 4.53V	
A8CR4	1902-3079	DIODE BREAKDOWN:SILICON 4.53V	
A8CR5	1902-3079	DIODE BREAKDOWN:SILICON 4.53V	
A8CR6	1901-0179	DIODE:SILICON 15WIV	
A8L1	8180-0224	WIRE:#24 1.6" LONG	
	0890-0048	SLEEVE:TEFLON 1.3" LONG	
A8L2	9140-0158	COIL:FXD RF 1 UH 10%	
A8L3	9140-0158	COIL:FXD RF 1 UH 10%	
A8L4	9140-0158	COIL:FXD RF 1 UH 10%	
A8L5	9100-0346	COIL:FXD 0.05 UH 20%	
A8L6	9100-1724	COIL:FXD 0.22 UH 10%	
A8L7	8180-0224	WIRE:#24 1.6 LONG	
	0890-0048	SLEEVE:TEFLON 1.3" LONG	
A8L8	8180-0224	WIRE:#24 1.6" LONG	
	0890-0048	SLEEVE:TEFLON 1.3" LONG	
A8L9	9100-0366	COIL:FXD 0.33 UH 10%	
A8L10	8180-0224	WIRE:#24 1.6" LONG	
	0890-0048	SLEEVE:TEFLON 1.3" LONG	
A8L11	8180-0224	WIRE:#24 1.6" LONG	
	0890-0048	SLEEVE:TEFLON 1.3" LONG	
A8Q1	1854-0073	TRANSISTOR:NPN 2N2857	
A8Q2	1854-0323	TRANSISTOR:NPN 2N2857	
A8Q3	1854-0019	TRANSISTOR:SILICON NPN	
A8Q4	1853-0227	TRANSISTOR:SILICON PNP	

See introduction to this section for ordering information

Table 7-1. A8 Prescaler Assembly (05257-60013) (Cont'd)

Reference Designation	ℏ Part No.	Description #	Note
A8Q5	1853-0227	TRANSISTOR:SILICON PNP	
A8Q6	1854-0019	TRANSISTOR:SILICON NPN	
A8Q7	1854-0073	TRANSISTOR:NPN 2N2857	
A8Q8	1854-0073	TRANSISTOR:NPN 2N2857	
A8Q9	1854-0019	TRANSISTOR:SILICON NPN	
A8Q10	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A8Q11	1853-0015	TRANSISTOR:SILICON PNP 2N3640	
A8Q12	1854-0073	TRANSISTOR:SILICON NPN	
A8Q13	1854-0073	TRANSISTOR:SILICON NPN	
A8Q14	1854-0019	TRANSISTOR:SILICON NPN	
A8Q15	1854-0019	TRANSISTOR:SILICON NPN	
A8Q16	1853-0009	TRANSISTOR:SILICON PNP	
A8Q17	1853-0009	TRANSISTOR:SILICON PNP	
A8Q18	1854-0215	TRANSISTOR:SILICON NPN 2N3904	
A8Q19	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A8Q20	1854-0003	TRANSISTOR:NPN SILICON	
A8Q21	1854-0005	TRANSISTOR:SILICON NPN 2N708	
A8R1	0698-3378	R:FXD CARBON 51 OHM 5% 1/8W	
A8R2	0757-0939	R:FXD MET FLM 4300 OHM 2% 1/4W FACTORY SELECTED PART	
A8R3	0698-3361	R:FXD COMP 150 OHM 5% 1/8W	
A8R4	0698-5173	R:FXD COMP 36 OHM 5% 1/8W	
A8R5	0674-2405	R:FXD COMP 24 OHM 5% 1/8W	
A8R6	0757-0931	R:FXD MET FLM 2000 OHM 2% 1/4W	
A8R7	0698-5178	R:FXD COMP 1500 OHM 5% 1/8W	
A8R8	0757-0925	R:FXD MET FLM 1100 OHM 2% 1/4W	
A8R9	0757-0934	R:FXD MET FLM 2.7K OHM 2% 1/4W	
A8R10	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	
A8R11	0698-3376	R:FXD CARBON 51 OHM 5% 1/8W	
A8R12	0757-0922	R:FXD MET FLM 820 OHM 2% 1/4W	
A8R13	0698-3113	R:FXD CARBON 100 OHM 5% 1/8W	
A8R14	0757-0922	R:FXD MET FLM 820 OHM 2% 1/4W	
A8R15	0698-3376	R:FXD COMP 43 OHM 5% 1/8W	
A8R16	0757-0923	R:FXD MET FLM 910 OHM 2% 1/4W	
A8R17	0698-3378	R:FXD CARBON 51 OHM 5% 1/8W	
A8R18	0757-0922	R:FXD MET FLM 820 OHM 2% 1/4W	
A8R19	0698-3376	R:FXD COMP 43 OHM 5% 1/8W	
A8R20	0757-0923	R:FXD MET FLM 910 OHM 2% 1/4W	
A8R21	0698-3361	R:FXD COMP 150 OHM 5% 1/8W	
A8R22	0757-0925	R:FXD MET FLM 1.1K OHM 2% 1/4W	
A8R23	0698-3380	R:FXD CARBON 75 OHM 5% 1/8W	
A8R24	0757-0924	R:FXD MET FLM 1.0K OHM 2% 1/4W	
A8R25	0757-0922	R:FXD MET FLM 820 OHM 2% 1/4W	
A8R26	0757-0893	R:FXD MET FLM 51 OHM 2% 1/4W	
A8R27	0757-0923	R:FXD MET FLM 910 OHM 2% 1/4W	
A8R28	0698-3378	R:FXD CARBON 51 OHM 5% 1/8W	
A8R29	0757-0922	R:FXD MET FLM 820 OHM 2% 1/4W	
A8R30	0757-0893	R:FXD MET FLM 51 OHM 2% 1/4W	
A8R31	0757-0923	R:FXD MET FLM 910 OHM 2% 1/4W	
A8R32	0757-0904	R:FXD MET FLM 150 OHM 2% 1/4W	
A8R33	0757-0925	R:FXD MET FLM 1.1K OHM 2% 1/4W	
A8R34	0757-0893	R:FXD MET FLM 51 OHM 2% 1/4W	
A8R35	0757-0931	R:FXD MET FLM 2000 OHM 2% 1/4W	
A8R36	0757-0909	R:FXD MET FLM 240 OHM 2% 1/4W	
A8R37	0757-0931	R:FXD MET FLM 2000 OHM 2% 1/4W	
A8R38	0757-0904	R:FXD MET FLM 150 OHM 2% 1/4W	
A8R39	0757-0900	R:FXD MET FLM 100 OHM 2% 1/4W	
A8R40	0757-0942	R:FXD MET FLM 5600 OHM 2% 1/4W	
A8R41	0757-0941	R:FXD MET FLM 5100 OHM 2% 1/4W	
A8R42	0757-0931	R:FXD MET FLM 2000 OHM 2% 1/4W	
A8R43	0757-0945	R:FXD MET FLM 7500 OHM 2% 1/4W	

See introduction to this section for ordering information

SCHEMATIC DIAGRAMS

SECTION VIII
CIRCUIT DIAGRAMS

8-1. INTRODUCTION

8-2. This section includes the following:

a. General Notes for Schematic Diagrams are given in Figure 8-1.

b. Block Diagram (Figure 8-2).

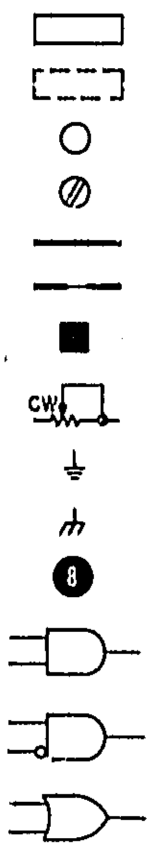
c. Schematic Diagrams and Component Location Illustrations of Model 6257A circuits, assemblies and connectors in the order of their assembly designation (A1 through A11, Figures 8-3 through 8-10). These figures also include voltages.

8-3. The Block Diagram or any schematic diagram, when unfolded, can be used with any other part of this manual, or with the manual closed.

8-4. Dc voltages are measured with a HP Model 412A DC Voltmeter. Typical voltages are shown.

Figure 8-1. Schematic Diagram Notes

SYMBOLS



FRONT PANEL

REAR PANEL

KNOB CONTROL

SCREWDRIVER ADJUST

MAIN SIGNAL PATH

FEEDBACK PATH

CONDUCTING ELEMENT

WIPER MOVES TOWARD "CW" WHEN CONTROL IS ROTATED CLOCKWISE

POWER LINE GROUND

CIRCUIT COMMON GROUND

TEST POINT

"AND" GATE

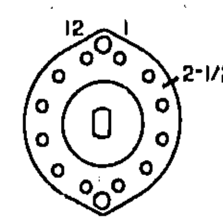
INHIBIT GATE

"OR" GATE

WAVEFORMS SHOWN ARE TYPICAL

SWITCH DESIGNATIONS

A3S1BR(2-1/2)

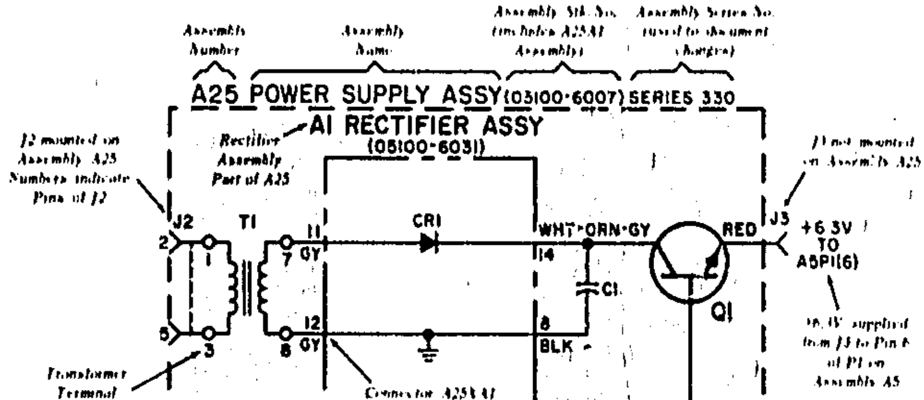


A3S1	SWITCH S1 WITHIN ASSEMBLY A3
B	2ND WAFER FROM FRONT (A=1ST, ETC)
R	REAR OF WAFER (F=FRONT)
(2-1/2)	TERMINAL LOCATION (2½) (VIEWED FROM FRONT)

REFERENCE DESIGNATIONS

REFERENCE DESIGNATIONS WITHIN ASSEMBLIES ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.

ASSEMBLY	ABBREVIATION	COMPLETE DESCRIPTION
A25	C1	A25C1
A25A1	CR1	A25A1CR1
NO PREFIX	J3	J3



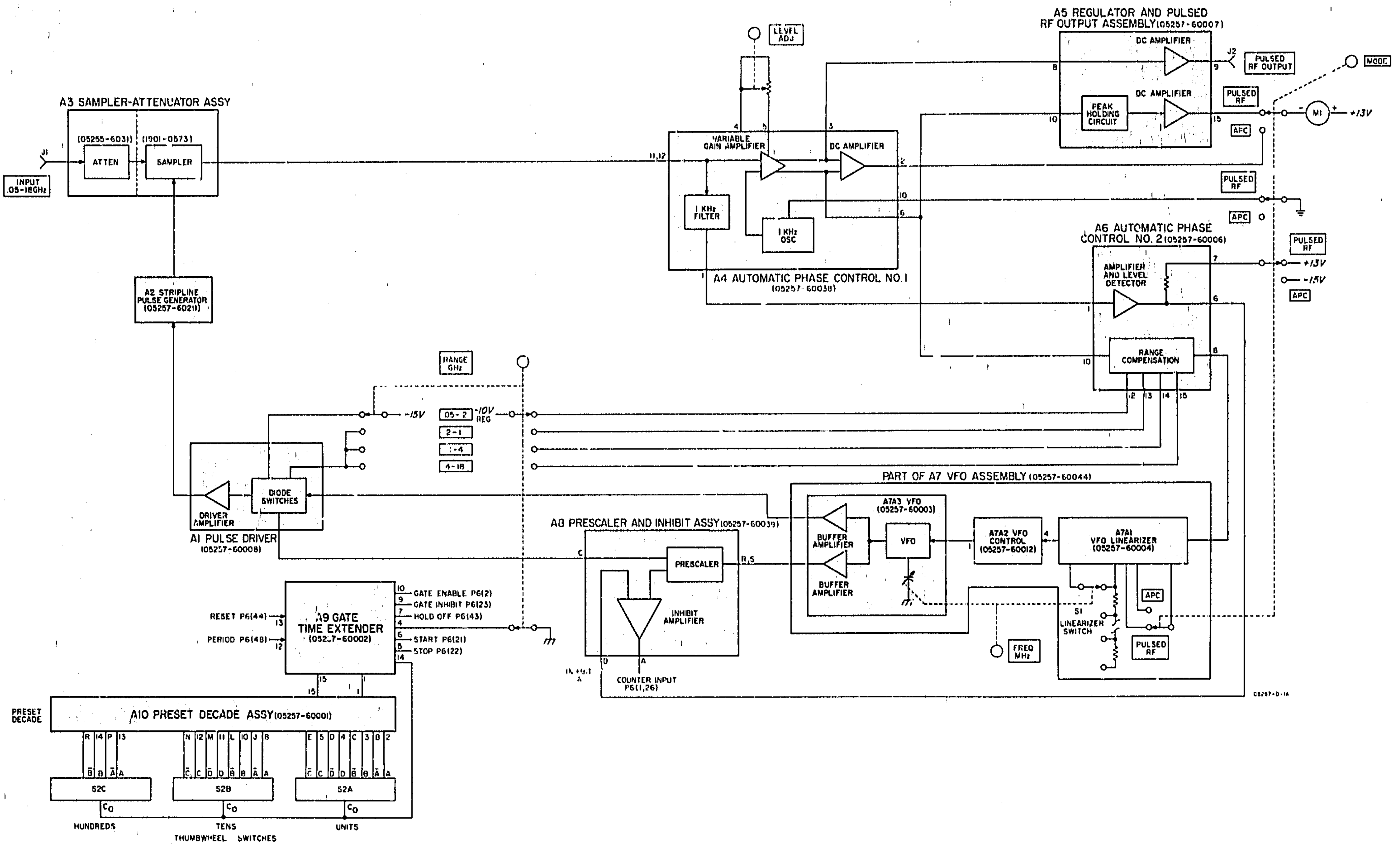
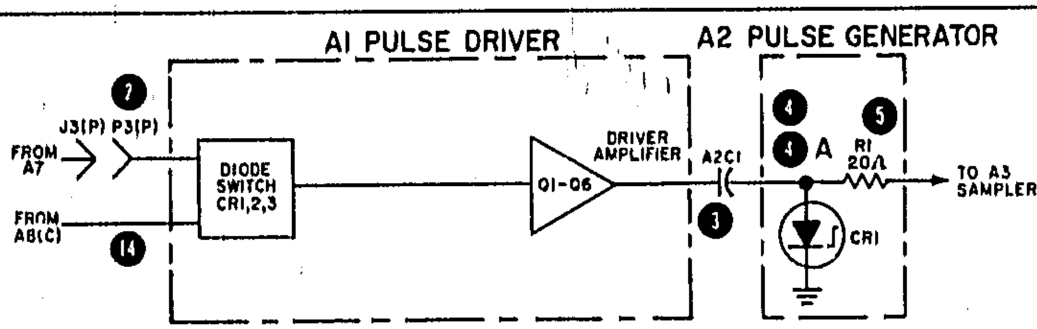


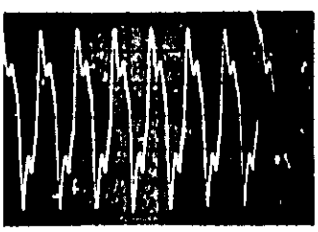
Figure 8-2. Block Diagram

A1 operates at either the VFO frequency or 1/4 the VFO frequency. A1 gives the signal that generates the sampling pulses via the stripline pulse generator A2. In the .05-.2 GHz range, -15 V is removed from CR1, CR2, and CR3, and applied to CR4 and CR5 so that only the VFO signal that is divided by 4 is allowed to trigger the pulse driver. The reverse occurs on all other ranges. R17 is selected for best sensitivity at 18 GHz. Its value ranges from 82Ω to 240Ω. The signal at Q6 collector is about 6 volts peak-to-peak.

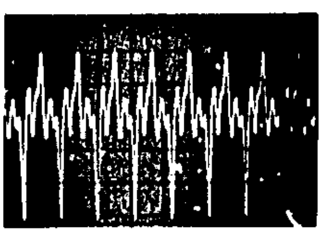
A2 generates pulses that drive the sampling diodes. A2CR1 can be open-circuited by turning the plastic screw above it ccw. This will simulate a non-sampling condition as shown by waveform 4A. The A2 output waveform 5 cannot be used to determine an RF shorted stripline. Do not attempt any repairs on A2 other than replacing CR1. Do not unsolder C1 at A2, always unsolder at A1. The contact under A2CR1 is cut to fit. A shorted stripline is usually caused by a fine wire coming through the hole on the board and touching the ground plane on the bottom causing a non-sampling condition.



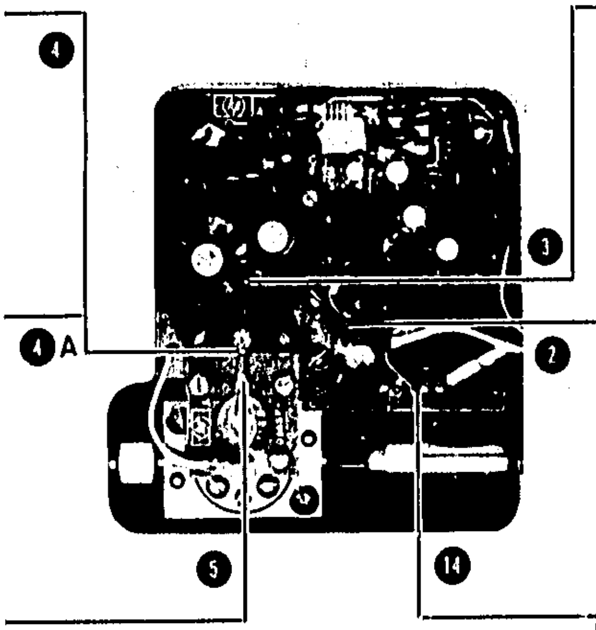
3.5 V p-p @ 17 MHz
A2CR1 OK

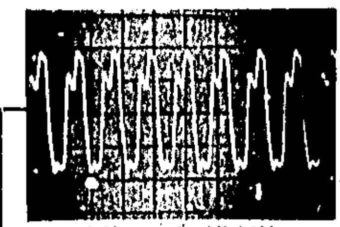


5.5 V p-p @ 17 MHz
A2CR1 open

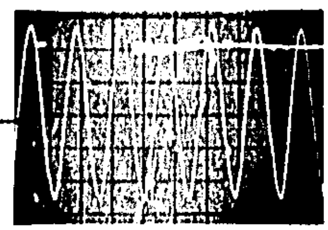


.4 V p-p @ 17 MHz
after 20Ω resistor

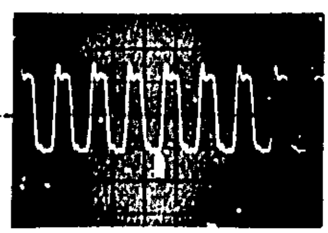




6 V p-p @ 17 MHz
collector of Q6 to grd

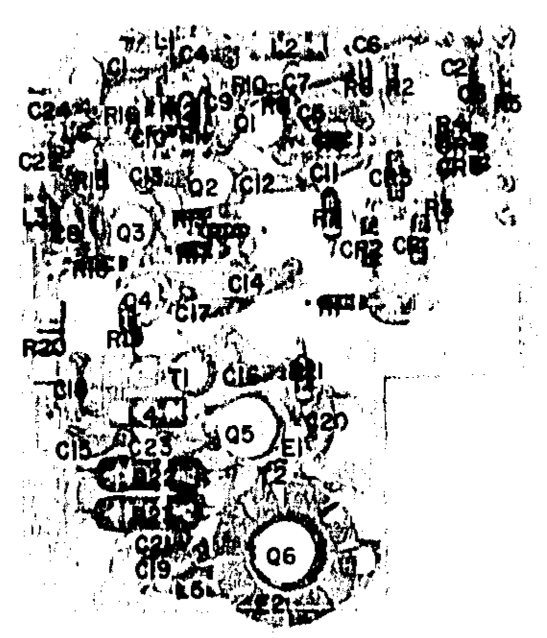


.5 V p-p @ 70 MHz
.2 GHz - 18 MHz range

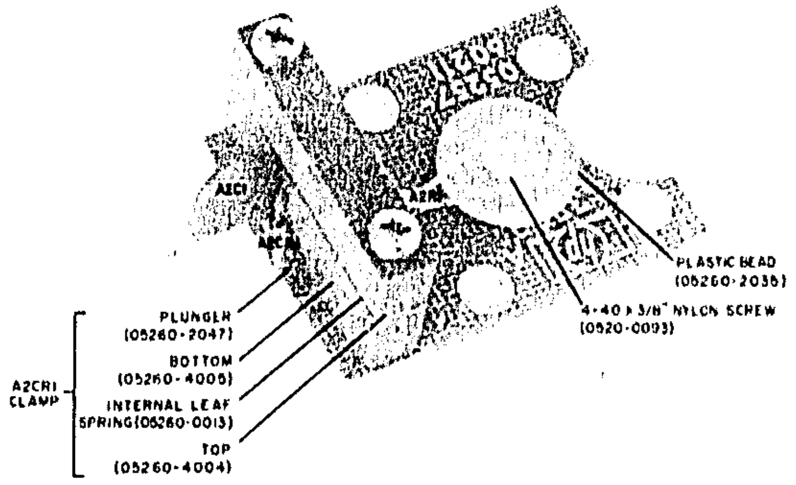


.5 V p-p @ 17 MHz
.05-.2 GHz range

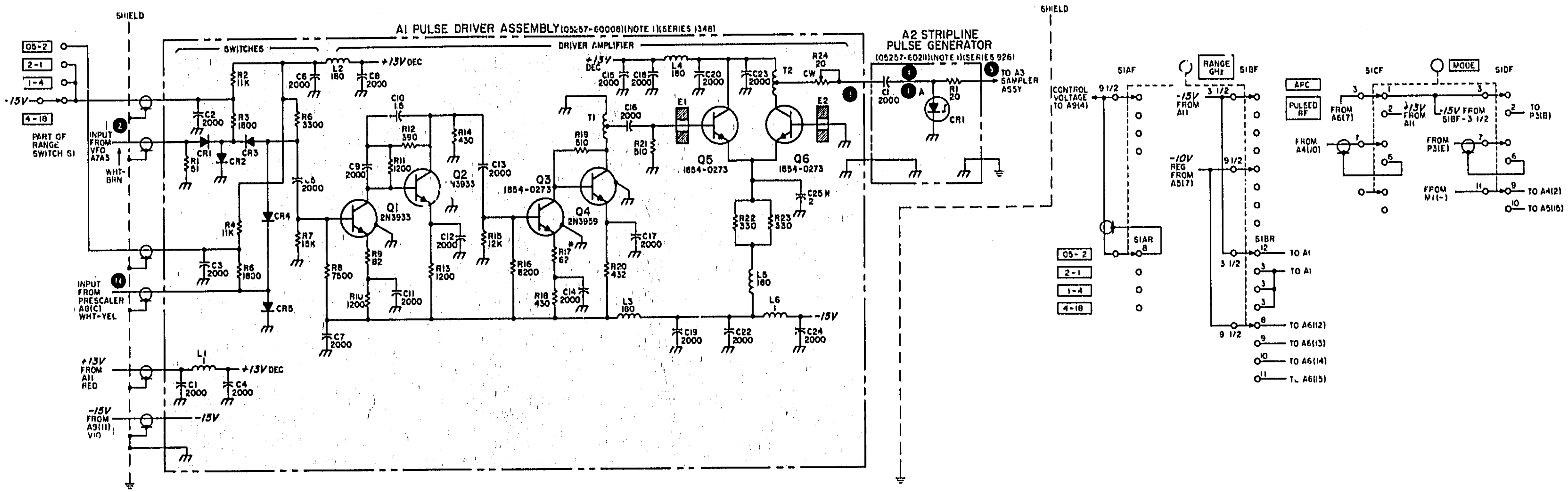
Waveforms taken with HP 180A, 1801A Vertical Amplifier and a 10004A 10 to 1 Divider Probe. The 5257A is in APC mode with no fx input, VFO at 70 MHz, .05 to .2 GHz range, LEVEL fully CW, N = 001 and sampling. Waveform notes indicate exceptions to these conditions.

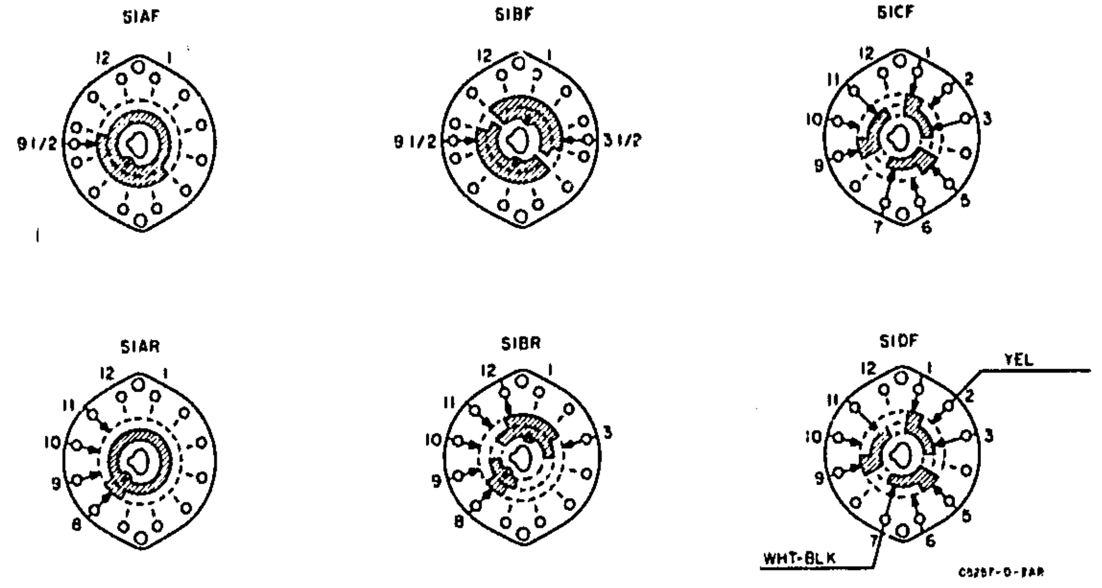


A1



A2





NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS,
   CAPACITANCE IN PICOFARADS,
   INDUCTANCE IN MICROHENRIES
3. EACH SWITCH SHOWN IN MAX CCW POSITION
4. DOT (•) ON ROTOR INDICATES FRONT AND REAR ROTORS ARE ELECTRICALLY CONNECTED
5. ASTERISK (*) INDICATES SELECTED COMPONENT, AVERAGE VALUE SHOWN
6. SERIES B BOARD DIFFERS FROM SERIES C BY ELIMINATION OF RESISTOR R24. CAPACITOR C26 CONNECTS DIRECTLY BETWEEN BOARDS A1 & A2

REFERENCE DESIGNATIONS

NO PREFIX	A1	A2
	C1-25	C1
	CR1-5	CR1
	E1,2	
	L1-6	
	Q1-6	
	R1-24	R1
S1	T1,2	

Figure 8-3. A1 Pulse Driver
A2 Stripline Pulse Generator

A3 contains the sampling diodes which receive their input from the attenuator INPUT signal and the stripline pulse generator A2. A3 output is a low level signal that is the difference between the VFO and the sampled INPUT signal.

To check resistance at INPUT connector measure from center of INPUT connector to ground with an HP 412A. Resistance should be 50Ω ±2Ω. If resistance is not within this range factory repair will be necessary.

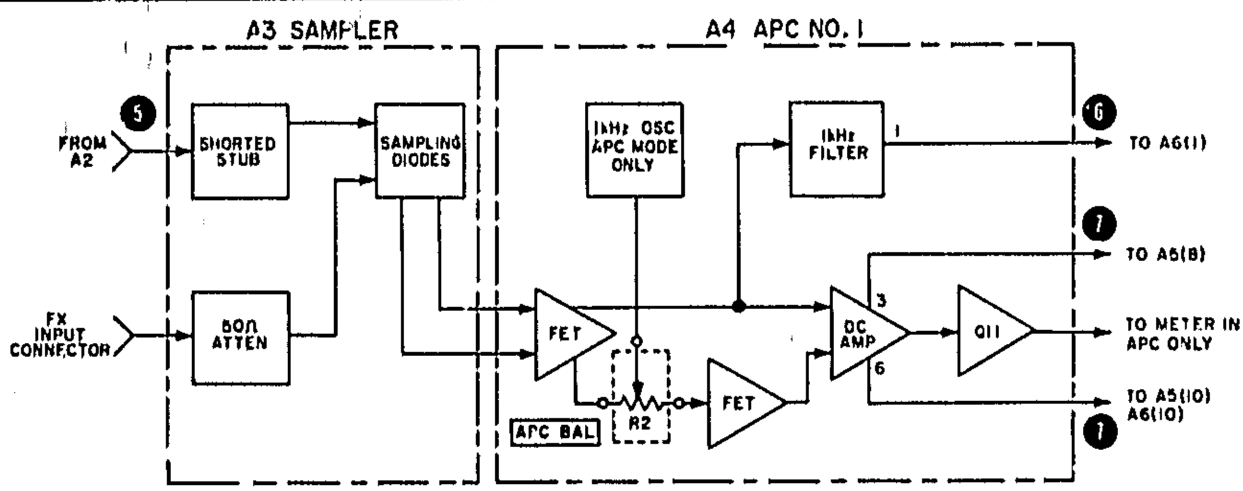
Sampling diodes A3CR1 and A3CR2 may be checked with an HP 412A on the 10K range. To check A3CR1 and A3CR2, unsolder one of the white leads connected to A4R1 and A4R2. With the board removed from the connector, measure the resistance from the INPUT connector to the white leads. The diodes should have a front to back resistance of 10K ohms to infinity, respectively. During the above tests be sure that there are no other connections to the 5257A. Replacement part no. for A3CR1 and A3CR2 is 1901-0573 and includes CR1, CR2, plus holder and resistor in a matched pair.

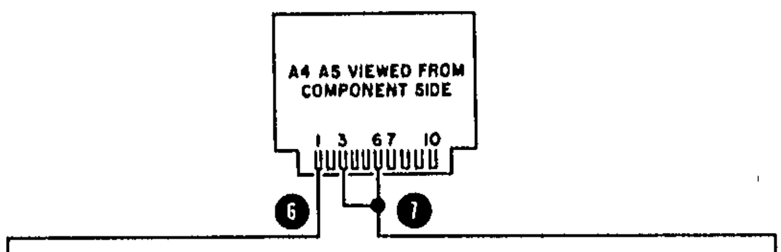
A4 circuits amplify the sampling diodes output. Amplifier bandwidth is about 1 kHz to 4 MHz. Also included on A4 are a 1 kHz oscillator and a 1 kHz filter which are part of the lock sensing circuit in the APC mode.

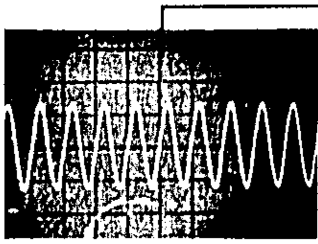
The front-panel APC BAL control is set to give midscale meter reading in the APC mode with the VFO at 100 MHz, LEVEL ADJ full cw, and no input signal.

Lock sensing can be checked by checking the dc voltage at A6(6). A voltage of -15 V indicates phase lock and Counter enabled; -7 V indicates no phase lock and Counter is disabled.

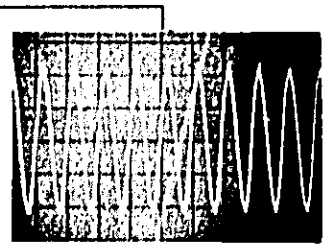
A4 output waveforms at pins 3 and 6 are shown below as waveform no. 7.







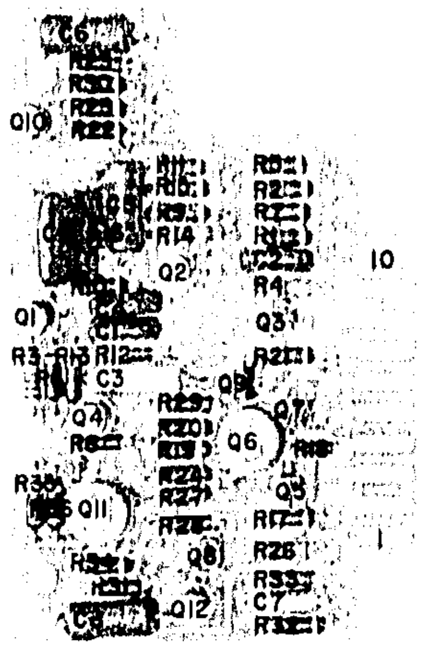
* If sampling there is a small, <20 mV signal here in no lock condition.

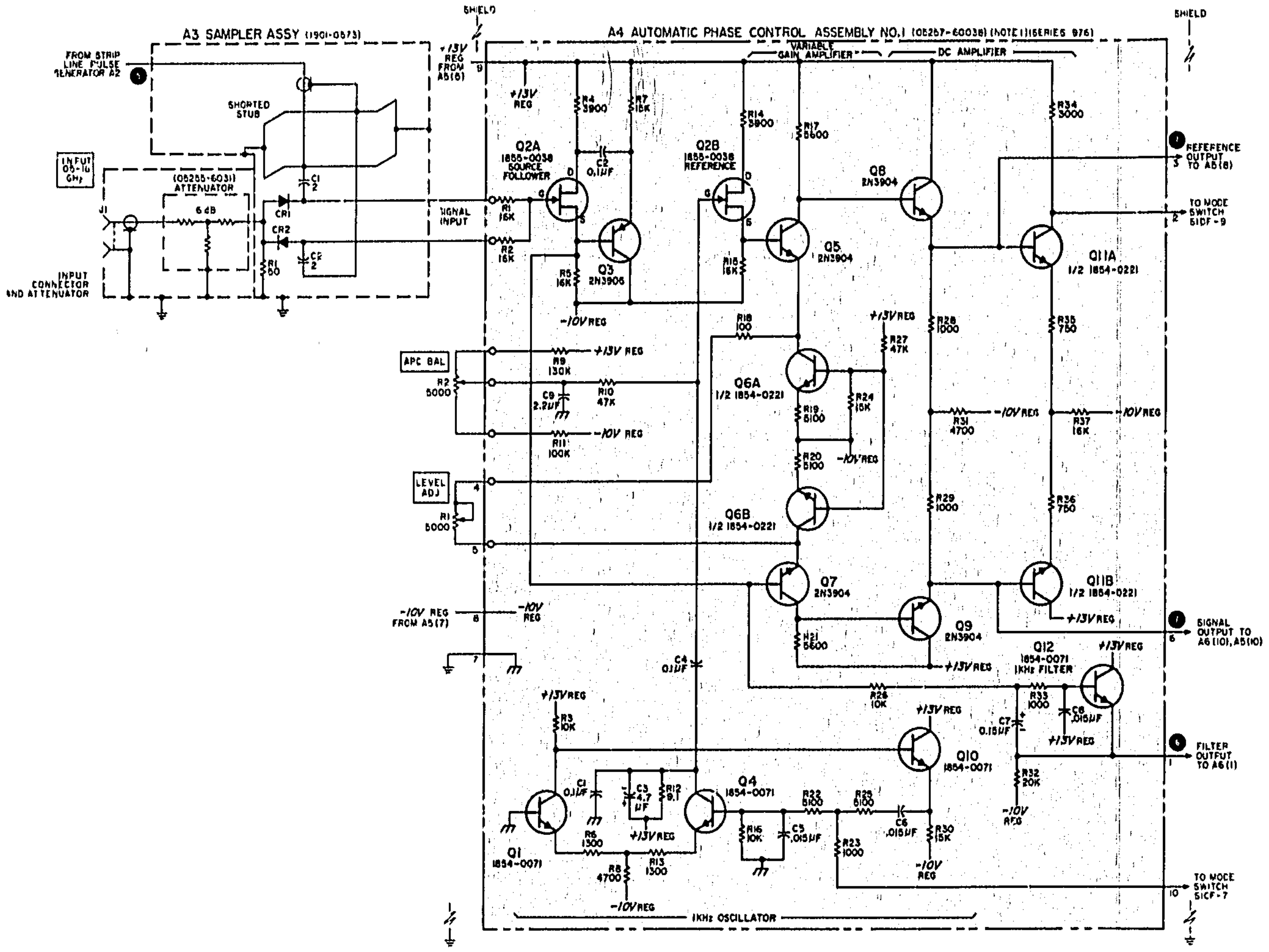


.3 V p-p @ 1 kHz
non-sampling *

.5 V p-p @ 1 kHz
pin 3 is the same

Waveforms taken with HP 180A, 1801A Vertical Amplifier and a 10004A 10 to 1 Divider Probe. The 5257A in APC mode with no fx input, VFO at 70 MHz, .05 to .2 GHz range, LEVEL fully CW, N = 001 and sampling.





NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
   INDUCTANCE IN MICROHENRIES
3. Q2A AND Q2B, Q6A AND Q6B, AND Q11A AND Q11B ARE MATCHED PAIRS.

REFERENCE DESIGNATIONS

NO PREFIX	A3	A4
	C1,2 CR1,2	C1-9
J1,2		
R1,2 S1	R1	Q1-12 R1-37

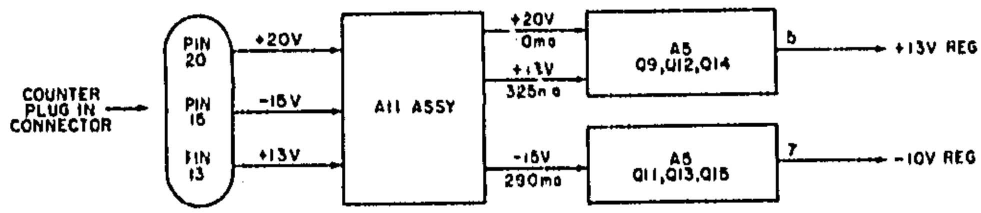
05257-D-3AB

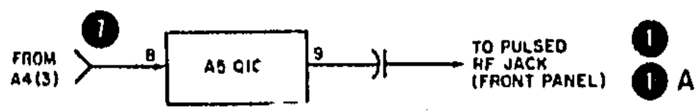
05257-D-3

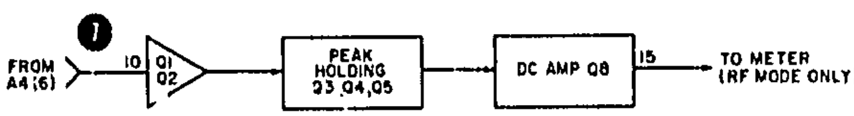
Figure 8-4. A3 Sampler
A4 Automatic Phase Control No. 1

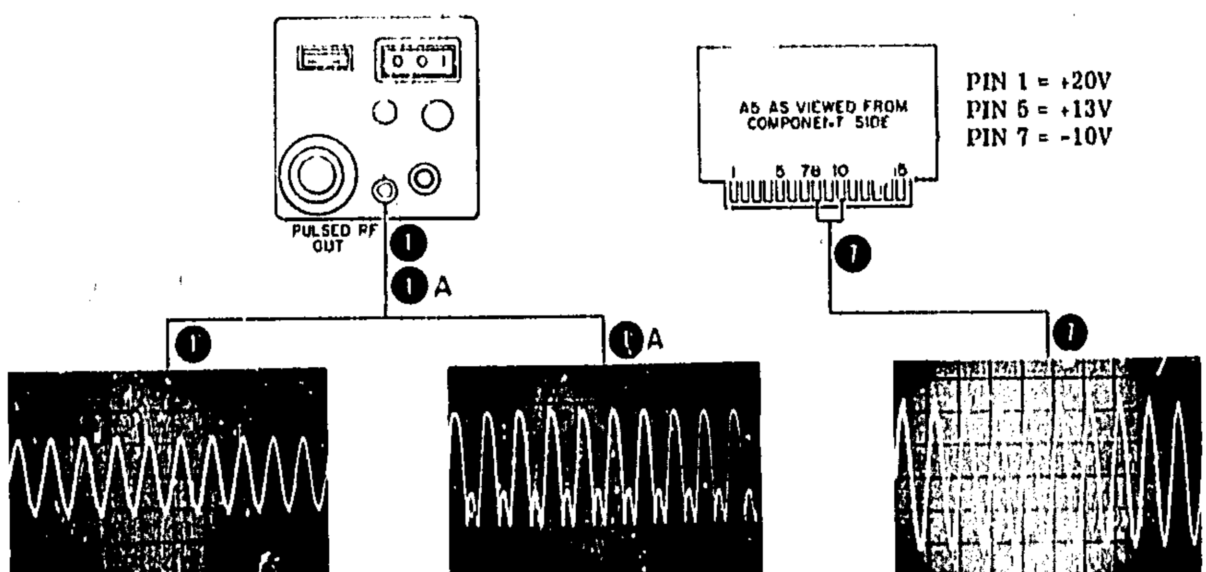
A11 assembly is located at the rear of the 5257A above the plug-in connector. It filters and feeds power supply voltages from Counter to the 5257A regulators. Check this assembly for burned coils.

A5 assembly regulates power supply voltages. The +13 V and -10 V can be ±.5 V. These levels can affect adjustment of A4R10. Q10 is amplifier for isolation of pulses appearing at the Pulsed RF Out jack. The signal that appears at Q1, Q2 is converted by peak holding circuits so that the meter acts as a zero beat detector in the RF mode. The meter is not connected to this circuit in the APC mode.







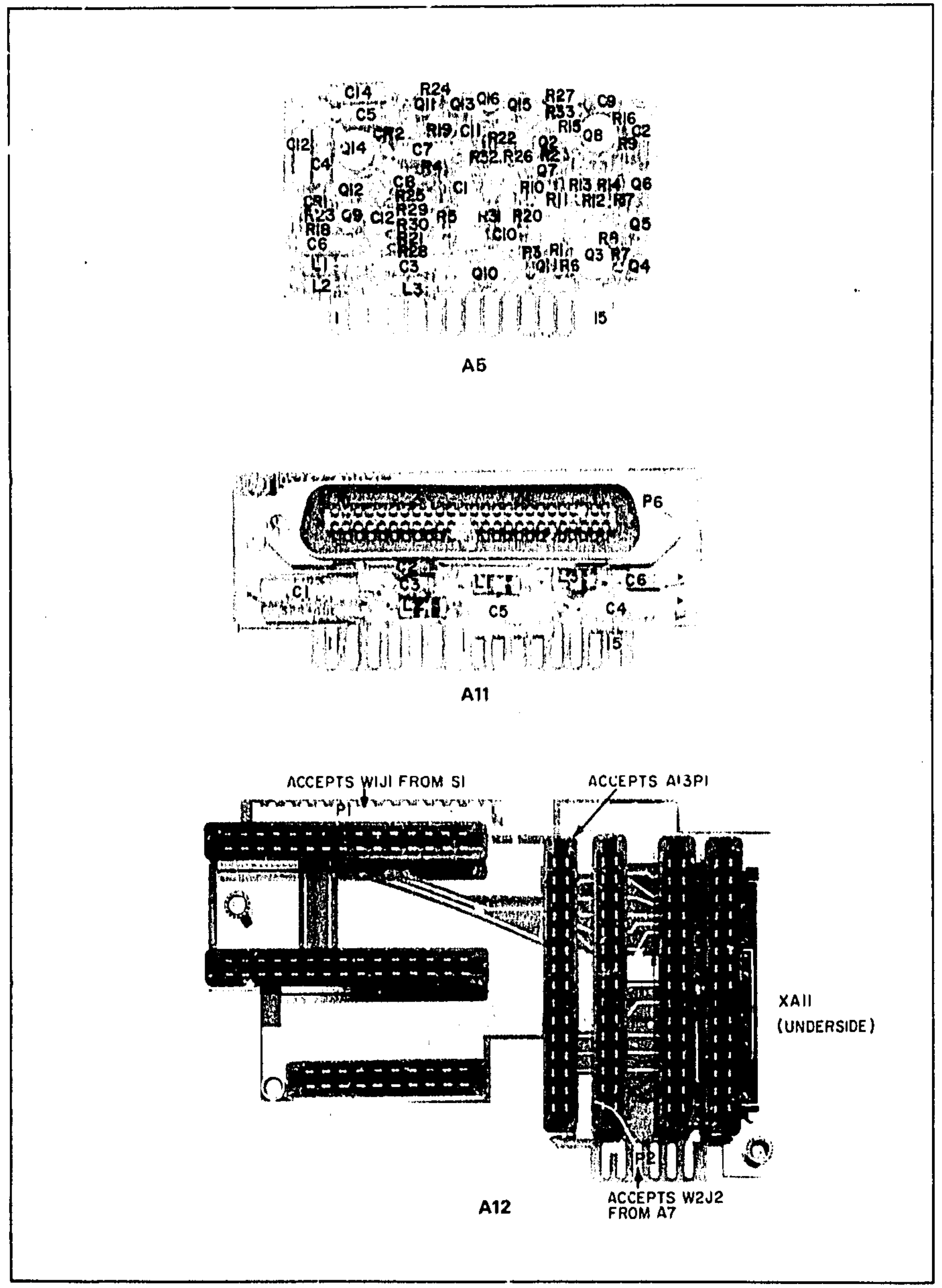


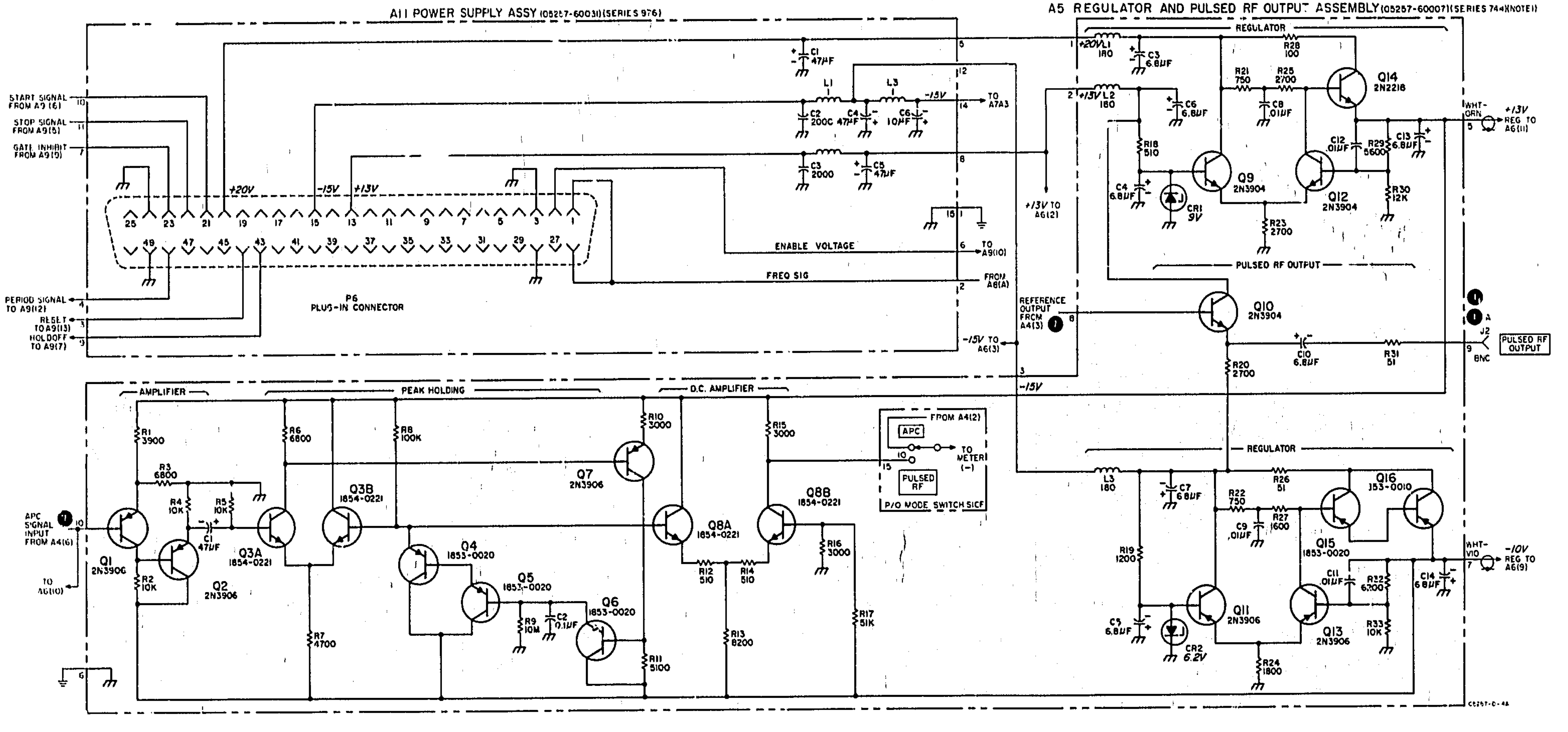
.5V p-p @ 1 kHz, sampling

5.5V p-p @ 1 kHz, not sampling

.5V p-p @ 1 kHz, A4(6) or (3)

Waveforms taken with HP 180A, 1801A Vertical Amplifier and a 10004A 10 to 1 Divider Probe. The 5257A in APC mode with no fx input, VFO at 70 MHz, .05 to .2 GHz range, LEVEL fully CW, N = 001 and sampling.





NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN MICROHENRIES

REFERENCE DESIGNATIONS

NO PREFIX	A5	A11
J2	C1-14 CR1,2 L1-3 Q1-16 R1-33	C1-6 L1-3 P6
S1		

Figure 8-5. A5 Regulator and Pulsed RF Output
A11 Power Supply Filter

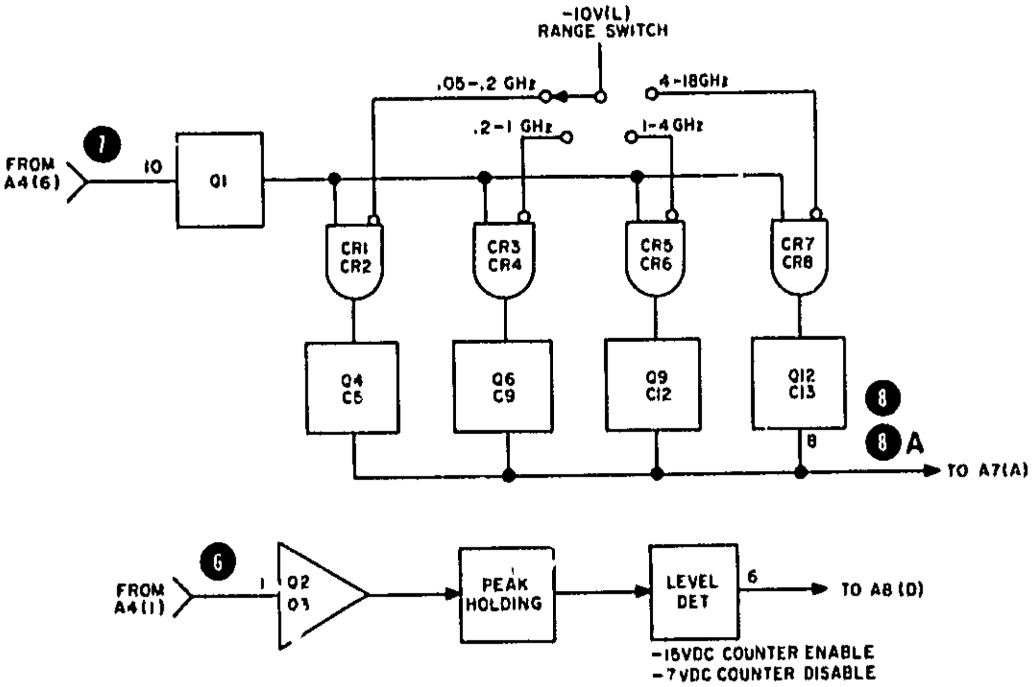
A6 gives frequency compensation for the phase lock loop. Each range has a different time constant inserted into the loop to give the following -3 dB points:

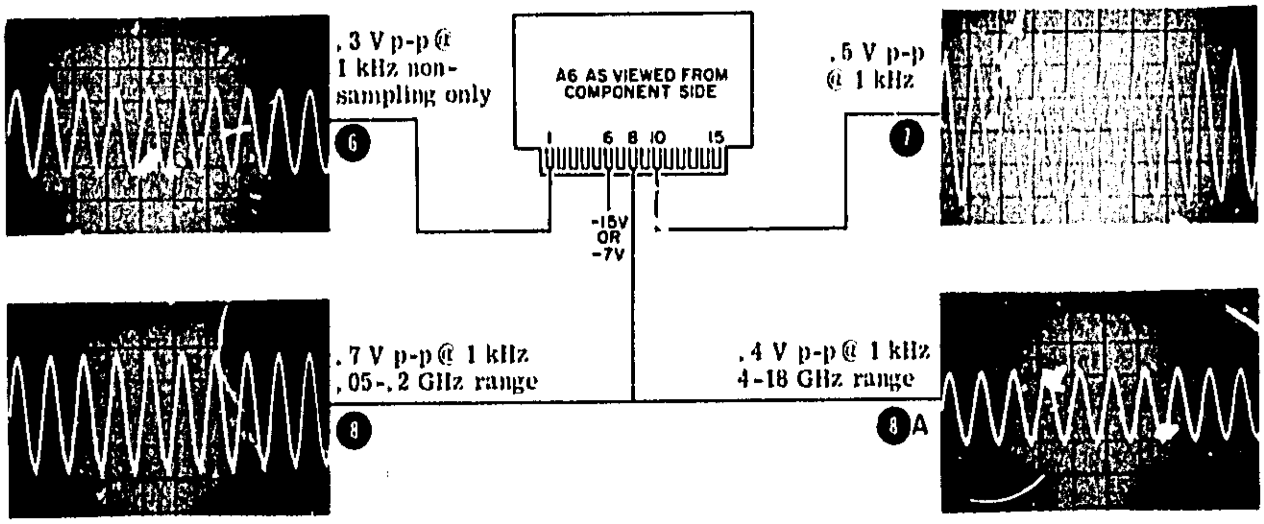
RANGE	-3 dB
.05 to .2 GHz	70 kHz
.2 to 1 GHz	16 kHz
1 to 4 GHz	3 kHz
4 to 18 GHz	800 Hz

Note: This is not the loop bandwidth.

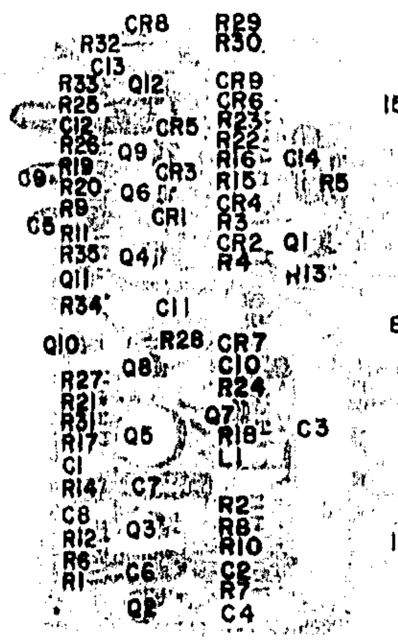
A6 also contains parts of the system lock indicator. In the APC mode with a phase lock condition a 1 kHz signal appears at Q2 input. The level must be greater than 20 mV and will cause -15 V at pin 6 to enable the Counter.

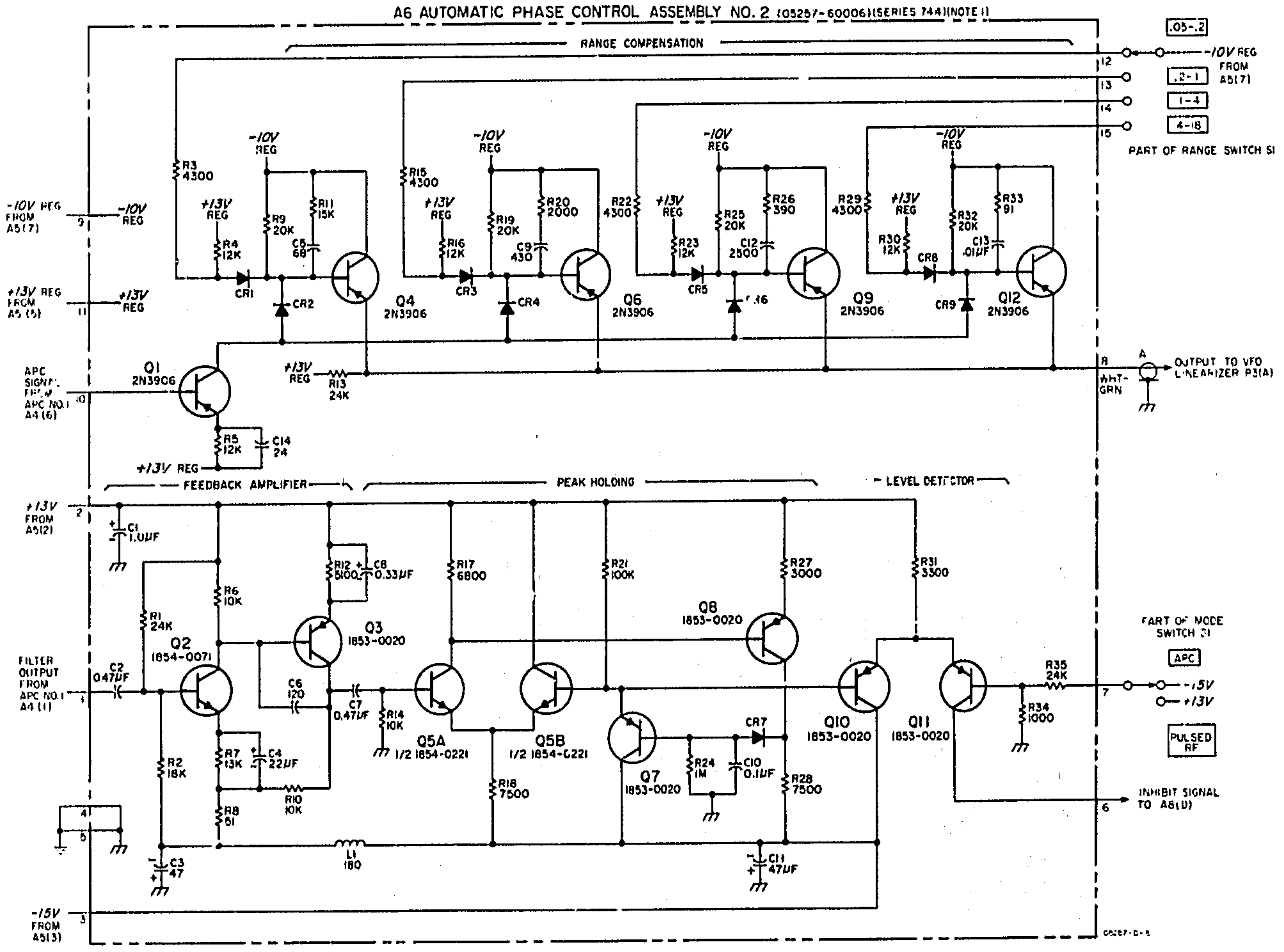
The waveform at point 6 was taken with the unit sampling. The level at this point is small so check the dc output voltage for proper indication.





Waveforms taken with an HP 180A, 1801A Vertical Amplifier and a 10004A 10 to 1 Divider Probe. The 5257A in APC mode with no fx input, VFO at 70 MHz, .05 to .2 GHz range, LEVEL fully CW, N = 001 and sampling. Waveform 8A taken with RANGE set to 4-18 GHz.





NOTES

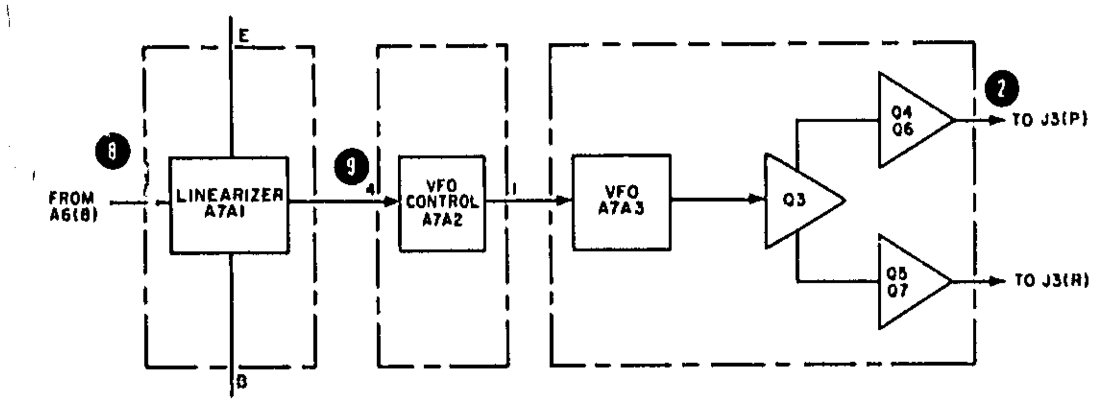
1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN MICROHENRIES

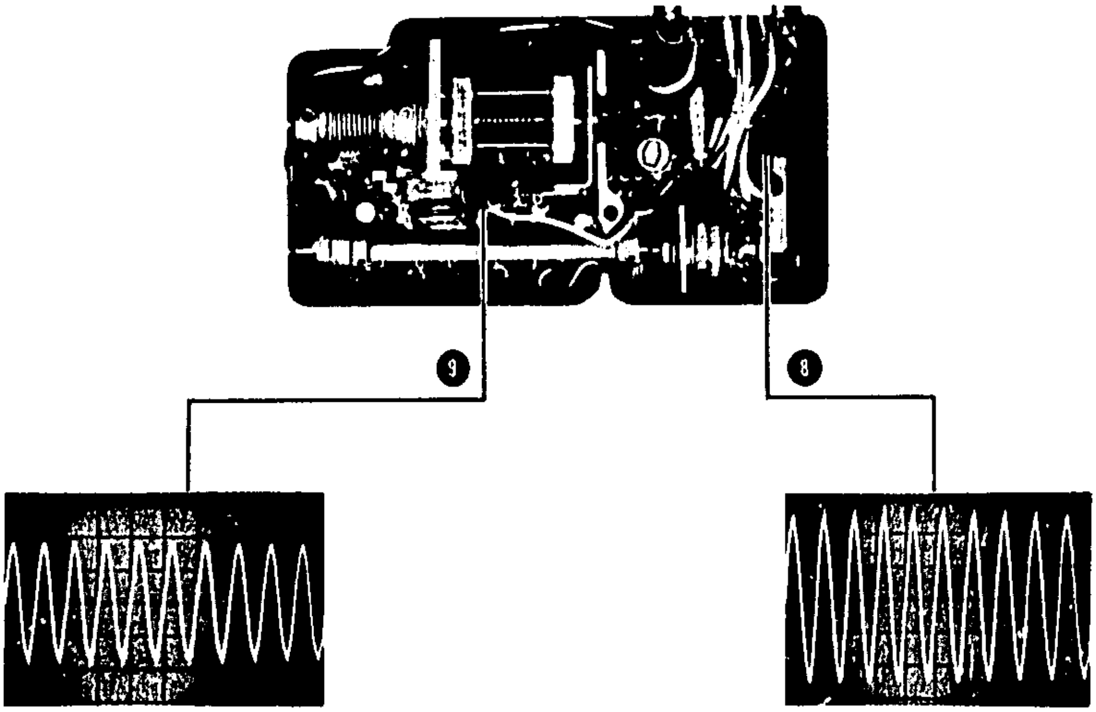
REFERENCE DESIGNATIONS

NO PREFIX	A6
	C1-14 CR1-9 L1 Q1-12 R1-35
S1	

Figure 8-6. A6 Automatic Phase Control No. 2

A7 includes three circuit boards, 1) linearizer A7A1, 2) VFO control A7A2, and 3) VFO A7A3. The frequency range is 66.7 to 133.3 MHz and is the signal displayed by the Counter after prescaler A8. In the APC mode input is from A6. In the PRF mode pin E is grounded and -15 V is applied to pin B which sets point 9 at approximately +8 V as measured with an HP 412A. In the PRF mode a signal from A6 has no effect on A7A2. The linearizer is enabled in the APC mode and holds the VFO level over the tuning range by inserting R8 through R17 into the loop. At 133.3 MHz all the resistors are used. The VFO control A7A2 uses two reverse biased variceps CR1 and CR2. The capacitance is inversely proportional to the bias (an increase in bias decreases the capacitance).

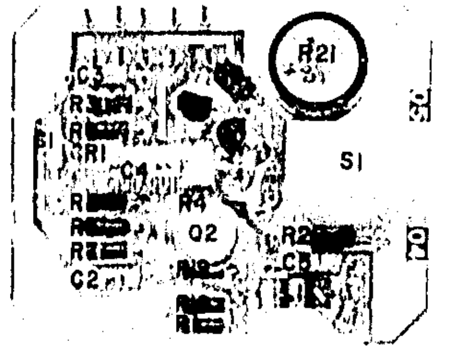




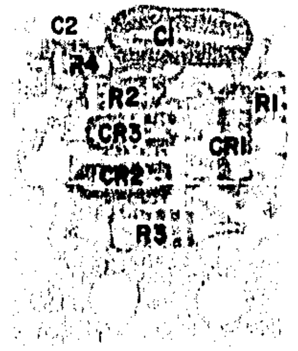
2.5 V p-p @ 1 kHz (PRF mode measure approx. +8 V on HP 412A)

.7 V p-p @ 1 kHz

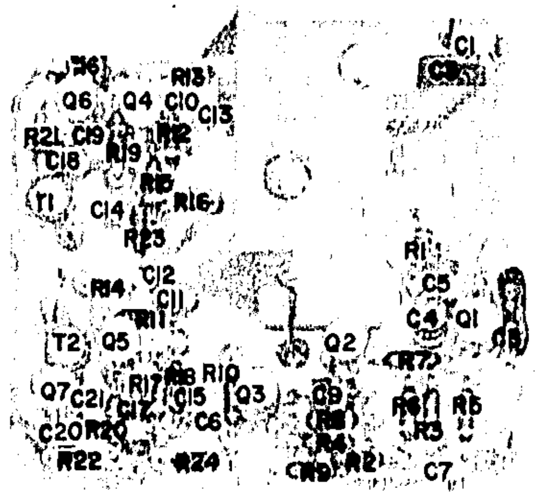
Waveforms taken with an HP 180A, 1801A Vertical Amplifier and a 10004A 10 to 1 Divider Probe. The 5257A in APC mode with no fx input, VFO at 70 MHz, .05 to .2 GHz range, LEVEL fully CW, N = 001 and sampling. Waveform 9 note indicates dc volts for PRF mode.



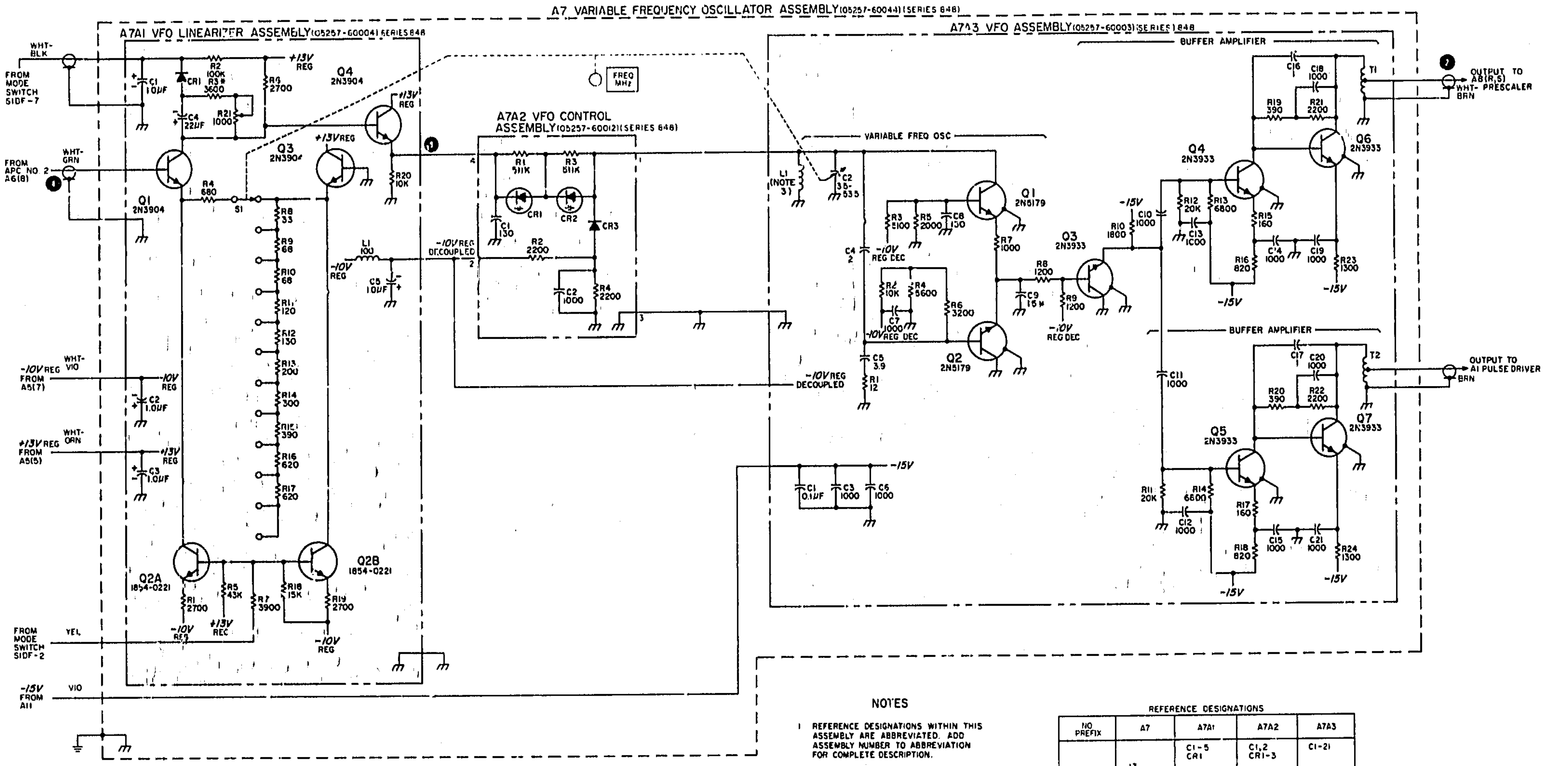
A7A1



A7A2



A7A3



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
   INDUCTANCE IN MICROHENRIES
3. A7A3L1 IS HP STOCK NO. 05257-60022
4. ASTERISK(*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

REFERENCE DESIGNATIONS

NO PREFIX	A7	A7A1	A7A2	A7A3
P1 S1	J3	C1-5 CR1 L1 Q1-4 R1-21 S1	C1,2 CR1-3 R1-4	C1-21 L1 Q1-7 R1-24 T1,2

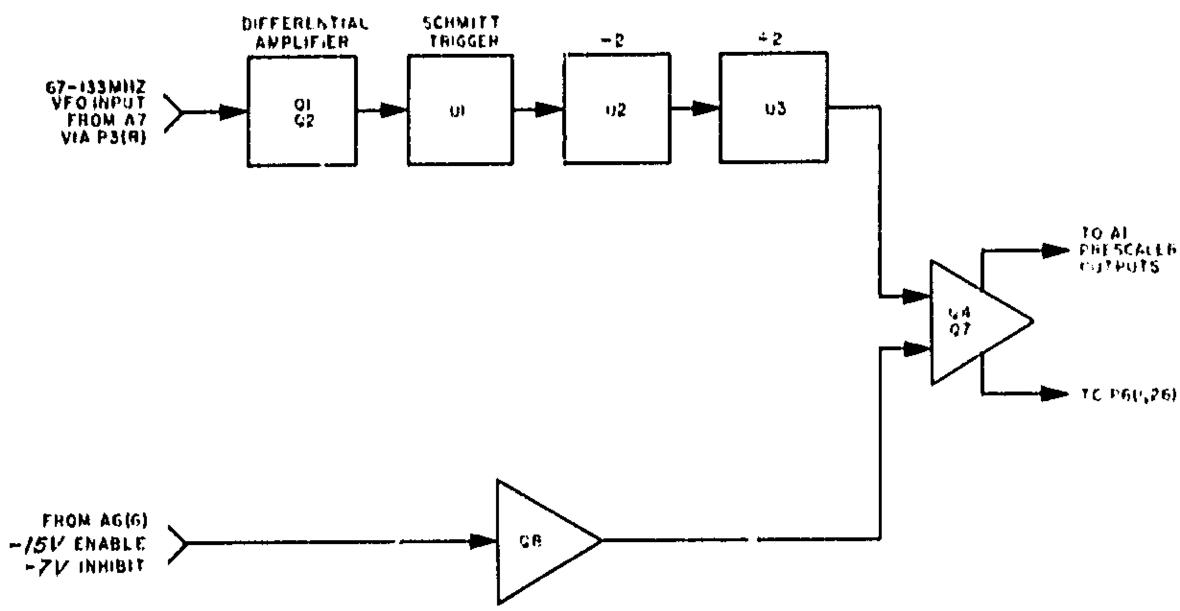
05257-C-6A

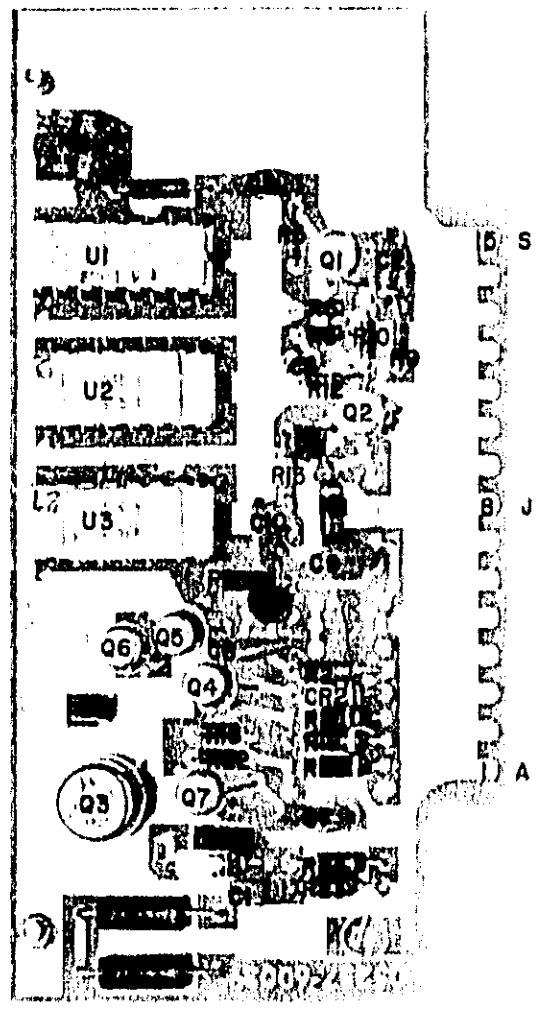
Figure 8-7. A7 Variable Frequency Oscillator

A8 (see block diagram below) converts the input signal into square waves of relatively constant amplitude at exactly 1/4 of the input frequency. That constant amplitude square wave is the counted signal. The other output is applied to the A1 pulse driver in the .05 to .2 GHz range only. R8 should be adjusted for a stable count at 200 MHz with an 80 mV input signal.

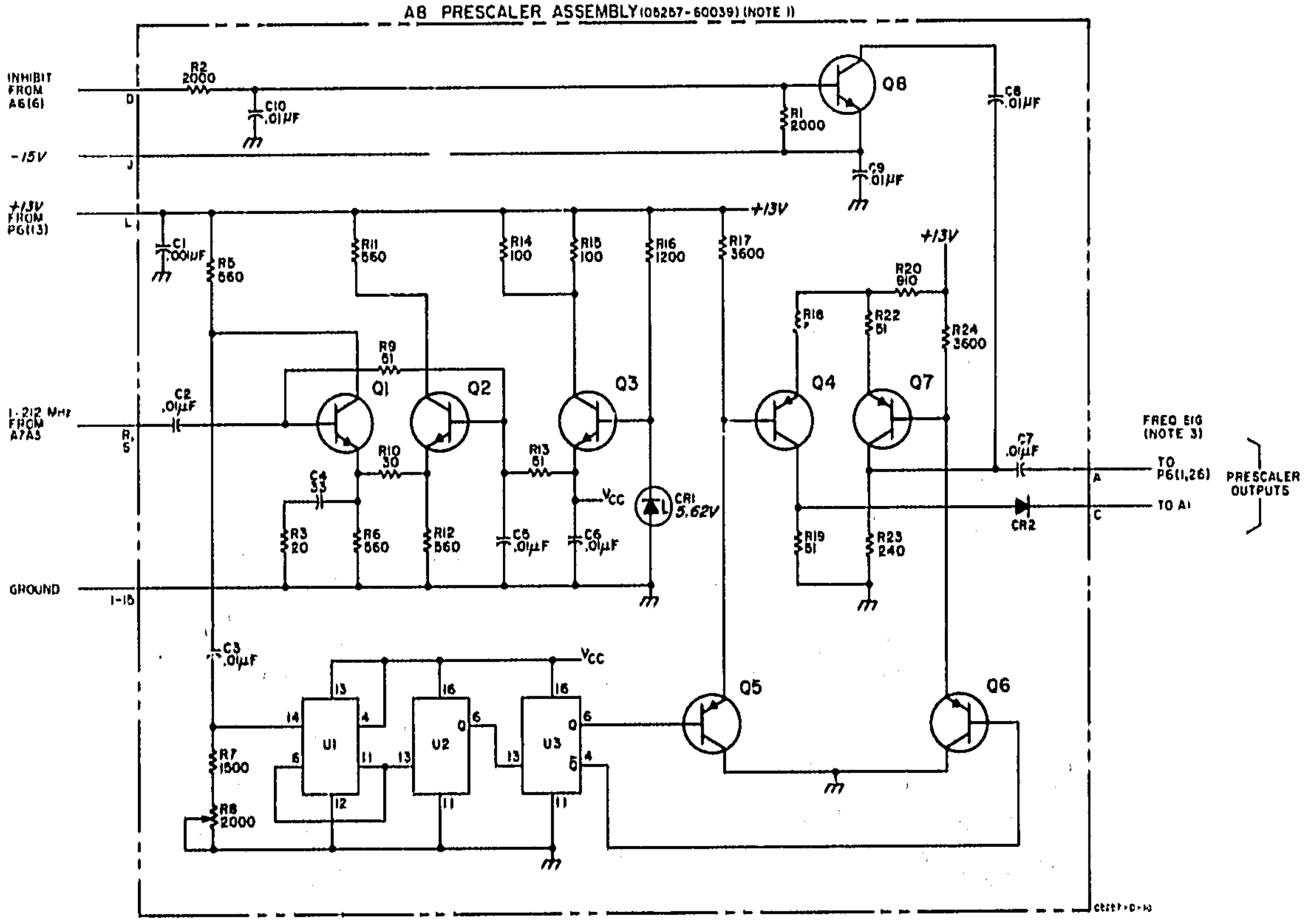
CR1 and Q3 provide a current source for differential amplifier Q1 and Q2. U1 is a Schmitt Trigger which sharpens the waveform for divide-by-two integrated circuits U2 and U3. The square waves out of U3(4) and (6) and 1/4 of the input frequency. Emitter followers Q5 and Q6 level shift those square waves which are then amplified by Q4 and A7.

In the APC mode, when the VFO is not phase locked, an INHIBIT signal from the A6 assembly will prohibit the counted signal at the output of the prescaler from being applied to the counter. The -7V INHIBIT signal from A6 is applied to Q8, turning it on. During the time Q8 is on, there is a short circuit to ground through C8, Q8, and C9 at the counted frequency. If the VFO becomes phase locked, a -15V ENABLE signal from the A6 assembly cuts off Q8 and the counted signal is coupled through C7 to the counter. In the Pulsed RF mode of operation, the input to Q8 is always -15V.





A8



NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS, CAPACITANCE IN PICOFARADS
3. TO PLUG-IN POSITION OF A1 SWITCH ON COUNTER

REFERENCE DESIGNATIONS

A8
C1-10 CR1,2 Q1-7 R1-3,5-20 22-24 U1-3

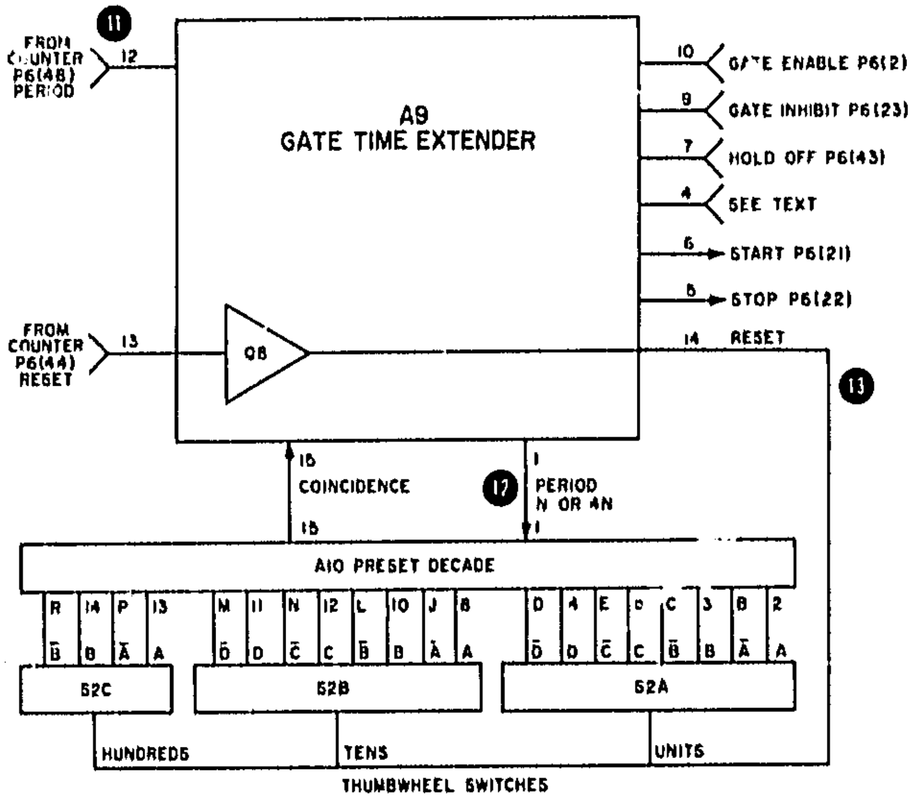
DELETE: R4, R21

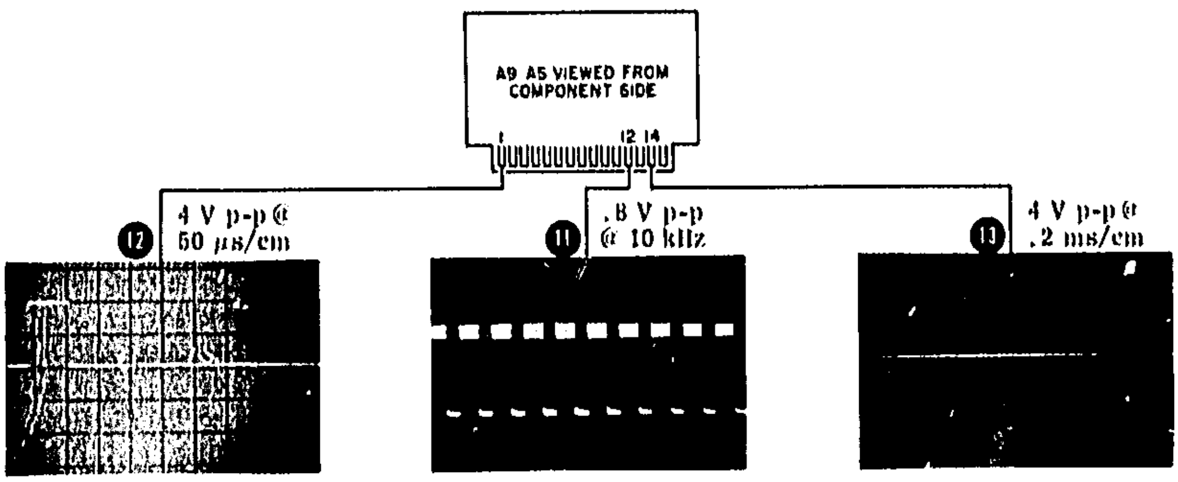
Figure 8-8. A8 Prescaler and Inhibit

A9 gives start and stop signals for Counter gating. It receives reset, period, gate enable, gate inhibit, and holdoff from Counter. The output period is N on the .05-.2 GHz range with pin 4 grounded. On all other ranges the output period is 4N with pin 4 ungrounded. On the .05-.2 GHz range the counted signal will be 1/4 the FREQUENCY dial reading. On all other ranges, the counter signal is the FREQUENCY dial reading if the thumbwheel switches are set to 001. A10 extends the Counter gate time by any desired integer up to 227.

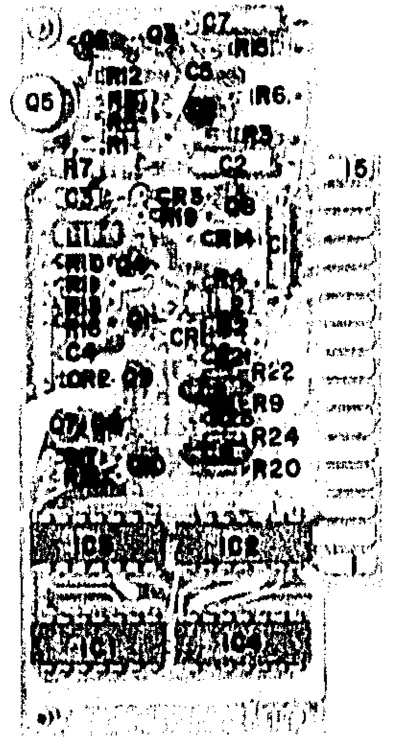
Note that integers up to 399 can be set, but are not used for practical measurements.

The thumbwheel switches on the front panel are used to dial the integer by which the Counter gate time is multiplied. These switches can be checked independently from the rest of the instrument by performing gate extender check in Paragraph 5-17. The VFO section must be operating for the complete test but if the gate light is cycling it is a good indication of proper operation of A9 and A10.

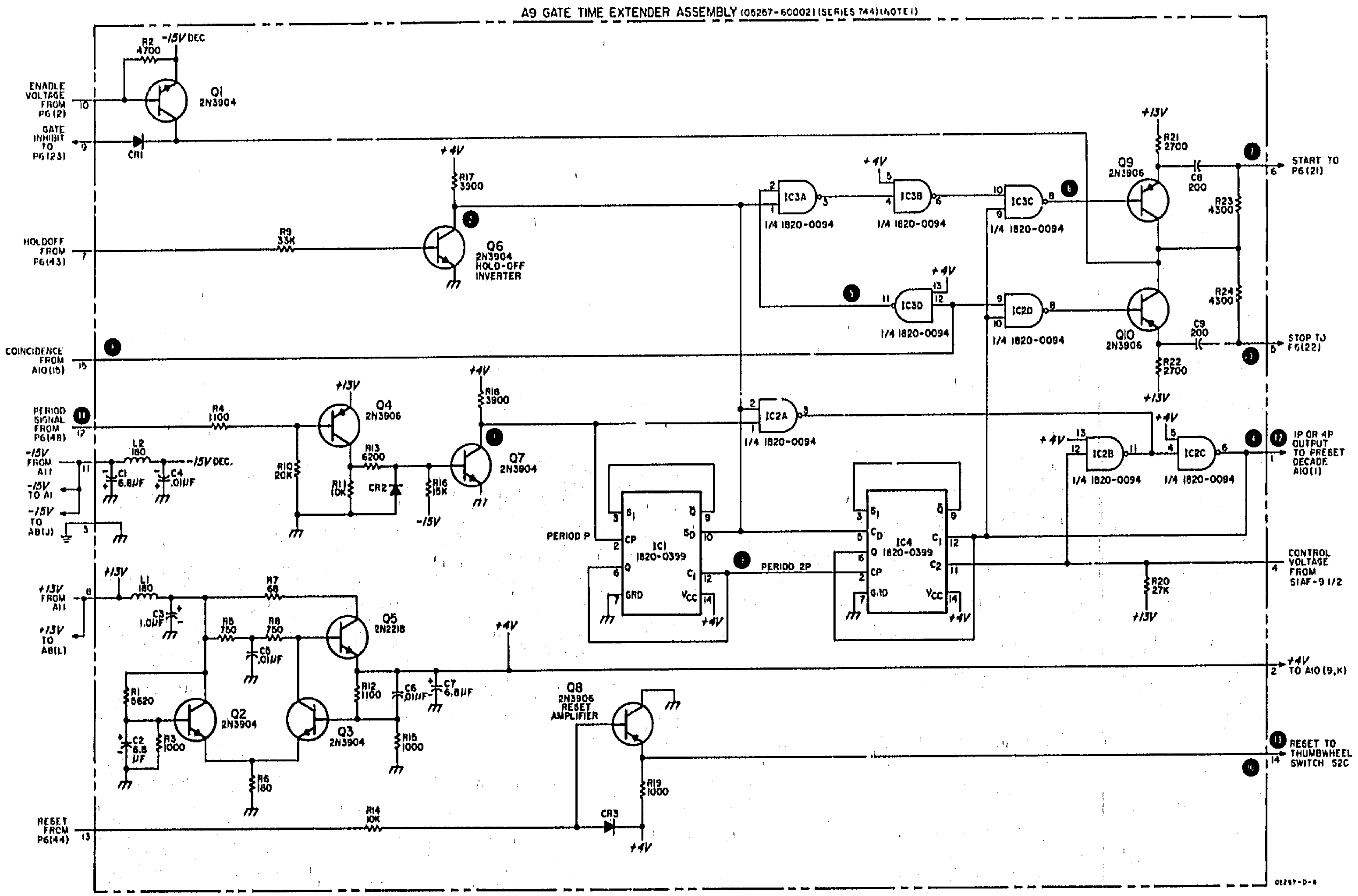




Waveforms taken with an HP 180A, 1801A Vertical Amplifier and a 10004A 10 to 1 Divider Probe. The 5257A in APC mode with no fx input, VFO at 70 MHz, .05 to .2 GHz range, LEVEL fully CW, N = 001 and sampling. Counter TIME BASE set to .1 ms.



A9

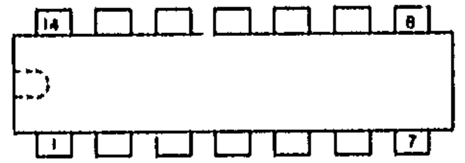


NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED:
   RESISTANCE IN OHMS;
   CAPACITANCE IN PICOFARADS;
   INDUCTANCE IN MICROHENRIES
3. WAVEFORMS FOR 1 THRU 10 INSIDE DASHED ASSEMBLY LINE ARE SHOWN ON PAGE 4-5 WAVEFORMS FOR 11,12,13 SHOWN ON FACING PAGE

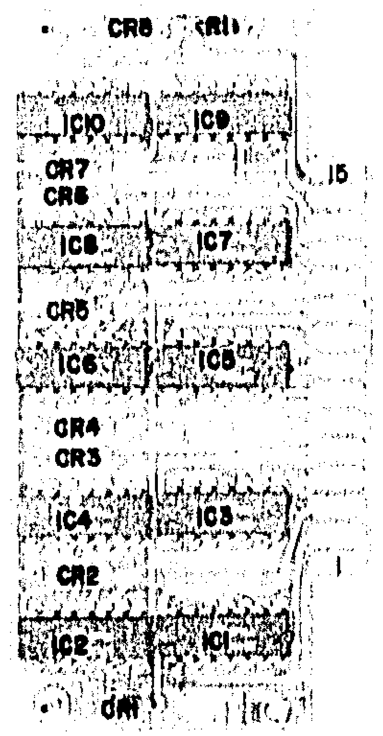
REFERENCE DESIGNATIONS

A9
C1-9 CR1-3 IC1-4 L1,2 Q1-10 R1-24

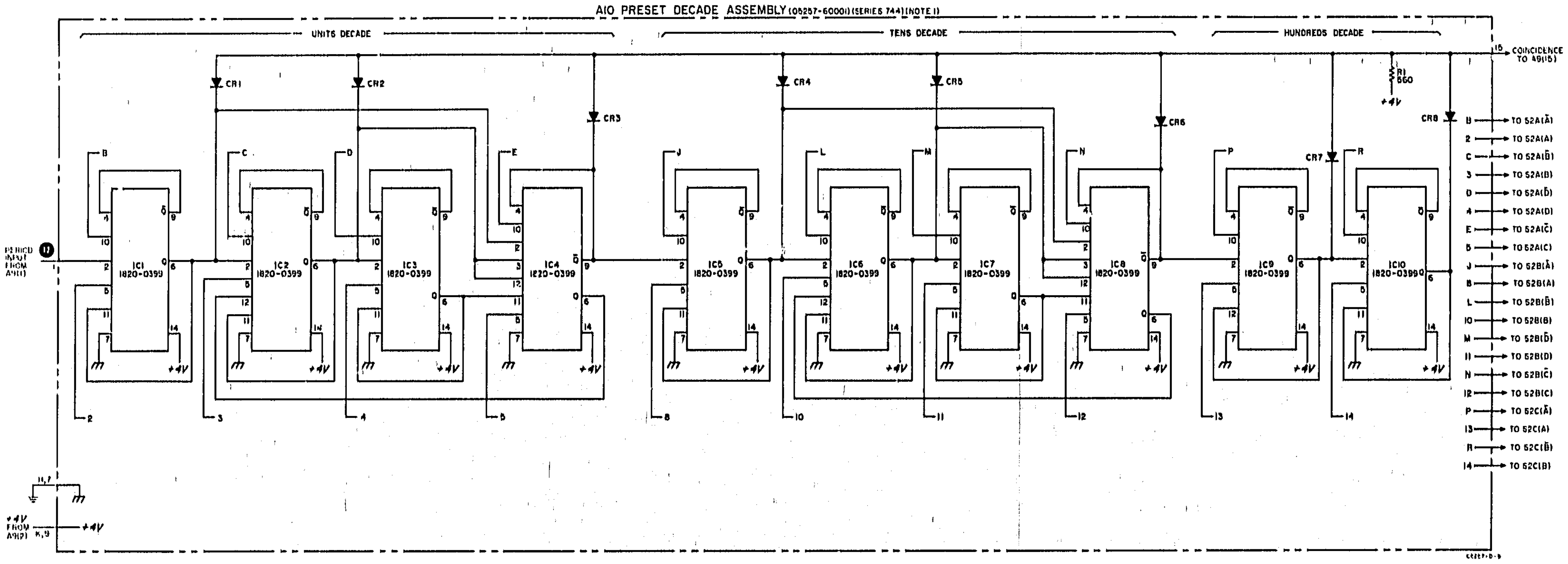


IC1-4
(TOP VIEW)

Figure 8-9. A9 Gate Time Extender



A10

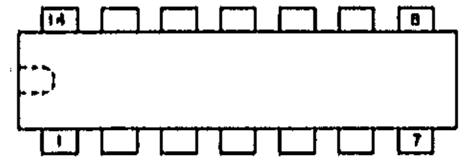


NOTES

1. REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY NUMBER TO ABBREVIATION FOR COMPLETE DESCRIPTION.
2. UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS.

REFERENCE DESIGNATIONS

A10
CR1-6 IC1-10 R1



IC1-10
(TOP VIEW)

Figure 8-10. A10 Preset Decade

MANUAL CHANGES

MANUAL CHANGES

MANUAL DESCRIPTION

INSTRUMENT:	5257A Transfer Oscillator Operating and Service Manual
SERIAL PREFIX:	1348A
DATE PRINTED:	JAN 1974
HP PART NO:	05257-90016
MICROFICHE NO:	05257-90017

CHANGE DATE: May 13, 1980

(This change supersedes all earlier dated changes)

- Make all changes listed as ERRATA.
- Check the following table for your instrument's serial prefix or serial number and make listed change(s) to manual.

IF YOUR INSTRUMENT HAS SERIAL PREFIX OR SERIAL NUMBER	MAKE THE FOLLOWING CHANGES TO YOUR MANUAL	IF YOUR INSTRUMENT HAS SERIAL PREFIX OR SERIAL NUMBER	MAKE THE FOLLOWING CHANGES TO YOUR MANUAL
1348A03039 through 1348A03878	1	1848A	1,2,3,4
1744A	1,2	1912A	1,2,3,4,5
1820A	1,2,3		

■ NEW OR REVISED ITEM

ERRATA

Page 3-7, Figure 3-10, Step 11:
Delete "cw"; add (if necessary, repeat steps 10 and 11).

Page 4-3, Paragraph 4-23:
Change third sentence from (chassis part) to (front panel).

Page 4-4, Paragraph 4-38:
Change last sentence from "R6 and R3" to "R6, R21, and R3".
Add after last sentence "The emitter voltage of Q4 is adjusted in Pulsed RF, by R21, to be the same as in APC mode."

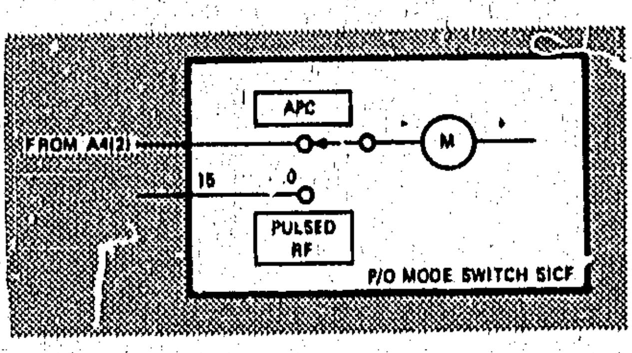
Page 6-4, Table 6-1, Replaceable Parts:
Change A4R9 from 0757-0975 to 0757-0963 43K; C4-1/8-TO-4302-G.
Change A4R11 from 0757-0972 to 0757-0960 33K; C4-1/8-TO-3302-G.

Page 6-12, Table 6-2, Replaceable Parts:
Add 73138 BECKMAN INSTR. INC. HELIPOT DIV., FULLERTON, CA 92634.
Add 24546 CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIV., BRADFORD, PA 16701.

Page 8-3, Figure 8-2:
Change "+13V" to "+13V (REG)" in line from M1 in upper RH corner.

Page 8-7, Figure 8-4, A4 Schematic Diagram:
Change A4R9 from 130K to 43K.
Change A4R11 from 100K to 33K.

Page 8-9, Figure 8-5, A5 Schematic Diagram:
Change as shown below:



Page 8-12, Test below waveforms:
Add "NOTE: This voltage should be set at same amplitude as in APC mode by adjusting A7A1R21."

3A/J—6111-5653-7104/7914/8222/8442-8455/8471/9462E/

HEWLETT PACKARD

■ ERRATA (Cont'd)

Page 6-3, Table 6-1, Replaceable Parts:
Change A1R24 from 0757-0346 to 2100-1985 R:VAR TRMR 20 OHM 20%; 73138; 62-201-1; 05257-60008 boards with this change are REV. E SERIES 1348A.

Page 1-2, Table 1-1, Specifications:
Delete Option 001 for a "Precision Type APC-7 input connector."

Page 6-11, Table 6-1, Replaceable Parts:
Delete all parts for Option 001.

Option 001 is no longer availabe. Ignore any part of this manual which refers to the Option 001 input connector.

Page 6-8, Table 6-1, A8 (05257-60039) Replaceable Parts:
Change A8IC2 and A8IC3 from 1820-0712 to 1820-0557 in the "HP" and "Mfr" part number columns.

Page 5-2, Table 5-2, Recommanded Test Equipment:
Add "Accuracy ±3%" to the characteristics of the RF millivolmeter.
Add "Accuracy ±2%" to the characterics column of the following test equipment:

1. DC VTVM HP 412A
2. Power Meter HP 431C
3. VHF Signal Generator HP 608C/D/E/F
4. UHF Signal Generator HP 614A
5. SHF Signal Generator HP 620B
6. SHF Signal Generator HP 628A
7. UHF Signal Generator HP 616B

Page 5-4, Table 5-3, In-Cabinet Performance Check:
*Add the following NOTE after step 6 of the COUNTER GATE EXTENSION:
"NOTE — When the 5257A is used with the 5345A/10590A, the maximum thumbwheel setting on the 5257A is 249. The 5345A will read 10.000 GHz and 24.900 GHz for the thumbwheel settings of 100 and 249, respectively. See the 10590A Operating and Service Manual, page 3-2 and Table 5-2."

*Add the following instructions to step 2 of FREQUENCY DIAL CHECK:
If a 5345A counter is used, set the 5345A counter controls as follows:

FUNCTION .... PLUG-IN
GATE TIME .... 100 µs
CHECK-COM-SEP .... SEP

Page 6-5, Table 6-1, Replaceable Parts:
Change A5L1 from 9140-0138 to 9140-0096; COIL-MLD 1UH 10% Q=50 .155DX .375LG-NOM; 28480; 9140-0096.
Change A5L2 from 9140-0138 to 9140-0096; COIL-MLD 1UH 10% Q=50 .155DX .375LG-NOM; 28480; 9140-0096.

Page 8-9, Figure 8-5, A11 Schematic Diagram:
Change L3 from 1 to 180UH.
Label coil between C3 and C5 as L2-1UH.

Page 6-11, Table 6-1, Replaceable Parts:
Change MP1 part number in "HP" and "Mfr" columns from 1500-0014 to 1500-0535.

■ Page 6-11, Table 6-1, Replaceable Parts:
Delete MP2 and MP3 washers HP Part No. 2190-0325.
Delete MP6 spring washer HP Part No. 5000-0206.

CHANGE 1 (1348A03039 thru 1348A03678)
Page 6-4, Table 6-1, A2 Replaceable Parts:
Change A2R1 from 0698-5666 to 0698-8694 in "HP Part Number" and "Mfr. Part Number" columns. The resistance value is the same for both part numbers.

CHANGE 2 (1744A)
Page 6-3, Table 6-1, A1 Replaceable Parts:
Add (SERIES 1744) to A1 (05257-60008) "Description".
Change A1R17 from 0757-0895 (62Ω) to 2100-2061; RESISTOR-VAR 200Ω 10% C TOP-ADJ 1-TURN; 30983; ET50W201.

Page 8-5, Figure 8-3, A1 (05257-60008) Schematic Diagram:
Change "SERIES 1348" at top of A1 diagram to "SERIES 1744".
Change A1R17 from a fixed resitor to a 200Ω potentiometer with the center contact and one end connected to the emitter of Q3. Clockwise rotation reduces the effective value of A1R17.

Page 6-4, Table 6-1, A3 and A4 Replaceable Parts:
Add "(SERIES 1744)" to the "Description" for A3.
Change A3 Part Number in "HP" and "Mfr" columns from 1901-0573 to 05257-60045.
Add "(SERIES 1744)" to the "Description" for A4.
Change A4R9 from 0757-0963 (43 KΩ) to 0757-0975; RESISTOR-FXD 130K 2% .125W F TC=0±100; 24546; C4-1/8-TO-1302G.
Change A4R11 from 0757-0960 (33 KΩ) to 0757-0972; RESISTOR-FXD 100K 2% .125W F TC=0±100; 24546; C4-1/8-TO-1002G.

Page 8-3, Figure 8-2, Block Diagram:
Change A3 SAMPLER from HP Part No. 1901-0573 to 05257-60045.

Page 8-7, Figure 8-4, A3 and A4 Schematic Diagrams:
Change A3 from HP Part Number 1901-0573 to "05257-60045 (SERIES 1744)".
Change A4 from "(SERIES 976)" to "(SERIES 1744)".
Change A4R9 from 43K to 130K ohm.
Change A4R11 from 33K to 100K ohm.

CHANGE 3 (1820A)
Page 6-7, Table 6-1, A7A3 (05257-60003) Replaceable Parts:
Add series number 1820.
Change A7A3C5 (3.9 pf) from 0150-0034 to 0150-0015; CAPACITOR-FXD 2.2 pf +-10% 500VDC TI DIOX; 28480; 0150-0015.

Page 8-13, Figure 8-7, A7A3 (VFO Assembly) Schematic Diagram:
Change the series number (top of diagram) from 848 to 1820.
Change A7A3C5 from 3.9 to 2.2 pf.

CHANGE 4 (1848A)
Page 6-8, Table 6-1, A8 (05257-60039) Replaceable Parts:
Add "(SERIES 1848)" to Description of A8.
Change A8C1 from 0160-2327 (.001 μF) to 0160-3277; CAPACITOR-FXD 0.01 UF 20% 40VDC; 28480; 0160-3277.

Page 8-15, Figure 8-8, A8 Schematic Diagram:
Add "SERIES 1848" at top of A8 diagram.
Change A8C1 from 0.001 to 0.01 μF.

CHANGE 5 (1912A)
Changes in GEAR BOX ASSY MP11 (see Figure 5-2 on Page 5-8) permit removal of bellows MP1 (see Figure 5-2) for servicing of VFO assembly A7A3. The 05257-20033 shaft and 05257-20051 shaft collar normally used in MP11 are replaced by a shorter shaft (05257-20086) so bellows MP1 (HP Part No. 1500-0535) can be removed for access to components on circuit board A7A3.