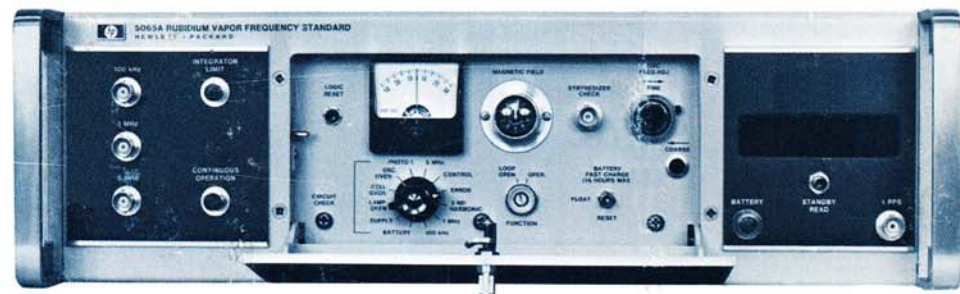


## OPERATING AND SERVICE MANUAL

# 5065A

## RUBIDIUM VAPOR FREQUENCY STANDARD



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## **SAFETY**

*This product has been designed and tested according to International Safety Requirements. To ensure safe operation and to keep the product safe, the information, cautions, and warnings in this manual must be heeded. Refer to Section I for general safety considerations applicable to this product.*

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*Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.*

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# **RUBIDIUM VAPOR FREQUENCY STANDARD**

## **5065A**

### **SERIAL PREFIX: 1908A**

This manual applies directly to HP Model 5065A Rubidium Vapor Frequency Standards having serial prefix 1908A.

### **OLDER INSTRUMENTS**

Changes required to backdate this manual for older instruments are in Section VII.

### **OPTIONS**

For instruments having Options 001, 002, or 003, refer to Sections III through VII.

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5301 STEVENS CREEK BLVD., SANTA CLARA, CALIF. 95050

Manual Part No. 05065-9041  
Microfiche Part No. 05065-9042

Printed: NOV 1979



**HEWLETT  
PACKARD**

## MANUAL CONTENTS

This manual is supplied to help you make best use of your instrument. The manual covers eight sections of information as follows:

Section I is an introduction to the Instrument. Electrical specifications and accessories information is given.

Section II covers inspections, power, mounting, packing, shipping, and connection.

Section III outlines operating procedures.

Section IV discusses technical operations.

Section V contains disassembly and repair procedures and an in-cabinet performance check.

Section VI lists replaceable parts.

Section VII gives options and manual changes information.

Section VIII contains circuit diagrams, component locators and waveforms. Included are adjustment procedures and troubleshooting information.

## HOW TO ORDER

To order an operating and service manual, contact the nearest Hewlett-Packard Sales and Service Office. Give complete model, name, and nine-digit serial number. The serial number plate is on the rear panel. Comments on this manual are welcome at any Sales and Service Office.

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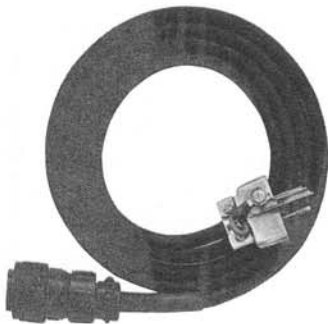


Figure 1-1. Model 5065A and Accessories

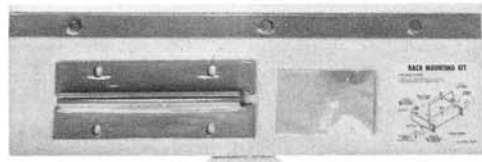


Shown with Option 003 (001 + 002 = 003)

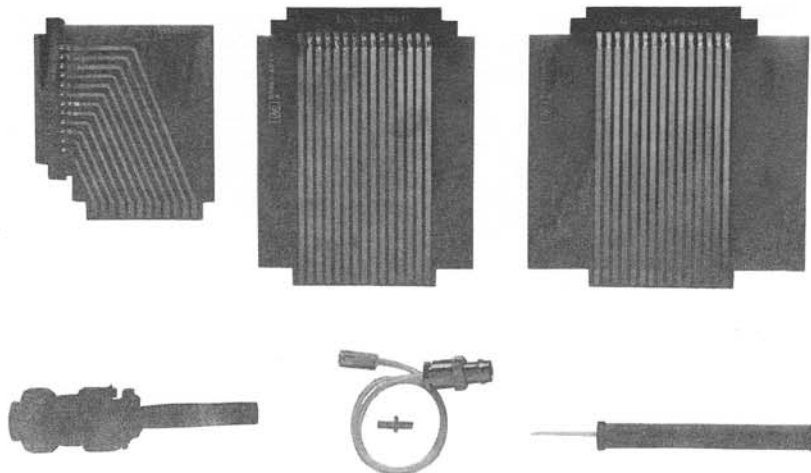
**AC POWER CORD**



**RACK MOUNT KIT**



**ACCESSORY KIT**



## SECTION I

### GENERAL INFORMATION

#### 1-1. INTRODUCTION

##### 1-2. Description

1-3. The Hewlett-Packard Model 5065A Rubidium Vapor Frequency Standard is a compact, self-contained secondary frequency standard which uses an optically-pumped Rubidium vapor cell as the reference element. A 5 MHz oscillator is stabilized against a natural atomic resonance, the hyperfine transition of Rubidium 87. This technique produces a long-term stability of better than  $1 \times 10^{-11}$  per month with excellent short-term stability which is conservatively rated at less than  $5 \times 10^{-12}$  rms averaged over a one-second period. Output frequencies are 5 MHz, 1 MHz, and 100 kHz.

1-4. Frequency setting for any offset of the UTC time reference is accomplished by changing the microwave excitation frequency and the magnetic field applied to an Rb<sup>87</sup> vapor cell. Thumbwheel switch control (of a digital frequency synthesizer) provides approximate step adjustment of the microwave excitation frequency with a range of 1000 parts in  $10^{10}$ . In addition, the front-panel MAGNETIC FIELD control provides for exact adjustment of the Rb<sup>87</sup> hyperfine transition with a resolution of 2 parts in  $10^{12}$ .

##### 1-5. Options

a. A digital clock, Option 001, provides a clock display and a one pulse per second (1 PPS) electrical output. The clock pulse may be retarded up to 1-second in increments as small as 1-microsecond and as large as 0.1-second. In addition, a separate control provides continuous adjustment of clock-pulse delay from 0- to 1-microsecond.

b. Standby battery, Option 002, provides a 10-minute minimum power source (at 25°C) in the event of external ac power failure. A front-panel lamp flashes when ac power is interrupted and lights continuously during fast charge. Charge rate is controlled by a 3-position front-panel switch; FAST, CHARGE-FLOAT, RESET.

##### 1-6. Circuit Checks and Outputs

1-7. The CIRCUIT CHECK switch and meter provide continuous monitoring of outputs and other signals. The CONTINUOUS OPERATION lamp gives an indication of correct operation. The 5 MHz, 1 MHz, and 100 kHz output levels are at least 1 volt rms when properly terminated with 50 ohms.

#### 1-8. TERMINOLOGY

1-9. The definitions of the following terms apply to these terms as used throughout this manual.

a. ATOMIC TIME. Time scale based on the hyperfine resonance of Cesium 133.

b. UNIVERSAL TIME (UT2). Time scale based on the earth's rotation about its axis with correction for angular position and seasonal variations; proceeds at a rate slightly slower than Atomic time.

c. UNIVERSAL TIME (COORDINATED) (UTC). A piecewise uniform scale which approximates UT2 to 0.1-second by step adjustments in phase as announced by the Bureau International de l'Heure in Paris.

d. HYPERFINE RESONANCE OF Rb<sup>87</sup>. Hyperfine resonant frequency arising from the difference in energy between the upper and lower ground states of Rb<sup>87</sup>.

e. RVFR (Rubidium Vapor Frequency Reference). The assembly which houses the Rb<sup>87</sup> lamp, filter cell, the Rb<sup>87</sup> absorption cell, and the harmonic generator/mixer diode.

#### 1-10. SPECIFICATIONS

1-11. Table 1-3 lists the technical specifications for the Model 5065A.

1-12. Table 1-1 lists equipment supplied and Table 1-2 lists accessories available for the Model 5065A.

#### 1-13. INSTRUMENT IDENTIFICATION

1-14. Hewlett-Packard uses a two-section nine-digit serial number (0000A00000) mounted on the rear-panel to identify this instrument. The first four digits are the serial prefix and the last five digits refer to the specific instrument. If the serial prefix on your instrument differs from that listed on the title page of this manual, differences exist between the manual and your instrument. Lower serial prefixes are documented in Section VII and higher serial prefixes are covered by a manual change sheet included with the manual. If this sheet is missing contact the nearest Hewlett-Packard Sales and Service office (lists are provided at the rear of this manual).

Table 1-1. Equipment Supplied

Equipment	Description	HP Part No.
AC Power Cable	3-Conductor with ground pin	05061-6091
Accessory Kit includes:		05065-6066
Adapter	Micon, male-to-male	1250-0813
Connector	Plug, female	1251-0126
Screwdriver	Ceramic	8710-0033
Cable Assembly Test	Micon to BNC	05060-6116
Board Extender	15 pin	05065-6064
Board Extender	15 pin, extra wide	05065-6065
Board Extender	12 pin	05061-6073

Table 1-2. Accessories Available

Accessory	Description	HP Part No.
Standby Power Supply	24 Vdc, 2-ampere supply with 18 ampere-hours standby batteries	Model 5085A
Cable	Connects 5065A to 5085A dc output	103A-16A
Extension Slides and Rack	Permits sliding instrument out and tilting from rack-mounted position	1490-0718 1490-0721
Standby Power Supply	24 Vdc, 2-ampere supply with 12 ampere-hours sealed standby batteries for flying clock experiments. Operates on 6, 12, and 24 Vdc, 115 Vac/230 Vac, $\pm 10\%$ , 48 to 440 Hz.	K02-5060A
Rack Mount Kit	Provides conversion from bench to rack model	5060-8740

Table 1-3. Specifications

5065A		OUTPUTS:	
<b>Frequency Stability:</b>		<b>Frequencies:</b> 5 MHz, 1 MHz, 100 kHz.	
Long term: $\pm 1 \times 10^{-11}$ per month (maximum limit of drift rate).		<b>Voltages Levels:</b> $>1$ V rms into 50 ohms at 5 MHz, 1 MHz, 100 kHz.	
Short term*: for 5 MHz output.		<b>Connectors:</b> BNC Front and Rear for 5 MHz, 1 MHz, 100 kHz.	
Fractional Frequency Fluctuations		<b>Harmonic Distortion:</b> (5 MHz, 1 MHz, 100 kHz) Down more than 40 dB from rated output.	
Avg. Time ( $\tau$ )		<b>Nonharmonically Related Output:</b> (5 MHz, 1 MHz, 100 kHz) Down more than 80 dB from rated output.	
$< 7.5 \times 10^{-10}$	1 ms	<b>Signal-to-Noise Ratio:</b> For 1 and 5 MHz, $>87$ dB at rated output (in a 30 kHz noise bw).	
$< 1.5 \times 10^{-10}$	10 ms	<b>ENVIRONMENTAL:</b>	
$< 1.5 \times 10^{-11}$	0.1 s	<b>Temperature, Operating:</b> $0^\circ$ to $50^\circ$ C. Frequency change is $< \pm 4 \times 10^{-11}$ from frequency reference at $25^\circ$ C.	
$< 5 \times 10^{-12}$	1 s	<b>Temperature, Nonoperating:</b> $-40^\circ$ to $+75^\circ$ C. (With Options to $50^\circ$ C.)	
$< 1.6 \times 10^{-12}$	10 s	<b>Production Units Have Passed Type Test as Follows:</b>	
$< 5 \times 10^{-13}$	100 s	HUMIDITY: 0 to 95% relative humidity.	
$< 5 \times 10^{-13}$	1000 s	VIBRATION: MIL-STD-167 and MIL-E-5400, CURVE I, with isolators.	
<b>Calibration Accuracy:</b> Set at factory to $\pm 1 \times 10^{-11}$ of specified time scale.		SHOCK: MIL-T-21200, and MIL-E-5400 (30 G's).	
<b>Settability:</b> $\pm 2 \times 10^{-12}$ .		ELECTROMAGNETIC COMPATIBILITY (EMC): MIL-I-6181D and MIL-STD-461, Class A.	
<b>Time Scale:</b> Set at factory to UTC unless specified differently.		ALTITUDE: Frequency change is $> 5 \times 10^{-11}$ from 0 to 40,000 ft.	
<b>Tunability:</b> Coarse Frequency Synthesizer Adjustment: Range: $1000 \times 10^{-10}$		FREQUENCY STABILITY DUE TO:	
Resolution: $< 2 \times 10^{-9}$ , thumbwheel adjust.		Magnetic Fields: $< 5 \times 10^{-12}$ for 1 gauss dc change or 1 gauss peak ac, $60 \pm 10\%$ Hz and $400 \pm 10\%$ Hz.	
Fine Frequency Magnetic Field Adjustment: Range: $2 \times 10^{-9}$ Resolution: $2 \times 10^{-12}$		Line Voltage: $< 4 \times 10^{-12}$ over specified input range.	
<b>Warm-up:</b> Within $1 \times 10^{-10}$ in 1 hour and $5 \times 10^{-11}$ in 4 hours of final frequency after 24 hours "off" time at $25^\circ$ C. Units typically warm-up to better than $\pm 2$ parts in $10^{11}$ of factory calibrated frequency.		<b>MATING CONNECTORS:</b>	
<b>*DEFINITION OF TERMS</b>		EXT DC input: HP 1251-0126 (5-contact), Cannon MS 3106E-14S-5S (Series ME) furnished.	
		<b>POWER:</b> 115 or 230 Vac $\pm 10\%$ , 50 to 400 Hz, or 23 to 30 Vdc.	
<b>Short-Term Stability:</b>		Approx. power required:	
		<b>24 Vdc</b> <b>115 Vac</b>	
		Without Options                      35 W                      49 W	
		Option 001 (Add)                      7.5 W                      10 W	
		Option 002 (Add)                      0 W                      6 W	
<b>Settability:</b>		Option 003 (Add)                      7.5 W                      16 W	
		<b>WEIGHT:</b> Net, 34 lb (15,4 kg). Shipping, 51 lb (23,5 kg). Option 001, add 2 lb (0,9 kg). Option 002, add 3.5 lb (1,6 kg).	
The degree to which an oscillator may be adjusted to correspond with a reference. This is also termed calibration.		<b>WARRANTY:</b> 1 year, except 3 years for RVFR.	

Table 1-3. Specifications (Continued)

**OPTION 001 TIME STANDARD**

**CLOCK PULSE:**

**Rate:** 1 pulse per second. **Rise Time:** <50 ns.  
**Fall Time:** <1  $\mu$ s. **Amplitude:** +10V peak  $\pm$ 10%  
**Jitter:** 5 ns rms max **Width:** 20  $\mu$ s min. All specs  
 with 50 $\Omega$  load. **Output:** Front-panel BNC.

**SYNCHRONIZATION:** Automatic to 10  $\pm$ 1  $\mu$ s, delayed  
 from reference input pulse (rear BNC). Manual  
 adj. to  $\pm$ 50 ns. Reference pulse must be >+5 v with  
 a rise time <50 ns and width >0.5  $\mu$ s.

**CLOCK MOVEMENT:** 24-hour LED Digital Clock.

**OPTION 002 STANDBY POWER SUPPLY**

**CAPACITY:** 10-minute minimum at 25 $^{\circ}$ C after full  
 charge (incl. Option 001).

**CHARGE CONTROL:** Front panel, Fast Charge-  
 Float-Reset switch.

**INDICATOR:** A front-panel light flashes when ac  
 power is interrupted and battery is being used.  
 A continuous light indicates a fast charge condition.

**OPTION 003**

Combines Options 001 and 002

**PERFORMANCE OF QUARTZ OSCILLATOR ONLY**  
 (Rubidium Control Loop Open)

**AGING RATE:** < $\pm$ 5  $\times$  10<sup>-10</sup> per 24 hours.

**FREQUENCY ADJUSTMENTS:**

**Fine Adjustment:** 5  $\times$  10<sup>-8</sup> range, with dial readings  
 of parts in 10<sup>10</sup>.

**Coarse Adjustment:** 1 part in 10<sup>6</sup>, screwdriver  
 adjustment at front panel.

**STABILITY:**

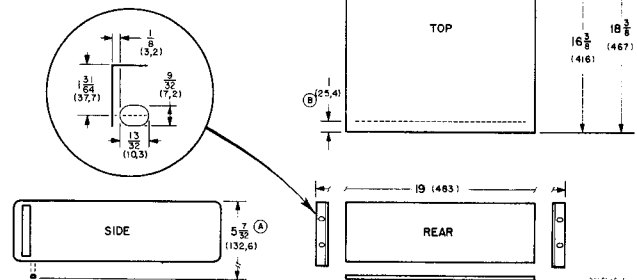
**As a Function of Ambient Temperature:** Fre-  
 quency change is less than 2.5  $\times$  10<sup>-9</sup> total from  
 0 $^{\circ}$  to +50 $^{\circ}$ C.

**As a Function of Load:**  $\pm$ 2  $\times$  10<sup>-11</sup> from open  
 circuit to short, 50 $\Omega$ R, L, or C load change.

**As a Function of Supply Voltage:**  $\pm$ 5  $\times$  10<sup>-11</sup> for  
 23 to 30 Vdc from 26 Vdc reference, or for  
 115/230 Vac  $\pm$ 10%.

**DIMENSIONS:**

NOTES:  
 DIMENSIONS IN INCHES AND (MILLIMETERS)  
 (A) EIA RACK HEIGHT (INCLUDING FILLER STRIP)  
 FOR CABINET HEIGHT (INCLUDING FEET) ADD  $\frac{1}{8}$  (3.2) TO  
 EIA RACK HEIGHT  
 (B) REAR APRON RECESS



## SECTION II

### INSTALLATION

#### 2-1. UNPACKING AND INSPECTION

2-2. If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect instrument for damage (scratches, dents, broken knobs, etc.). If instrument is damaged or fails Performance Check, notify the carrier and the nearest Hewlett-Packard Sales and Service office immediately (Sales and Service Offices listed inside back cover). Retain the shipping carton and the padding material for the carrier's inspection. The office will arrange for repair or replacement without waiting for the claim against the carrier to be settled.

#### 2-3. STORAGE AND SHIPMENT

##### 2-4. Environment

2-5. Temperatures during storage and shipment should be limited as follows:

- a. Maximum temperature: +75° C (165° F), +50° C (122° F) with Options 001, 002, or 003. Longterm storage +35° C (95° F).
- b. Minimum temperature: -40° C (-40° F).

##### NOTE (Option 002 Only)

When placing the 5065A in storage, remove the top cover and momentarily remove fuse F4 located directly over the battery. Replace the fuse. When ac power is reapplied, the battery will be automatically switched into the circuit.

##### 2-6. Extended Storage

2-7. If the Model 5065A is to be stored for an extended period (longer than 2 months) or if immediate operation is required after storage, then RVFR tube should have power applied to it for the duration of the storage as described in the following procedure.

##### 2-8. RVFR Storage Procedure

- a. Remove all power from 5065A and remove bottom cover.
- b. Disconnect the red and black twisted pair of wires from XA4(1) and XA8(1) respectively.
- c. Obtain a current-limiting power supply capable of producing 100 milliamps (power supply voltage is not important).
- d. Before turning on power supply, place a short across its output terminals.
- e. Connect the power supply as shown in Figure 2-1. The short should remain in place on the power supply output.

f. Set power supply voltage and current controls to minimum position. The precautions of steps d, e, and f are to prevent the filter capacitor on the power supply output from discharging into the RVFR.

g. Turn on Power Supply and adjust voltage high enough so output current can be set with current-limit control. Read current on power supply meter.

h. Set current-limit control so supply output current is 100 mA.

i. Reduce voltage control setting so that it is just above the point where further reduction would reduce the power supply output current.

j. Recheck polarity of power supply connection to red and black wires. This must be properly connected.

k. Remove short from power supply output to allow current to flow into the RVFR. Adjust power supply voltage and/or current limit to bring current to 100 mA.

l. The power supply should remain connected for the duration of storage.

2-9. When the 5065A is to be operated again:

1. Disconnect the power supply and reconnect RVFR red wire to XA4(1) and the black wire to XA8(1). Check POLARITY.
2. Apply power to the 5065A. Follow turn-on procedure in Section III.

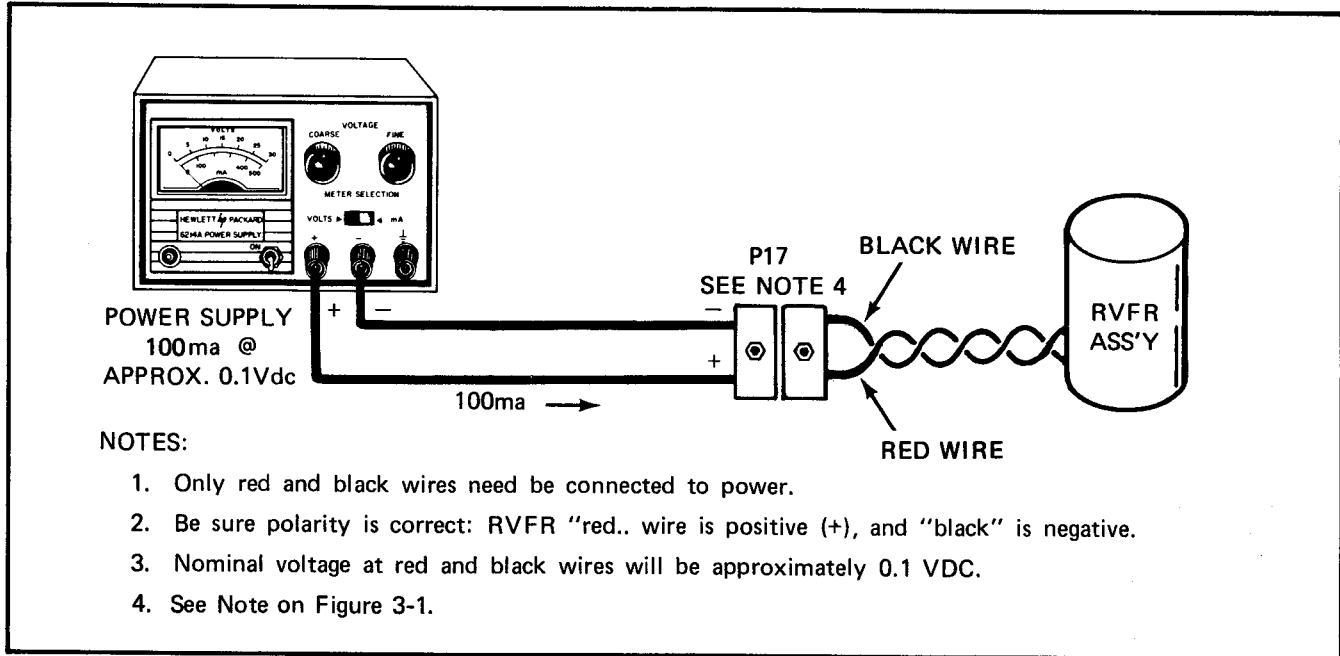
##### 2-10. Packaging

2-11. To protect valuable electronic equipment during storage or shipment always use the best packaging methods available. Your Hewlett-Packard Sales and Service office can provide packing material such as that used for original factory packaging. Contract packaging companies in many cities can provide dependable custom packaging on short notice. Here is a recommended method:

2-12. The original packaging procedure is to:

- a. Wrap the instrument in large plastic sheet or bag.
- b. Place the wrapped instrument into a "same-size" carton (HP Part No. 9211-1102).
- c. When the carton is sealed, install 4 polyurethane foam, post-packs (HP Part No. 9220-1316) on each corner of the carton.
- d. Install boxed instrument into the final cardboard outer carton (HP Part No. 9211-1101) seal effectively and label properly.

Figure 2-1. Electrical Hookup for RVFR Storage



2-13. Alternate methods which provide effective protection for the instrument can also be used, however, the previously described method is considered the better one.

**2-14. ELECTRICAL CONNECTIONS**

**2-15. Power Connection**

**CAUTION**

The Model 5065A has the negative side of its power supply grounded. When operating with auxiliary equipment such as an external battery or clock, check to ensure that the equipment can be connected together.

2-16. LINE VOLTAGE. The Model 5065A can be operated from either 115- or 230-volt ( $\pm 10\%$ ) ac power lines. A slide switch on the rear panel permits quick conversion for operation from either voltage. Insert a narrow-blade screwdriver in the switch slot and set the switch to expose the correct numbers to correspond to the line voltage used (Table 2-1). The instrument is supplied with a 115-volt fuse; change this fuse for 230-volt operation (Table 2-1).

**IMPORTANT**

Before connecting ac power to the instrument, be certain slide switch is properly positioned for 115 or 230 volt operation.

Table 2-1. 115/230 Volt Conversion

Conversion	115 Volts	230 Volts
Slide Switch	Right	Left
AC Line Fuse	1A slo-blo	0.5 A slo-blo

2-17. POWER CABLE. The Model 5065A is equipped with a detachable three-conductor power cable. Install as follows:

a. Connect the round, three-conductor female plug to the ac line jack on the instrument rear panel.

b. Connect male plug (two-blade with round grounding pin) to three-conductor (grounded) outlet. Exposed portions of the instrument are grounded through the round pin for safety; when only two-conductor outlets are available, use connector adapter (HP Stock No. 1251-0048) and connect short wire from adapter to a suitable ground.

**2-18. Mating Connectors**

2-19. Table 2-2 lists the Model 5065A front and rear panel connectors and their respective mating connectors. Not all connectors listed are shipped with the instrument but are included in the table as useful information for installation.

**2-20. OPERATION AS BENCH OR RACK INSTRUMENT**

2-21. The Model 5065A is shipped from the factory ready for operation as a bench instrument. Parts necessary to convert the instrument for operation as a rack-mounted instrument are not supplied. When ordered separately, Rack Mounting Kit is available by ordering HP Part No. 5060-8740. To convert for rack operation, refer to Figure 2-1 and proceed as follows:

- a. Remove feet (press the foot-release button, slide foot forward toward center of instrument, and lift off).
- b. Remove adhesive-backed trim strips on sides, just behind front handles.
- c. Attach filler strip along bottom edge of front panel.
- d. Attach mounting brackets to sides (larger corner notch toward bottom of instrument, see Figure 2-2). Instrument is now ready to mount in standard 19-inch rack.

**2-22. INSTALLATION LOCATION**

2-23. The Rb87 absorption cell in the RVFR Assembly A12 is slightly sensitive to external magnetic fields. Avoid installing this instrument near large motor-generators, transformers, or other equipment which radiate strong magnetic fields of 2 Gauss or more.

Figure 2-2. Conversion for Rack Mounting

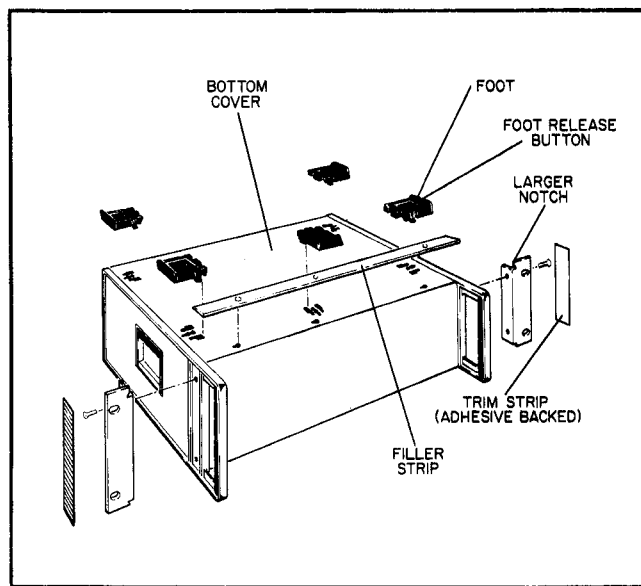


Table 2-2. Mating Connectors

Connector Description	Connector HP Part No.	Mating Connector HP Part No.	Mating Connector Description
Rear BNC Female jack (J1, 2, 3, 4, 5)	1250-0140	1250-0061*	BNC male plug, UG88/U
EXT DC, 5-pin male jack (J9)	1251-0111	1251-0126	5-pin female plug
AC LINE, 3-pin male jack (J8)	1251-1458	1251-2457	3-pin female plug
Front Panel OUTPUT Signal jacks (J10, 11, and 12)	1250-0102	1250-0061*	BNC male plug, UG88/U
1 PPS, BNC jack (J14) Option 001 only	1250-0102	1250-0061*	BNC male plug, UG88/U
*These connectors not shipped with the instrument.			



**SECTION III**  
**OPERATION**

**3-1. INTRODUCTION**

3-2. This section provides operating procedures for the 5065A Rubidium Vapor Frequency Standard. Tables 3-1 and 3-2 gives the basic turn-on procedure. Figures 3-9, 3-10, and 3-11 explain front, top, and rear controls and connectors.

**3-3. OPTIONS 001 AND 002**  
**(Option 003 = 001 and 002)**

3-4. Operating procedures for Option 001 (Time Standard) and Option 002 (Standby Power Supply) are covered in Paragraphs 3-19 through 3-31.

**3-5. OPERATING PROCEDURE**

**3-6. General**

3-7. In instruments equipped with Option 002, Standby Power Supply, remember that the internal standby battery is fully discharged when delivered and must be brought to full charge (16 hours minimum) before it can deliver rated standby power. Battery charging instructions are included in Figure 3-2, Turn-On Procedure. For more standby power, available accessories are the HP Model 5085A Standby Power Supply or HP Model K02-5060A Power Supply.

**3-8. Turn-On Procedure** (see Figure 3-2)

**3-9. Turn-On After Long Storage**

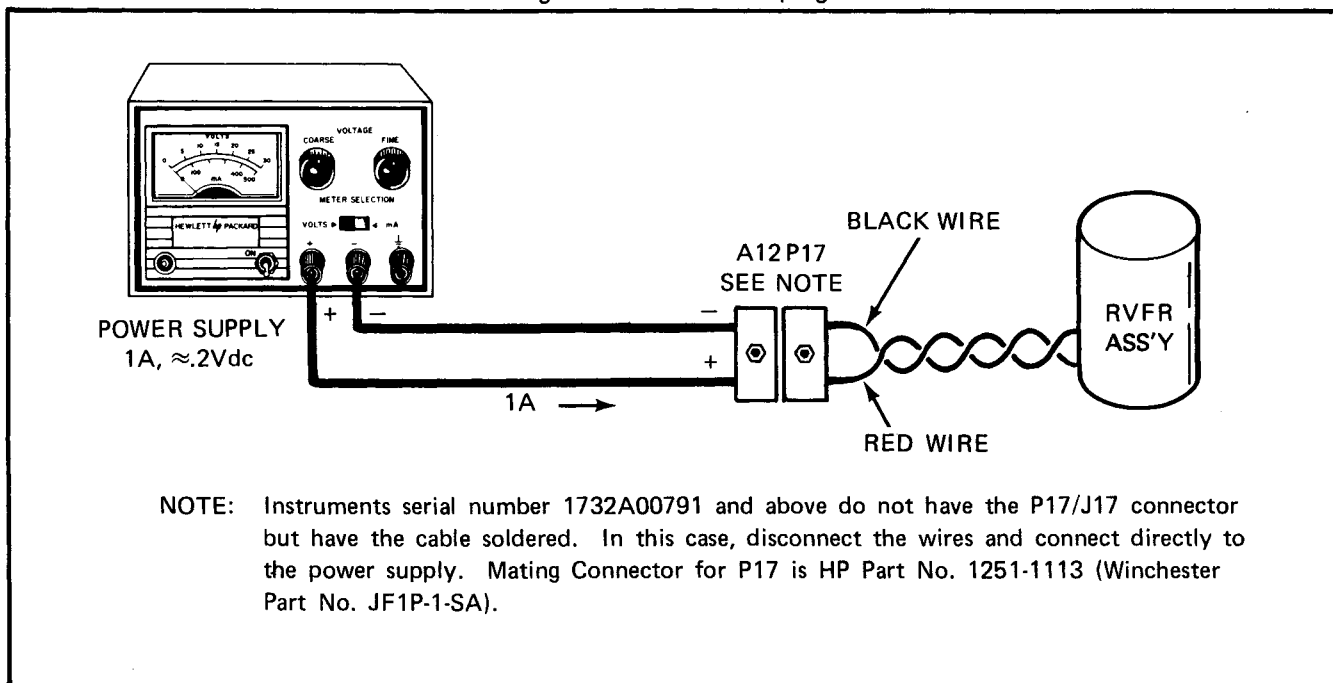
If the 5065A has been in storage for longer than 2 months, there is a possibility of cell flooding occurring in the RVFR tube. If after 1 hour of warm-up from initial turn-on no 2nd harmonic is present, then cell flooding can be suspected. The following procedure should be used to correct cell flooding.

- a. Remove all power from 5065A and remove bottom cover.
- b. Disconnect the red and black twisted pair of wires from XA4(1) and XA8(1) respectively.
- c. Obtain a current-limiting power supply capable of producing 1 amp (power supply voltage is not important).
- d. Before turning on power supply, place a short across its output terminals.
- e. Connect the power supply as shown in Figure 3-1. The short should remain in place on the power supply output.
- f. Set power supply voltage and current controls to minimum position. The precautions of steps d, e, and f are to prevent the filter capacitor on the power supply output from discharging into the RVFR.

Table 3-1. Operating Checks

CIRCUIT CHECKS		
Switch Position	Meter Indication	Description
BATTERY	35-45 Option 002)	Indicates battery voltage
SUPPLY	38 - 42	Indicates +20 volts regulated supply
LAMP OVEN	10 - 45	Indicates power to lamp oven in RVFR
CELL OVEN	10 - 45	Indicates power to absorption cell oven in RVFR
OSC OVEN	25 - 50	Indicates power to quartz OSC oven
PHOTO I	25 - 50	Indicates RVFR output current
5 MHz	35 - 45 (no load)	Indicates 5 MHz output level
CONTROL	-50 to +50	Indicates dc control voltage to quartz oscillator
ERROR	0	Indicates frequency difference between RVFR and microwave field as a dc voltage
2ND HARMONIC	20 - 50	Indicates 2ND HARMONIC level
1 MHz	38 - 42 (no load)	Indicates 1 MHz output level
100 kHz	38 - 42 (no load)	Indicates 100 kHz output level

Figure 3-1. RVFR Pumping



g. Turn on Power Supply and adjust voltage high enough so output current can be set with current-limit control. Read current on power supply meter.

h. Set current-limit control so supply output current is 1A.

i. Reduce voltage control setting so that it is just above the point where further reduction would reduce the power supply output current.

j. Recheck polarity of power supply connection to A12P17. This must be properly connected.

k. Remove short from power supply output to allow current to flow into the RVFR. Adjust power supply voltage and/or current limit to bring current to 1A.

l. Reconnect 5065A to AC line. Set front panel MODE switch to LOOP OPEN, meter switch to 2nd HARMONIC. Allow power supply and 5065A to operate continuously.

m. Within 12 to 48 hours signal should begin to appear on 2ND HARMONIC meter. NOTE: the quartz oscillator on the 5065A must be within about  $1 \times 10^{-7}$  of 5 MHz for the signal to appear. If possible, set the 5065A oscillator against a reference standard before proceeding.

n. Check 2ND HARMONIC meter readings twice per day until reading is greater than 10 or reaches a maximum. If this does not occur within 15 days then cell flooding is not the problem.

o. When checking 2ND HARMONIC meter reading also record meter reading in PHOTO I position.

p. When 2ND HARMONIC reading is maximum or greater than 10, remove power from 5065A. Remove power supply connection, and reconnect red wire to XA4(1) and the black wire to XA8(1).

q. Replace bottom cover and reconnect AC power to 5065A. The 5065A internal circuit will now optimize the rubidium in the RVFR. Operate the 5065A continuously for about 1 week. The 2ND HARMONIC reading should stabilize. If the meter stabilizes at greater than 25 the instrument can be returned to service. If the reading is less than 25 perform adjustments described in paragraphs 5-24 thru 5-31 in the 5065A Operating and Service Manual.

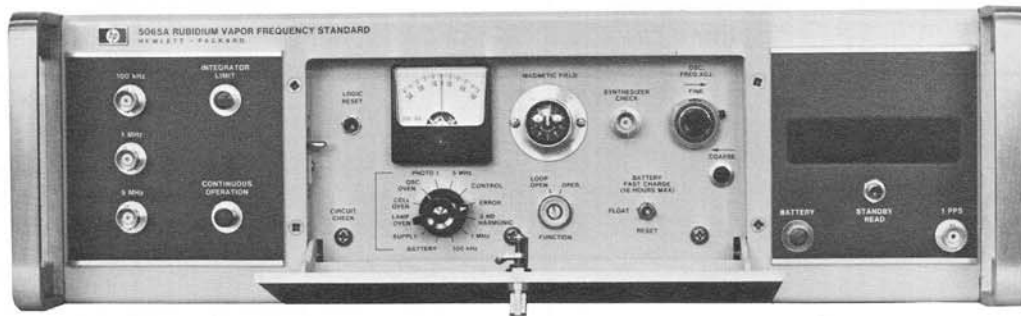
### 3-10. FREQUENCY OFFSET AND CALIBRATION

3-11. The Rubidium Vapor Frequency Standard is a secondary frequency standard with a specified long term stability drift less than 1 part in  $10^{11}$  per month.

3-12. Over a period of time, it may be necessary to check the offset that has accrued since last calibration and recalibrate the instrument to a primary frequency standard.

3-13. Frequency adjustment can be made after determining the frequency error with respect to a reference. Front panel MAGNETIC FIELD control is then adjusted to correct any frequency offset.

Figure 3-2. Turn-On Procedure



1. Set rear 115/230 Vac switch to correspond with line voltage used.
2. Check that function switch is set at OPER and OSC FREQ FINE is set at 250. It should remain in this position during normal operation.
3. Connect ac power cord (supplied) between rear ac jack and ac line power.
4. On units equipped with Option 002, Standby Power Supply, press BATTERY switch to RESET; then switch to FAST CHARGE. Note that BATTERY lamp comes on. If ac line power fails, the BATTERY lamp will pulse.
5. Allow 1-hour warmup and then press START/AUTO to START momentarily. In units equipped with Option 001, a mechanical lock prevents placing this switch at AUTO START.
6. Press LOGIC RESET. CONTINUOUS OPERATION lamp should come on to indicate that frequency-stabilizing feedback loop is locked. If not, refer to Section V. Use  $50\ \Omega$  load on outputs.
7. Rotate CIRCUIT CHECK (all positions) and check for meter readings (Table 3-1). If readings do not check out, refer to troubleshooting information in Section V. Note: After a 1-hour

warmup, the 5065A is within approximately 1 part in  $10^{10}$  of the UTC Time Scale and within approximately 5 parts in  $10^{11}$  after 4 hours.

#### NOTE

If CONTINUOUS OPERATION lamp goes off after instrument has warmed up, the CIRCUIT CHECK meter switch should be set to the LAMP OVEN and CELL OVEN positions. If either meter indication is full scale, the instrument should be turned off immediately. If not the RVFR assembly could be damaged.

8. Let the 5065A battery continue to fast charge for a total of 16 hours. At the end of this time, set BATTERY switch to FLOAT for a continuous trickle charge.
9. After 24 hours running time, thermal equilibrium is established and meter readings are stabilized. Rotate CIRCUIT CHECK switch through all positions and record readings on the door chart.
10. See Paragraph 5-7 for periodic adjustments.

Table 3-2. Front Panel Lamp Indications

FRONT PANEL LIGHTS		DESCRIPTION
INTEGRATOR LIMIT	CONTINUOUS OPERATION	
OFF	ON	Indicates Normal Operation
ON	ON	Indicates quartz oscillator is locked to resonant frequency of RVFR but oscillator has exceeded one-half its control range. To correct this proceed as follows: <ol style="list-style-type: none"> <li>1. Set CIRCUIT CHECK switch to CONTROL.</li> <li>2. Adjust OSC FREQ ADJ COARSE control for zero on CIRCUIT CHECK meter. NOTE: this adjustment may cause CONTINUOUS OPERATION lamp to go off. If this occurs, momentarily press LOGIC RESET button. CONTINUOUS OPERATION lamp should come on and stay on.</li> </ol>
ON	OFF	Indicates one of the following troubles: <ol style="list-style-type: none"> <li>1. Quartz oscillator control limit has been exceeded. To correct, set CIRCUIT CHECK to CONTROL, adjust OSC FREQ ADJ COARSE for zero on CIRCUIT CHECK meter, then momentarily press LOGIC RESET.</li> <li>2. Synthesizer Assembly A1 failure.</li> </ol>
OFF	OFF	Press LOGIC RESET switch. If CONTINUOUS OPERATION lamp does not come on, look for one or more of the following troubles: <ol style="list-style-type: none"> <li>1. Quartz oscillator not locked to Rubidium resonance.</li> <li>2. 2nd harmonic signal too low.</li> <li>3. Fundamental signal too high.</li> <li>4. Cell or lamp ovens not operating normally. Check CELL OVEN and LAMP OVEN on CIRCUIT CHECK meter. If meter is maximum TURN INSTRUMENT OFF.</li> <li>5. Synthesizer failure.</li> <li>6. FUNCTION switch not set to OPER.</li> </ol>

3-14. The two following calibration technique measures the changing phase relationship between the 5065A 5 MHz output and a primary frequency standardd (HP 5061A Cesium Beam Frequency Standard or equivalent) 5 MHz output over an 8-hour period. Either procedure may be used and both are equally accurate. The phase change is converted to frequency error and the necessary MAGNETIC FIELD adjustment is set in.

3-15. The procedure is divided into two parts; Table 3-9 lists recommended test instruments and equipment.

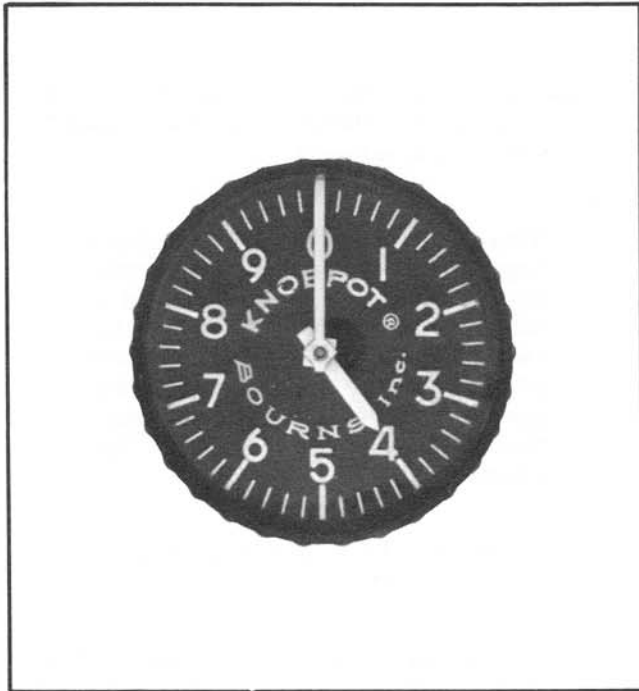
However, items with equivalent specifications may be substituted.

- a. Calibrating the measurement system.
- b. Performing the error measurement.

3-16. Calibrating the Measurement System: To calibrate the system for phase error measurement, proceed as follows:

- a. Connect equipment as shown in Figure 3-5.
- b. Set HP 8405A FREQ RANGE to agree with input frequency (5 MHz).

Figure 3-3. Magnetic Field Control



c. Zero HP 8405A PHASE meter by cranking in necessary offset with METER OFFSET control and the red ZERO knob.

d. With the meter zeroed, set the RANGE switch at +6. Recenter the PHASE meter with the red ZERO knob.

e. Set strip chart recorder range to .5 volt. Set pen to chart scale center with recorder zero control.

f. Set HP 8405A phase range to  $\pm 180$  and change METER OFFSET by  $+180^\circ$ .

g. Adjust 10k ohm pot for full scale pen deflection on recorder.

h. Change METER OFFSET polarity to (-) using the center knob of the METER OFFSET CONTROL. Pen should move to opposite chart edge. Make required fine adjustments to record zero and 10k pot for full scale chart deflection. The recorder is now calibrated for  $360^\circ$  or  $0.2\mu\text{sec}$  full scale.

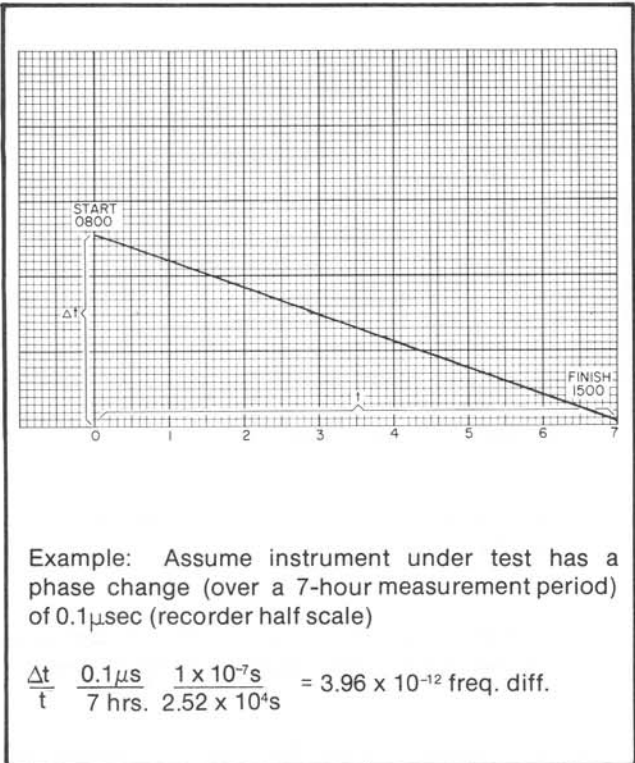
3-17. Frequency Difference Measurement: To perform the frequency difference measurement, proceed as follows:

- a. Connect equipment shown in Figure 3-6.
- b. Set HP 8405A Vector Voltmeter PHASE RANGE to  $180^\circ$  and METER OFFSET switch to 0.

c. Determine frequency error  $\Delta f/f$  using the relationship  $\frac{\Delta t}{t} = \frac{\Delta f}{f}$ .

d. Since chart calibration is  $0.2\mu\text{sec}$  full range (at 5 MHz), error in proportional parts can be determined from the strip chart record as illustrated in Figure 3-4.

Figure 3-4. Error Measurement



e. Since one minor division of the MAGNETIC FIELD adjustment changes the 5065A frequency by 4 parts in  $10^{12}$ , in Figure 3-4, the dial would be changed one minor division. During the phase measurement a cw movement of the HP 8405A phase meter indicates the 5065A frequency is higher than the reference standard and a ccw movement indicates the frequency is lower than the reference. If the MAGNETIC FIELD adjustment is at the end of the range:

1. Set the Magnetic Field adjustment to 5.00 and measure the frequency offset again. This is the "desired change in offset" Item 2 in Table 3-4. See Table 3-6 for an example of this calculation.

f. Increasing the MAGNETIC FIELD setting increases the 5065A frequency and decreasing this setting lowers it. Make this adjustment as required to align the 5065A with the reference standard.

g. After the MAGNETIC FIELD control has been reset, another phase comparison will show if the adjustment is correct, or if another adjustment is needed.

### 3-18. FREQUENCY COMPARISON USING K34-59991A LINEAR PHASE DETECTOR

a. Connect the K34-59991A OUTPUT terminals to a HP 680 Strip Chart Recorder or equivalent. Set recorder for 1V full scale and 1 in./hr. and turn on recorder.

b. Connect K34-59991A to line power and turn on the power switch.

Table 3-3. Frequency Offset Change Instructions

1. Remove instrument top cover and note setting of TIME SCALE thumbwheel and position of HI-LO switches. Record this information in Item 1.

NOTE

Be certain to include the correct algebraic sign (+ or -) with the numbers used in the following calculations.

2. Locate thumbwheel switch setting in Table 3-7 and record the corresponding Offset  $\times 10^{-10}$  value in Item 1 under Offset ( $\times 10^{-10}$ ).
3. Record the desired change in offset under Item 2 in the space provided.
4. Algebraically add the sum of Item 1 and Item 2 (Offset  $\times 10^{-10}$ ) and record the total in Item 3.
5. Locate the nearest Offset  $\times 10^{-10}$  in Table 3-7 that corresponds to the total offset recorded in Item 3. Record this offset, its corresponding TW switch setting, and HI-LO switch setting under Item 4 in the appropriate spaces provided.
6. Algebraically subtract Item 4 from Item 3 and record this remaining Frequency Offset in Item 5.
7. Divide the remainder recorded in Item 5 by 2 and record the answer in Item 6.

NOTE

The division in Step 7 is performed to convert the frequency offset to be corrected by MAGNETIC FIELD ADJUSTMENT into front panel MAGNETIC FIELD control setting.

8. Note present front panel MAGNETIC FIELD control setting and record this setting in Item 7.

9. Algebraically add the new MAGNETIC FIELD control setting from the setting recorded in Item 7. Record this total in Item 8.

NOTE

If the addition performed in Step 9 gives a negative number or a number greater than 10, the synthesizer setting selected in Item 4 must be changed. Select the adjacent offset from Table 3-7 closest to total offset recorded in Item 3, and record this new information in Item 4. Repeat Steps 5 through 9 using the new data. (See example, Table 3-4.)

10. Record Item 4 and Item 8 information in spaces provided under Item 9.
11. Set Synthesizer Assembly A1, TIME SCALE thumbwheel switch to the new setting recorded in Item 9a.
12. Set Synthesizer Assembly A1, HI-LO switch to the position recorded in Item 9b. Replace instrument top cover.
13. Adjust front panel MAGNETIC FIELD control to the setting recorded in Item 9c. Then perform Frequency Offset and Calibration (paragraph 3-10) again to align the 5065A with the reference standard.
14. Set front panel CIRCUIT CHECK switch to CONTROL and slowly adjust OSC FREQ COARSE control for CIRCUIT CHECK meter indication of "0".
15. If CONTINUOUS OPERATION lamp is off, wait 2 minutes, then momentarily press front panel LOGIC RESET button. CONTINUOUS OPERATION lamp should come on and stay on. The 5065A offset has been changed and the instrument is operating normally.

Table 3-4. Typical Frequency Offset Change, Sample (Insufficient MAGNETIC FIELD Control)

ITEM	OFFSET (x 10 <sup>-10</sup> )	TW SWITCH SETTING	HI-LO SWITCH
1. Present synthesizer Assy TIME SCALE settings (see Table 3-7 for corresponding frequency offset)	<u>-163.770</u>	<u>8619</u>	<u>HI</u>
2. Desired change in Offset	<u>-1 × 10<sup>-9</sup></u>		
3. Sum (Item 1) + (Item 2)	<u>-173.770</u>		
4. Nearest synthesizer setting (Table 3-8)	<u>-172.789</u>	<u>8238</u>	<u>HI</u>
5. Remaining offset to be adjusted by MAGNETIC FIELD control	<u>-98</u>	$(-173.770) - (-172.789)$ (Item 3) - (Item 4)	
6. Change required in MAGNETIC FIELD control setting	<u>-.49</u>	$\frac{\text{Item 5}}{2}$	$\frac{.98}{2}$
7. Present MAGNETIC FIELD control setting	<u>5.00</u>		
8. New MAGNETIC FIELD control setting	<u>4.51</u>	$(-.49) + (5.00)$	
9. New offset settings are:			
a. Synthesizer TW switch		Item 4 <u>8238</u>	
b. Synthesizer HI-LO switch		Item 4 <u>HI</u>	
c. MAG FIELD control		Item 8 <u>4.51</u>	

Figure 3-5. Equipment Setup for Calibrating Phase Measurement System

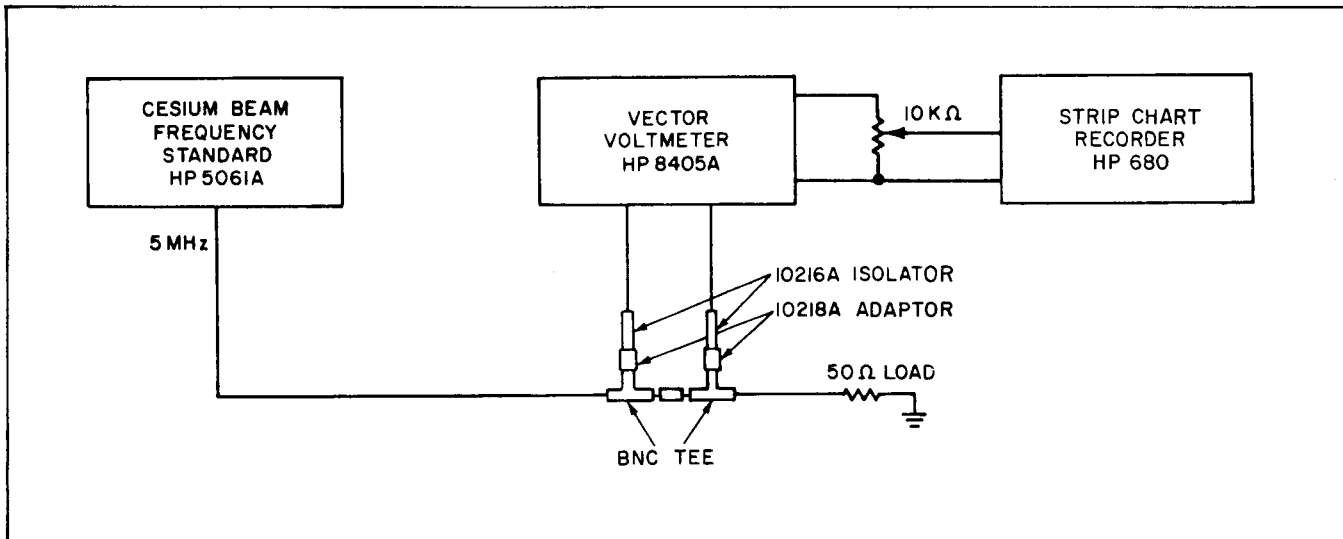
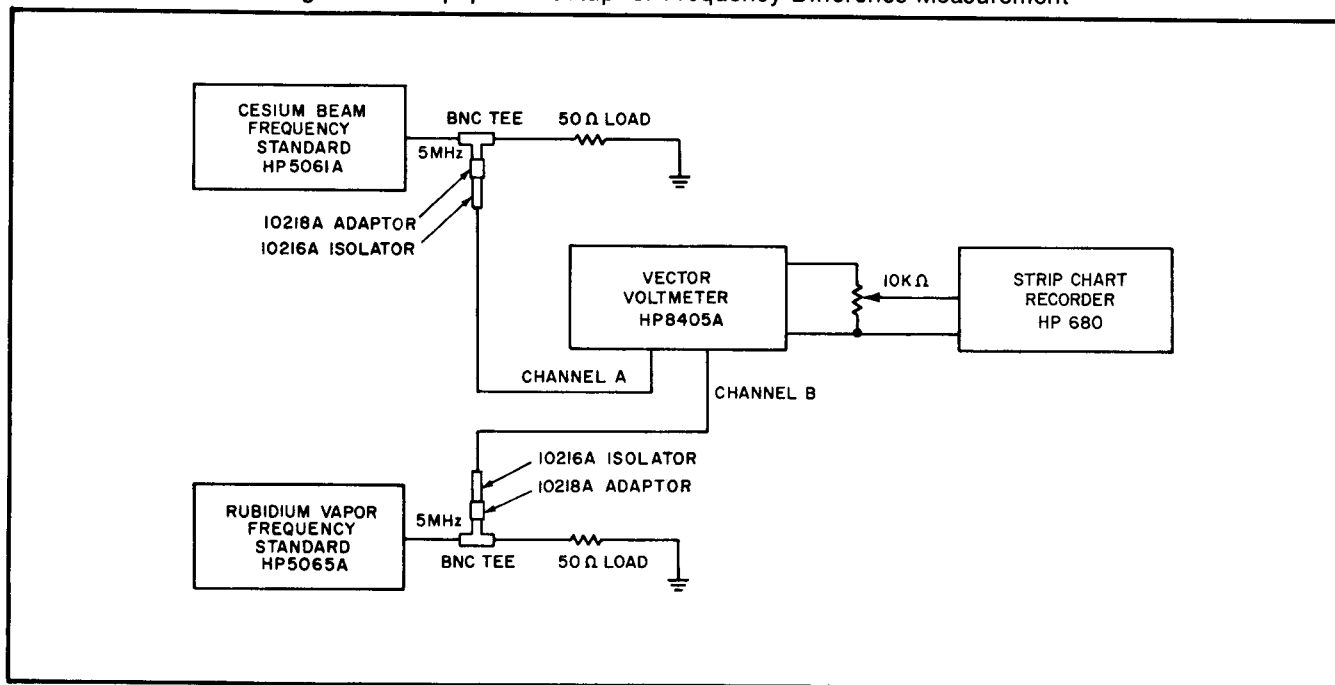


Table 3-5. Typical Frequency Offset Change,  $0 \times 10^{-10}$  Offset to  $-300 \times 10^{-10}$

ITEM	OFFSET ( $\times 10^{-10}$ )	TW SWITCH SETTING	HI-LO SWITCH
1. Present synthesizer Assy TIME SCALE settings (see Table 3-9 for corresponding frequency offset)	_____	_____	_____
2. Desired change in offset	_____		
3. Sum (Item 1) + (Item 2)	_____		
4. Nearest synthesizer setting (Table 3-8)	_____	_____	_____
5. Remaining offset to be adjusted by MAGNETIC FIELD control	_____	(Item 3) - (Item 4)	
6. Change required in MAGNETIC FIELD control setting	_____	$\frac{\text{Item 5}}{2}$	
7. Present MAGNETIC FIELD control setting	_____		
8. New MAGNETIC FIELD control setting	_____	Item 6) + (Item 7)	
9. New offset settings are:			
a. Synthesizer TW switch		Item 4. _____	
b. Synthesizer HI-LO switch		Item 4. _____	
c. MAG FIELD control		Item 8. _____	

Figure 3-6. Equipment Setup for Frequency Difference Measurement





c. Connect a reference 5 MHz to INPUT A and the 5065A 5 MHz output to INPUT B.

d. Set "Zero-Oper-Full" front panel mounted toggle switch to "Zero". Adjust "Zero Scale" control for a zero scale trace on recorder.

e. Set switch to "Full" and adjust "Full Scale" control for a full scale trace on recorder.

f. Check both "Zero" and "Full Scale" outputs and readjust if necessary.

g. The recorder will now provide a continuous record of frequency comparison and will be automatically reset when the recorder pen reaches zero or full-scale position.

h. With the recorder set for 1 volt full scale and 1 in./ hr., the phase difference recorder will be 0.2  $\mu$ sec full scale with 5 MHz inputs. See Figure 3-4 for an example of a frequency difference measurement under these conditions.

### 3-19. OPERATION WITH TIME STANDARD OPTION 001 (or 003)

3-20. Option 001 provides Model 5065A with a one pulse-per-second clock output. The divider drive is an internally connected 1 MHz signal from A6 frequency Divider Assembly. TIME DELAY controls are located on the A5 Assembly and can be seen with the top cover removed. The TIME DELAY six thumbwheel switch controls the phase of the clock-pulse output from 1 microsecond to 1 second with respect to an external reference. The 0-1 microsecond TIME DELAY screwdriver adjustment allows fine adjustment over any 1 microsecond portion of the thumbwheel settings.

3-21. The time standard option includes a 24 hour, LED digital clock assembly (A19) which indicates time in hours, minutes and seconds. The SYNC button on Divider Assembly A5 enables the instrument to synchronize to an external reference standard. The digital clock is set by pressing the SET pushbutton, SLOW/FAST switch and HOLD pushbutton (located on rear of clock).

### 3-22. SETTING THE CLOCK PHASE TO AN EXTERNAL CLOCK

3-23. The phase difference between the 5065A 1-PPS output and an external reference clock may be set to any desired point between coincidence and 1 second by using the following procedure. The technique used will depend on the Model 5065A application and individual user requirements.

### 3-24. Automatic Synchronization

3-25. To automatically synchronize the 1-PPS output pulse and the internal clock drive with an external 1-PPS reference, proceed as follows:

a. Remove the top cover for access to TIME DELAY controls.

b. Rotate the 0-1 sec TIME DELAY control maximum cw for minimum delay (do not overtighten).

c. Set the TIME DELAY thumbwheel switches for the desired time delay of the clock pulse. The thumbwheel switches read directly. However, there is a 9-11  $\mu$ sec built-in delay in the digital divider circuit which should be added to the time-delay calculation.

d. Connect the reference pulse to the rear SYNC INPUT jack (must be greater than +5V with less than 50 nanoseconds rise-time and a width greater than 0.5  $\mu$ sec).

e. Press SYNC pushbutton on A5 Assembly and hold down at least 1-second. The next tick of the clock output will be delayed according to the setting of the thumbwheel switches (plus the 9 to 11  $\mu$ sec built-in delay). For more precise adjustment of time delay, the 0-1  $\mu$ sec TIME DELAY provides continuous delay adjustment from 0-1  $\mu$ sec.

f. When the clock pulse is synchronized, the digital clock will advance in synchronism with the instrument 1PPS.

g. For a delay of less than 10  $\mu$ sec, the thumbwheel switches are first set at 999,999. Then the thumbwheel setting is decreased as required and final adjustment is made with the 0 to 1  $\mu$ sec TIME DELAY control. Use an arrangement like that of Figure 3-8 to accurately measure time intervals between the two 1-PPS pulses. For short delay intervals, use an oscilloscope. For longer delay intervals, use the optional counter arrangement.

### 3-26. Manual Synchronization

3-27. If the reference pulse does not meet the requirements for sync operation ( $>+5V$ ,  $<50$  nanosecond rise time, and width  $>0.5 \mu$ sec), use the technique of Figure 3-8 to measure time intervals. Set time delay of the 5065A 1-PPS output as required with the TIME DELAY thumbwheel switches and 0-1  $\mu$ sec control. For small delay intervals, use an oscilloscope. For larger delay intervals, use the optional counter arrangement.

### 3-28. Setting the Clock

a. Remove top cover.

b. Set hours, minutes, and seconds by placing the SLOW/FAST toggle switch at FAST, and momentarily depress the SET pushbutton for rapid advance of the display. Place toggle switch to SLOW and press SET pushbutton for slow advance of the display.

c. Set seconds on the display slightly ahead of the reference clock, and then press the HOLD pushbutton. Release HOLD pushbutton when reference clock time is identical to the digital clock.

d. Replace the instrument top cover.

Table 3-6. Offset Frequency Settings

Offset (x 10 <sup>-10</sup> )	Synthesizer Thumbwheel Setting	Synthesizer Frequency	HI-LO Switch Setting	Offset (x 10 <sup>-10</sup> )	Synthesizer Thumbwheel Setting	Synthesizer Frequency	HI-LO Switch Setting
-1000.619	9348	5314417.18	LO	-484.432	9587	5314769.98	HI
-986.784	9189	5314426.63		-472.694	8491	5314778.00	
-977.485	9030	5314432.99		-468.270	8904	5314781.02	
-970.804	8871	5314437.56		-458.497	9317	5314787.70	
-958.700	8394	5314445.83		-447.258	9047	5314795.38	
-950.573	7758	5314451.38		-440.981	8777	5314799.67	
-940.729	5691	5314458.11		-430.592	7697	5314806.77	
-930.051	9841	5314465.41		-418.827	9730	5314814.81	
-911.851	7472	5314477.85		-403.318	8253	5314825.41	
-903.502	8267	5314483.55		-396.379	8793	5314830.16	
-893.419	8744	5314490.45		-389.910	9063	5314834.58	
-888.110	8903	5314494.07		-378.205	9333	5314842.58	
-881.000	9062	5314498.93		-367.897	8936	5314849.62	
-870.988	9221	5314505.78		-360.496	8142	5314854.68	
-855.841	9380	5314516.13		-350.578	9603	5314861.46	
-844.926	8919	5314523.59		-336.597	8682	5314871.02	
-840.537	8458	5314526.59		-330.570	9079	5314875.14	
-830.246	9539	5314533.62		-315.411	9476	5314885.50	
-817.281	8776	5314542.48		-303.530	8825	5314893.62	
-809.448	9237	5314547.84		-293.966	9349	5314900.15	
-800.445	8935	5314553.99		-286.102	8571	5314905.53	
-789.990	8029	5314561.14		-279.522	9222	5314910.03	
-777.700	9698	5314569.54		-269.131	9095	5314917.13	
-763.045	8347	5314579.55		-255.182	8841	5314926.66	
-754.607	8951	5314585.32		-250.274	8714	5314930.02	
-745.271	9253	5314591.70		-240.036	8333	5314937.01	
-737.056	8808	5314597.32		-230.504	7698	5314943.53	
-723.264	9555	5314606.74		-221.054	6301	5314949.99	
-712.141	8522	5314614.34		-205.481	9873	5314960.63	
-707.350	8967	5314617.62		-191.251	5952	5314970.36	
-695.305	9412	5314625.85		-181.450	7603	5314977.05	
-685.873	8681	5314632.30		-172.789	8238	5314982.97	
-678.286	9269	5314637.48		-163.770	8619	5314989.14	
-666.835	9126	5314645.31		-154.369	8873	5314995.56	
-658.605	8983	5314650.93	-147.878	9000	5315000.00		
-647.504	8697	5314658.48	-139.498	9127	5315005.73		
-640.497	8411	5314663.31	-128.265	9254	5315013.40		
-630.506	7696	5314670.14	-112.423	9381	5315024.23		
-621.028	5980	5314676.62	-101.785	8889	5315031.50		
-608.302	9857	5314685.31	-97.677	8397	5315034.31		
-591.175	7013	5314697.02	-88.401	9508	5315040.65		
-582.542	8014	5314702.92	-77.379	8651	5315048.18		
-572.122	8586	5314710.04	-71.051	9143	5315052.51		
-562.949	8872	5314716.31	-60.293	8413	5315059.86		
-556.364	9015	5314720.81	-47.664	9635	5315068.49		
-547.544	9158	5314726.84	-32.628	8667	5315078.77		
-535.114	9301	5314735.34	-26.959	9032	5315082.64		
-526.775	8745	5314741.04	-14.426	9397	5315091.21		
-516.291	9444	5314748.20	-6.024	8556	5315096.95		
-502.712	9031	5314757.48	0.000	9159	5315101.07		
-497.249	8618	5314761.22	HI				

Table 3-7. Synthesizer Setting vs. Frequency Offset  
(See Table 3-6 for Thumbwheel Switch Settings)

Synthesizer Thumbwheel Setting	Offset (x 10 <sup>-10</sup> )	Synthesizer Thumbwheel Setting	Offset (x 10 <sup>-10</sup> )
5691	-940.729	8889	-101.785
5952	-191.251	8903	-888.110
5980	-621.028	8904	-468.270
6301	-221.054	8919	-844.926
7013	-591.175	8935	-800.445
7472	-911.851	8936	-367.897
7603	-181.450	8951	-754.607
7696	-630.506	8967	-707.350
7697	-430.592	8983	-658.605
7698	-230.504	9000	-147.878
7758	-950.573	9015	-556.364
8014	-582.542	9030	-977.485
8029	-789.990	9031	-502.712
8142	-360.496	9032	-26.959
8238	-172.789	9047	-447.258
8253	-403.318	9062	-881.000
8267	-903.502	9063	-389.910
8333	-240.036	9079	-330.570
8347	-763.045	9095	-269.131
8394	-958.700	9126	-666.835
8397	-97.677	9127	-139.498
8411	-640.497	9143	-71.051
8413	-60.293	9158	-547.544
8458	-840.537	9159	-0.000
8491	-472.694	9189	-986.784
8522	-712.141	9221	-870.988
8556	-6.024	9222	-279.522
8571	-286.102	9237	-809.448
8586	-572.122	9253	-745.271
8618	-497.249	9254	-128.265
8619	-163.770	9269	-678.286
8651	-77.379	9301	-535.144
8667	-32.628	9317	-458.497
8681	-685.873	9333	-378.205
8682	-336.597	9348	-1000.619
8697	-647.564	9349	-293.966
8714	-250.274	9380	-855.841
8744	-893.419	9381	-112.423
8745	-526.775	9412	-695.305
8776	-817.281	9444	-516.291
8777	-440.981	9476	-315.411
		9539	-830.264
8793	-396.379	9555	-723.264
8808	-737.056	9587	-484.432
8825	-303.530	9603	-350.578
8841	-255.182	9698	-777.700
8871	-970.804	9730	-418.827
8872	-562.949	9857	608.302
8873	-154.369	9873	-205.481

Table 3-8. Recommended Test Equipment

Instrument Type	Required Characteristics	Recommended Instrument
Frequency Standard	Frequency: 5 MHz  Output Level: 1 V rms into 50 ohms	HP Model 5061A
Recorder	Strip Chart, 1 inch/hr.	HP Model 680
Vector Voltmeter	Frequency: 1 MHz to 1 GHz  Voltage range: 1.5 mV to 1 V rms	HP Model 8405A
Terminations	Impedance: 50 ohms	HP Model 11048B

### 3-29. OPERATION WITH STANDBY POWER SUPPLY OPTION 002

3-30. Option 002 provides the 5065A with at least 10 minutes of standby power so that the Model 5065A can be moved; for example, from one room to another. Maximum recharge (FAST CHARGE) takes 16 to 18 hours. Necessary recharge time can be calculated on the basis of 1½ hours charge time per minute of standby operation up to a maximum of 16 to 18 hours. The front-panel BATTERY warning light indicates three battery-circuit conditions:

- a. Flashes on and off when instrument is powered from internal battery supply (when disconnected from line power).
- b. On when battery is being FAST CHARGED (with 5065A connected to line power).
- c. Off with BATTERY switch at FLOAT (continuous trickle charge).

3-31. If the instrument must be turned off for any reason, remove ac power and then momentarily disconnect F4 (this is the fuse located over the battery). In this manner, relay A2K1 is unlatched to de-energize the circuits and prevent battery drain.

Figure 3-7. Internal Measurement with Automatic Synchronization

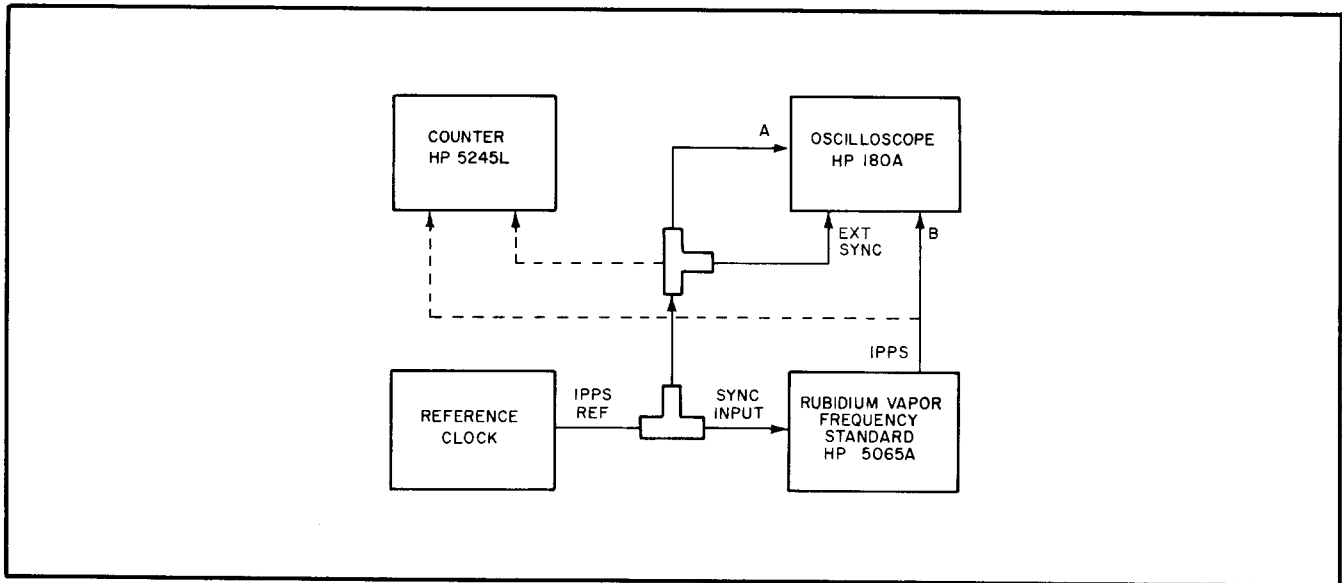


Figure 3-8. Internal Measurement with Manual Synchronization

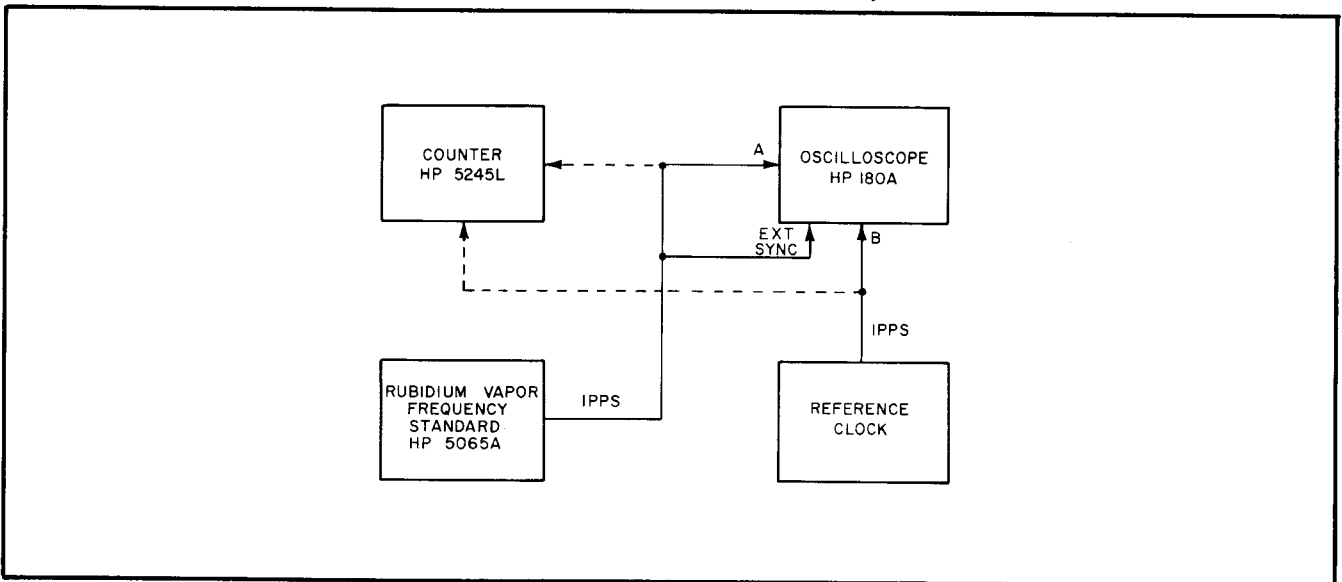
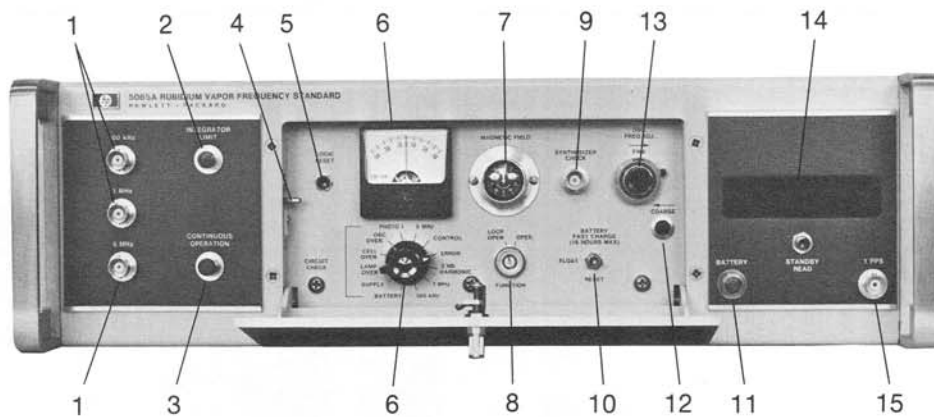
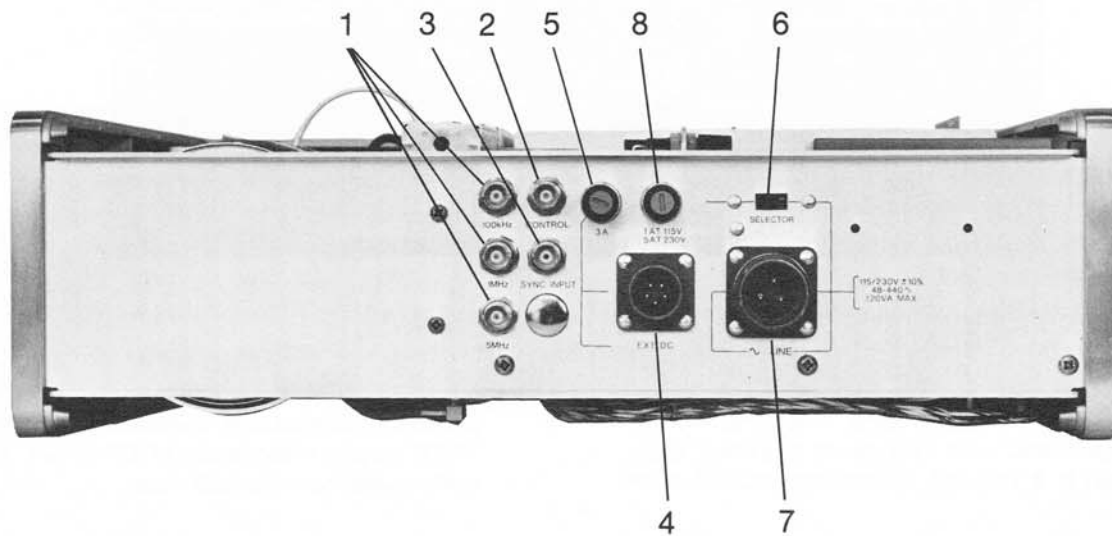


Figure 3-9. Front Panel Controls



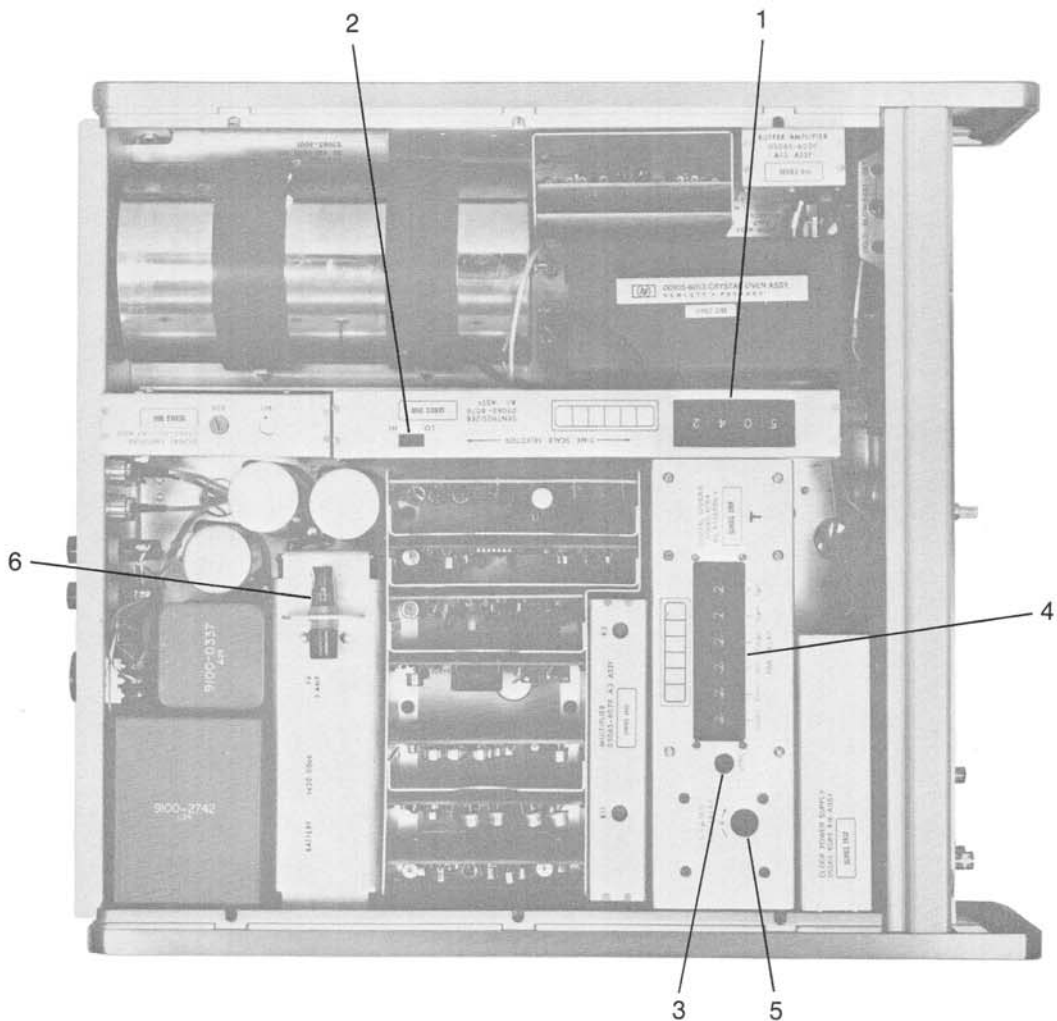
1. **OUTPUTS:** 5 MHz, 1 MHz, 100 kHz: BNC jacks paralleled with rear-panel outputs. Output level is 1 volt rms (minimum) into 50 ohm load.
2. **INTEGRATOR LIMIT lamp:** Normally off indicating that quartz oscillator dc correction voltage is less than the dynamic limit of  $\pm 5$  Vdc. When ON, indicates that quartz oscillator dc correction voltage is approaching the dynamic limit of  $\pm 5$  Vdc.
3. **CONTINUOUS OPERATION lamp:** Normally on, indicates circuits are functioning properly.
4. **START-AUTO/START divider mode switch:** Allows regenerative dividers to be operated in one of two modes: to manually start dividers, momentarily press to START, then release; for automatic start, set to AUTO START.
5. **LOGIC RESET switch:** Push to reset logic circuit and enable CONTINUOUS OPERATION lamp when operation is resumed after power interruption, repair, or adjustment.
6. **CIRCUIT CHECK meter and switch:** Provides monitoring of various circuits for operation checks and trouble indication, as specified in Table 5-3.
7. **MAGNETIC FIELD adjustment:** A high-resolution, 10-turn potentiometer with clock dial; controls the magnetic field within the RVFR Assy. Used as a fine control to set the 5065A to a specific frequency. A change of one minor division will change the frequency by 4 parts in  $10^{12}$ . Total adjustment is 2 parts in  $10^9$ .
8. **FUNCTION switch:** Controls the instrument mode of operation. OPERATE: Instrument operating with quartz oscillator locked to the RVFR resonant frequency. LOOP OPEN: All circuits operating with loop open.
9. **SYNTHESIZER CHECK jack:** Synthesizer Assembly A1 output frequency is available at this BNC jack to check Synthesizer operation as outlined in TIME SCALE CHECK of Table 5-2.
10. **BATTERY switch (Option 002 and 003 only):** Controls BATTERY lamp and internal standby battery charging rate. Three position switch has three functions:
  - a. **FAST CHARGE:** Charges battery at rapid rate with 16 hours maximum charging time.
  - b. **FLOAT:** Standby battery receives trickle charge (normal position).
  - c. **RESET:** Resets BATTERY lamp circuits after ac line power failure.
11. **BATTERY lamp (Option 002 and 003 only):** Operates with front panel BATTERY switch. Flashes on and off when ac power fails. When BATTERY switch is set to FAST CHARGE (16 HOURS MAX) lamp is on. Set BATTERY switch to RESET to turn lamp off.
12. **OSC FREQ ADJ COARSE:** Provides quartz oscillator frequency adjustment of 1 part in  $10^6$ . Use only COARSE control to correct oscillator frequency with frequency-locked operation.
13. **OSC FREQ ADJ FINE:** Control used for testing only. Normally set to 250.
14. **24-Hour Digital Clock (Option 001 and 003 only):** See Paragraph 3-29.
15. **1 PPS (Option 001 and 003 only):** +10V peak, 20  $\mu$ sec pulse at 1 pulse-per-second rate.

Figure 3-10. Rear Panel Operating Controls



1. OUTPUTS - 5 MHz, 1 MHz, 100 kHz: BNC jacks paralleled with front panel outputs.
2. CONTROL jack: Normally not used. Connected to voltage control point between integrator and quartz oscillator.
3. SYNC INPUT jack (Option 001 only): Input to digital divider circuits for external synchronizing pulse. External synchronizing pulse must be +5 V or more with rise-time of less than 50 nsec, and width  $>0.5\mu\text{sec}$ .
4. EXT DC connector: Five-pin male connector. Connects 5065A to external 24-volt dc supply.
5. EXT DC fuse (F2): 3-ampere fuse (HP Part No. 2110-0003) for external 24-volt dc power.
6. 115V/230V AC LINE switch: Set to expose correct ("115" or "230") for the ac line voltage used.
7. AC LINE jack: Accepts round female connector on power cable supplied.
8. AC LINE fuse: 1-ampere Slo-Blo fuse (HP Part No. 2110-0007) for 115 Vac operation or 0.5 ampere Slo-Blo (HP Part No. 2110-0008) for 230 Vac operation.

Figure 3-11. Top Operating Controls



1. Synthesizer TIME CLOCK SELECTOR thumb-wheel switch: selects synthesized frequency.
2. Synthesizer TIME SCALE SELECTOR HI-LO switch: used with thumbwheel switch to select synthesized frequency.
3. Clock SYNC switch (Option 001 and 003 only): Synchronizes digital clock with an external clock when depressed; clock remains synchronized when released.
4. Clock TIME DELAY thumbwheel switch (Option 001 and 003 only): selects time delay between an external reference pulse and the internal 1 pulse-per-second clock pulse. Adjustable in decade steps from 1  $\mu$ s to 1 sec.
5. 0-1  $\mu$ SEC TIME DELAY control (Options 001 and 003 only): allows continuous adjustment of clock pulse delay over any 1  $\mu$ sec range.
6. Battery fuse (F4): removed momentarily to disconnect optional standby battery from circuit for storage or shipment. Battery will remain disconnected after fuse is replaced.

## SECTION IV

### THEORY OF OPERATION

#### 4-1. THEORY

#### 4-2. General

4-3. For circuit theory on individual assemblies, refer to the schematic fold-out pages at the rear of this manual.

4-4. The simplified block diagram of Figure 5-6 shows the frequency-stabilizing feedback loop. The 5 MHz quartz oscillator output is stabilized, first by comparing the 5 MHz output in a frequency-synthesizing and multiplying process with the resonant frequency of  $\text{Rb}^{87}$  and then translating the difference frequency into a control voltage which corrects the quartz oscillator frequency.

4-5. Oscillator Assembly A10 generates the 5 MHz for A3 Multiplier where 5 MHz is: (1) phase modulated at 137 Hz, (2) multiplied to 60 MHz and, (3) combined with the synthesized 5.315... MHz after multiplication to 60 MHz. The 5.315... MHz is derived from 5 MHz in a frequency-synthesizing process. The combined 60 MHz and 5.315... MHz signal goes from A3 Multiplier to the harmonic generator step-recovery diode in A12 RVFR (Rubidium Vapor Frequency Reference) Assy. The harmonic generator/step-recovery diode couples to the  $\text{Rb}^{87}$  absorption cell which is housed in a microwave cavity tuned to 6.834685 GHz, the  $\text{Rb}^{87}$  resonant frequency. In the harmonic generator/step-recovery diode, 5.315... MHz phase-modulates the 114th harmonic of 60 MHz to produce the 6.834685... GHz lower sideband which matches the microwave cavity resonance and causes energy level transitions in the  $\text{Rb}^{87}$  gas.

4-6. Figure 4-3 shows the  $\text{Rb}^{87}$  absorption cell which contains the  $\text{Rb}^{87}$  gas. A 100-MHz oscillator in A12 RVFR Assy drives the lamp filled with  $\text{Rb}^{87}$  gas. The resulting light output passes through the  $\text{Rb}^{85}$  filter cell and the  $\text{Rb}^{87}$  absorption cell. The light output of the  $\text{Rb}^{87}$  absorption cell is monitored by a photodiode.  $\text{Rb}^{85}$  photo excitation is removed in the  $\text{Rb}^{85}$  filter cell to remove undesired transitions. When the  $\text{Rb}^{87}$  gas is

excited by the 6.834685... GHz microwave field at its resonant frequency, it increases in opacity to reduce light transmission about 1/2% as illustrated in Figure 4-1. This phenomenon permits using  $\text{Rb}^{87}$  gas as a frequency reference. Phase modulation at 137 Hz (in A3 Multiplier) produces a sinusoidal scan of the excitation frequency. As a result, 2nd harmonic 274 Hz appears in the photodiode output when "on" frequency and fundamental 137 Hz appears when "off" frequency, as shown in Figure 4-2. For example, as the 6.834685... GHz excitation is steered towards the  $\text{Rb}^{87}$  natural resonance by the feedback action of the frequency-control system, second harmonic appears in the photodiode output is mostly 2nd harmonic 274 Hz with a small amount of 137 Hz.

4-7. Temperature control of the  $\text{Rb}^{87}$  lamp and absorption cell in the A12 RVFR Assy is accomplished by temperature control circuits in the A11 Temperature Control Assy working with temperature sensors and heating elements in A12 cell and lamp ovens. Operating current for these ovens is monitored in the CELL OVEN and LAMP OVEN positions of the CIRCUIT CHECK switch. The A10 Oscillator Assy has its own temperature-control circuit for the 5 MHz quartz oscillator. Operating current for the oscillator oven is monitored in the OSC OVEN position of the CIRCUIT CHECK switch.

Figure 4-1. Rubidium Absorption Plot

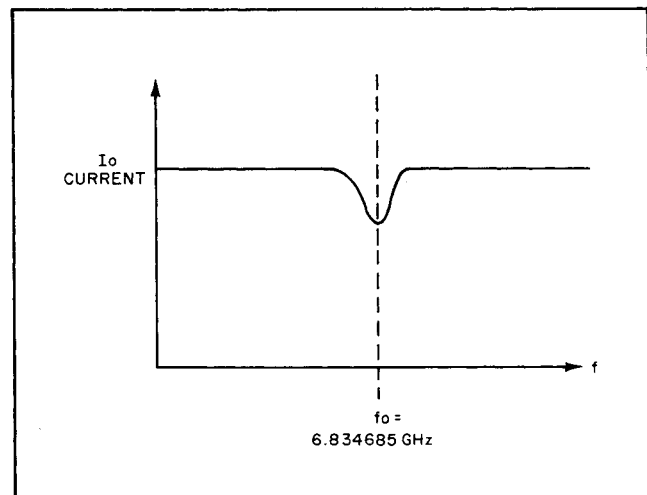
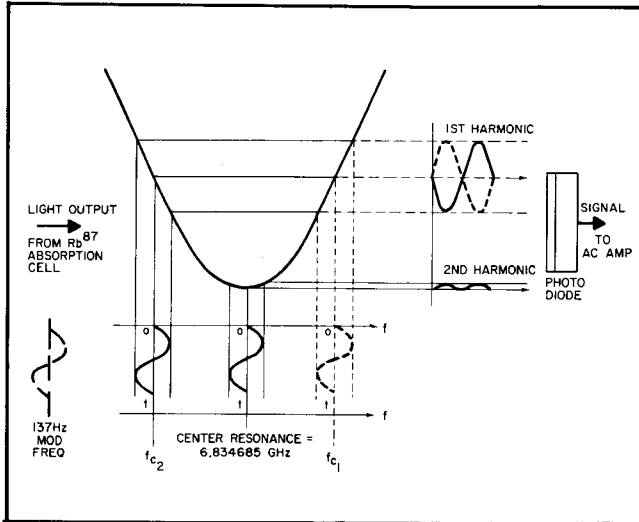




Figure 4-2. Rb<sup>87</sup> Absorption Cell Output



4-8. The A12 RVFR photodiode output is applied to A7J1. This signal contains a fundamental frequency of 137 Hz, a second harmonic of 274 Hz and is proportional to the frequency error. The composite input signal is amplified and then the 137 Hz and 274 Hz signals are separated, filtered and amplified. The 137 Hz output at A7("Y") is connected A8(18) and the 274 Hz output at A7("WBO") is connected to the 2ND HARMONIC position of M1 via A17(13).

4-9. In A8 Phase Detector, a reference 137 Hz signal is compared in phase with the 137 Hz input signal. The resulting dc output is either positive or negative depending on the phase of the 137 Hz input. Also, the dc output amplitude is proportional to the 137 Hz input amplitude. This dc output goes to the ERROR position of the CIRCUIT CHECK meter and to A9 Integrator Assembly.

4-10. In A9 Integrator Assembly, the dc error signal is amplified and integrated to slow feedback loop response. Connecting to this assembly is the FUNCTION switch which opens the control loop so that the A10 Oscillator can operate independently. In this LOOP OPEN position, A9 output is shorted to the input and the error signal is not amplified. With the FUNCTION switch at OPERate, the amplified and integrated dc control voltage connects to a varactor diode in A10 quartz oscillator circuit to correct the 5 MHz output frequency.

4-11. One 5 MHz output from A10 Oscillator is routed through a power amplifier in A3 Multiplier Assembly to A13 Buffer Amplifier. In A13 module, power amplifiers feed A1 Synthesizer and the front and rear 5 MHz output jacks. The second 5 MHz output from A10 Oscillator supplies A6 1 MHz Frequency Divider.

4-12. The A6 1 MHz Frequency Divider processes 5 MHz in a regenerative frequency divider to produce 1 MHz. One MHz outputs go to the front and rear 1 MHz output jacks and also to A4, 100 kHz Frequency Divider. A start circuit, which includes the START-AUTO-START switch, provides for manual or automatic starting of the regenerative divider circuit. Another A6 output is 1 MHz from a buffer amplifier which feeds the A5 Digital Divider Assembly.

4-13. The front panel START-AUTO-START switch permits manual starting so that frequency-divider circuits will not restart automatically. In the AUTO-START position, this switch provides for automatic restarting of divider circuits so the 5065A instrument can serve as a frequency source. When the Option 001 Time Standard is installed, a mechanical lock prevents using the AUTO-START position.

4-14. The A4 Frequency Divider processes the A6 1 MHz output through a decade divider to produce 100 kHz at front and rear 100 kHz output jacks

#### 4-15. OPTION 001, TIME STANDARD

4-16. Time Standard Option 001 consists of A5 Digital Divider, A16 Digital Divider Power Supply, and the front panel mechanical clock. The A5 module processes 1 MHz to produce digitally delayed 1 PPS output pulses. A SYNC INPUT jack at the rear enables the user to synchronize with an external reference. Incremental delay of the 1 PPS output is set by the TIME DELAY thumbwheel switches. Continuously-variable delay of the 1 PPS output, that is processed by the A16 module for a "tick" pulse output at the front-panel 1 PPS jack, is set by the 0-1  $\mu$ sec TIME DELAY adjustment.

4-17. An additional A5 control is the SYNC switch. To synchronize the 1 PPS output with a reference pulse, the SYNC pushbutton is depressed for at least 1-second and then released. If a sync pulse is connected to the rear SYNC INPUT jack, one reference pulse will enter the synchronizing circuits during the 1-second interval. This pulse will reset the digital divider. The output 1 PPS "tick" pulse from the 1 PPS front panel jack will then be in sync with the reference pulse.

4-18. Two 1 PPS inputs connect to the A16 Digital Divider Power Supply from the A5 module. One input pulse is shaped in a blocking oscillator and then amplified to provide the front panel 1 PPS "tick" output. The other 1 PPS input triggers a flip-flop stage which provides clock-driving pulses. The flip-flop output drives push-pull amplifiers to pulse the front-panel clock at a 1 PPS (or 10 PPS) rate.

4-19. The A14 Logic Assembly monitors several key points in the 5065A circuits and turns off the CONTINUOUS OPERATION lamp to indicate an operational discontinuity when one or more of the logic inputs indicate a "non-operating" condition. These logic inputs are shown in Table 4-1. In addition to the CONTINUOUS OPERATION lamp output, the Logic Assembly delivers an INTEGRATOR LIMIT lamp output when the A9 integrator output exceeds 50% of maximum. After an operational discontinuity, the LOGIC RESET switch resets the CONTINUOUS OPERATION lamp when all logic inputs are "operational."

Table 4-1. Logic Signals

Signal	Non-Operational Condition
a. Synthesizer Lock Signal	When present
b. AC Amplifier 2nd Harmonic Signal	When absent
c. Phase Detector Fundamental Error Signal	When too much signal
d. Cell Temperature Signal	When cell oven is full on or turned off
e. Lamp Temperature Signal	When lamp oven is full on or turned off
f. Function Switch Signal	When present with Function switch at LOOP OPEN

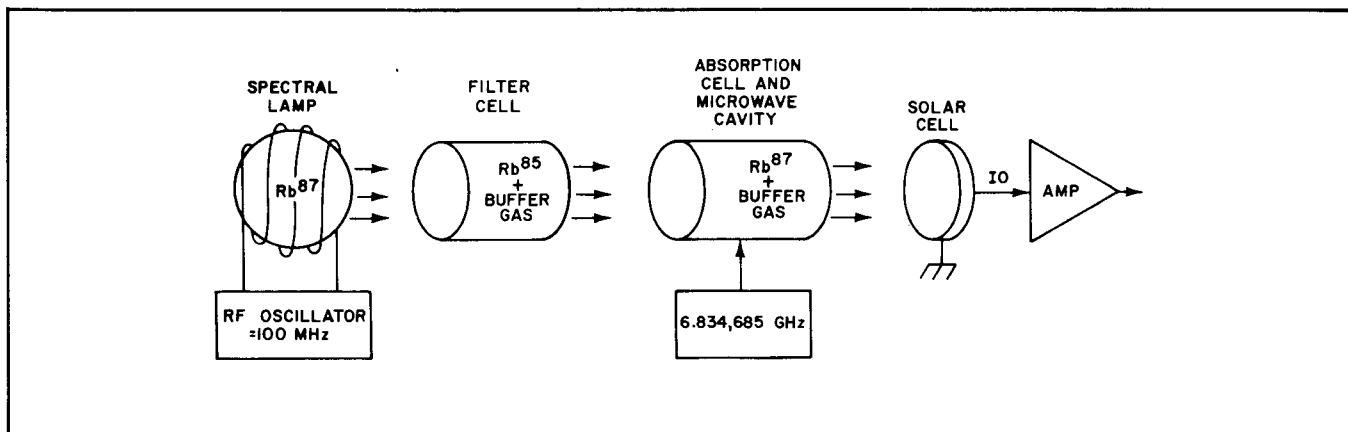
**4-20. OPTION 002, STANDBY POWER SUPPLY**

4-21. Standby Power Supply Option 002 automatically cuts in battery power if there is an ac (or dc) line interruption; for example when the unit is moved. This is accomplished by floating the battery across the power supply so that the battery takes over should ac (or dc) line power fail. This option consists of A2 Battery Charger Assembly, the nickel-cadium battery, and the BATTERY switch and lamp. The nickel-cadium

standby battery is charged as desired in either FAST CHARGE mode or a FLOAT (trickle charge) mode by a constant current charging circuit. The front panel BATTERY lamp pulses on and off to indicate a line-power discontinuity. With the BATTERY switch at FAST CHARGE, the BATTERY lamp glows steadily.

4-22. The FAST CHARGE position of the BATTERY switch is used to recharge the battery after discharge. After charging in the FAST CHARGE position, the BATTERY switch is set to FLOAT, for a trickle charge to maintain battery charge.

Figure 4-3. RVFR Assembly Block Diagram



## SECTION V MAINTENANCE

### 5-1. INTRODUCTION

5-2. This section provides maintenance and service information for the instrument. This section is organized as follows:

Paragraph No.	Section
5-7	Periodic Maintenance
5-8	Instrument Troubleshooting
5-19	Loop Alignment Procedure

5-3. In addition to the above sections, Table 5-1 lists module designations, Table 5-2 gives in-cabinet performance check to check instrument specifications, Table 5-3 gives front panel meter checks, Table 5-4 lists signal checks, and Table 5-5 gives recommended test equipment for performance checks maintenance, and troubleshooting.

Table 5-1. Assembly Designations

Assy	Name	HP Part No.
A1	Synthesizer	05065-6076
A2	Battery Charger (Opt. 002, 003)	05065-6022
A3	Multiplier	05065-6078
A4	100 kHz Frequency Divider	05065-6070
A5	Digital Divider (Opt. 001, 003)	05065-6084
A6	1 MHz Frequency Divider	05065-6016
A7	AC Amplifier	05065-6080
A8	Phase Detector	05065-6013
A9	Integrator	05065-6015
A10	Oscillator	00105-6034
A11	RVFR Temperature Controller	05065-6024
A12	RVFR	05065-6001
A13	Buffer Amplifier	05065-6020
A14	Logic	05065-6012
A15	Power Supply and Regulator	05065-6023
A16	Power Supply, Digital Divider (Option 001, 003)	05065-6085
A17	Terminal Board	05065-6014
A18	Jumper Board	05065-6057
A19	Clock Display	05065-60125 (Opt. 001) and 05065-60136 (Opt. 003)

5-4. For individual module or circuit board maintenance, see the appropriate schematic foldout page. The individual foldouts include theory, normal operation, operational checks, troubleshooting (including waveforms and/or voltages), and required circuit alignment after repair or replacement.

### 5-5. INSTRUMENT ACCESS

5-6. For access to the modules or circuit boards in the instrument, remove top and bottom covers. Remove four screws from the cover and slide it towards the rear. To replace cover, reverse procedure.

### 5-7. PERIODIC MAINTENANCE

a. Monitor all CIRCUIT CHECK meter readings and check these readings against those listed on the front panel door.

b. When the quartz oscillator control voltage exceeds  $\frac{1}{2}$  of its dynamic range, the INTEGRATOR LIMIT light will come on; this does not indicate a trouble. When this light comes on, proceed as follows:

- 1) Set CIRCUIT CHECK switch to CONTROL.
- 2) Observing the meter, adjust OSC. FREQ. ADJ. COARSE control to zero meter.

c. Over a period of time, the second harmonic signal level as seen on the meter may decay somewhat due to an aging process in the A12 RVFR Assembly. When this second harmonic signal level reaches  $\frac{1}{2}$  of its initial value, the instrument should be adjusted to reset the second harmonic signal level. This adjustment is performed as follows:

- 1) Set front panel OSC. FREQ. ADJ. FINE control to 250.
- 2) Set CIRCUIT CHECK meter to CONTROL. Observing the meter indication, adjust OSC. FREQ. ADJ. COARSE control for a zero reading.
- 3) Set FUNCTION switch to LOOP OPEN.
- 4) Set OSC. FREQ. ADJ. FINE control to 200.
- 5) Remove instrument top cover. Connect the vertical input of an oscilloscope to A8TP3 and the horizontal input to A8TP2. Use the oscilloscope horizontal amplifier instead of the triggered internal sweep.

- 6) Adjust Oscilloscope for a pattern similar to Figure 5-2. If waveform looks like Figure 5-1, phase and/or amplitude are misadjusted. Perform Loop Alignment, Paragraphs 5-19 through 5-31. If waveforms look like Figure 5-2 in shape and not necessarily in amplitude, continue to next step.
- 7) Adjust A3R3 and A3R11 fully ccw, then adjust cw ¼ turn until the oscilloscope pattern just splits. Readjust A3R3 and A3R11 cw slightly to where the pattern is similar to Figure 5-2. Splitting is observed at the lower right and left ends of the waveform.
- 8) Remove oscilloscope connections and replace top cover. Set OSC. FREQ. ADJ. FINE to 250 and set FUNCTION switch to OPERate.
- 9) Press LOGIC RESET pushbutton. CONTINUOUS OPERATION light will come on and stay on.

Figure 5-1. A8TP3 Waveform at  $200 \times 10^{-10}$  and Phase Misadjusted

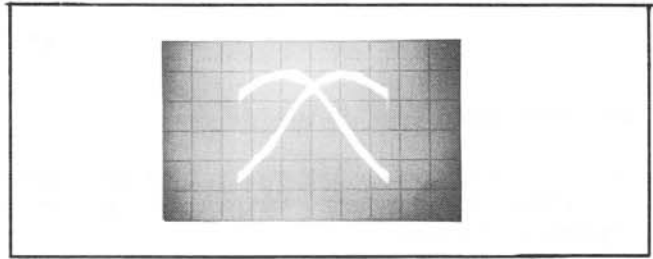


Figure 5-2. A8TP3 Waveform at  $200 \times 10^{-10}$  and Phase Correct

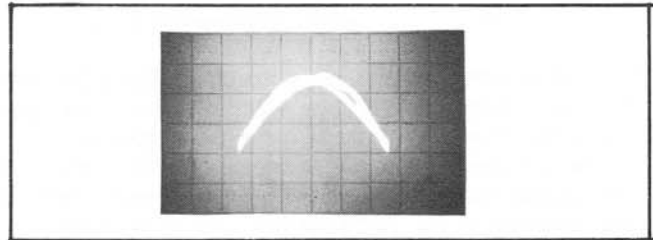
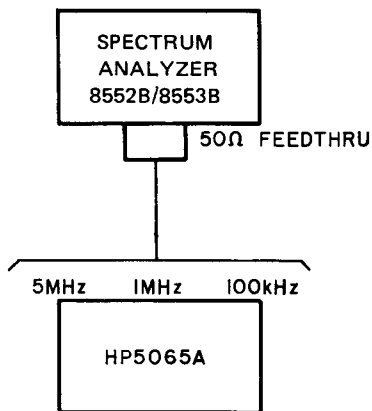


Table 5-2. In-Cabinet Performance Check

<p><b>1. CIRCUIT CHECK METER CHECK</b></p> <p>The circuit checks below involve setting the front panel CIRCUIT CHECK switch to all its positions and observing the corresponding indication on CIRCUIT CHECK meter. Switch positions and normal indications are listed in Table 5-3. Perform the circuit checks as follows: Set CIRCUIT CHECK switch to all its positions. CIRCUIT CHECK meter indications should be as in Table 5-3.</p> <p><b>2. OUTPUT FREQUENCIES</b></p> <p>Place instrument in operation (CONTINUOUS OPERATION light on, ALARM light off).</p> <p>Connect 5 MHz from a Primary Frequency Standard as an external time base to an Electronic Counter.</p> <p>Connect the Counter to each of the following OUTPUTS of the instrument under test:</p> <table style="margin-left: auto; margin-right: auto; border: none;"> <thead> <tr> <th style="text-align: left; padding-right: 20px;">FRONT PANEL</th> <th style="text-align: left;">REAR PANEL</th> </tr> </thead> <tbody> <tr> <td style="padding-right: 20px;">1 MHz</td> <td>1 MHz</td> </tr> <tr> <td style="padding-right: 20px;">5 MHz</td> <td>5 MHz</td> </tr> <tr> <td style="padding-right: 20px;">100 kHz</td> <td>100 kHz</td> </tr> </tbody> </table> <p>Counter should display the correct frequency, plus or minus the inherent 1-count error of the Counter.</p>	FRONT PANEL	REAR PANEL	1 MHz	1 MHz	5 MHz	5 MHz	100 kHz	100 kHz	<p><b>3. OUTPUT VOLTAGES</b></p> <p>Place instrument in operation (CONTINUOUS OPERATION light on, ALARM light off).</p> <p>Connect an RMS Voltmeter through a 50-ohm Feed-thru to front panel 5 MHz, 1 MHz, 100 kHz, rear panel 5 MHz, 1 MHz, and 100 kHz output jacks. Voltmeter should indicate between 1.0 and 1.5 Vrms for each frequency checked. Connect the same outputs to the vertical channel of an Oscilloscope. Oscilloscope display should be a clean sine wave.</p> <p><b>4. HARMONIC DISTORTION CHECK</b></p> <p>Harmonic distortion in the 5 MHz, 1 MHz, and 100 kHz output signals should be at least 40 dB down from the 1 Vrms output. To perform this check, a Spectrum Analyzer is tuned to the fundamental frequency and an amplitude reference is established. The output frequency spectrum is then investigated to determine fundamental-to-sideband amplitude relationship at harmonic points of the fundamental.</p> <p>Set instrument to normal operation mode (CONTINUOUS OPERATION light on).</p> <p>Connect equipment shown in Figure 5-3.</p>
FRONT PANEL	REAR PANEL								
1 MHz	1 MHz								
5 MHz	5 MHz								
100 kHz	100 kHz								

Table 5-2. In-Cabinet Performance Check (Cont'd)

Figure 5-3. Harmonic and Non-Harmonic Distortion Test Setup



To perform the check proceed as follows:

a. Connect 5 MHz output through 50-ohm Feed-thru to Spectrum Analyzer input. Check spectrum at 5 MHz center to 4th harmonic (20 MHz). Harmonics should be below 40 dB.

b. Remove connection from instrument 5 MHz output and connect to 1 MHz output jack. Check spectrum at 1 MHz center to 5th harmonic (5 MHz). Harmonics should be below 40 dB.

c. Remove connection from instrument 1 MHz output and connect to 100 kHz output jack. Check spectrum at 100 kHz center to 50th harmonic (5 MHz). Harmonics should be below 40 dB. Disconnect Spectrum Analyzer from instrument.

5. NON-HARMONIC DISTORTION CHECK

Non-harmonic distortion in the 5 MHz, 1 MHz, and 100 kHz output signals should be at least 80 dB down from the 1 Vrms output. To perform this check, a Spectrum Analyzer is tuned to the fundamental frequency and an amplitude reference is established. The output frequency spectrum is then investigated to determine fundamental-to-sideband amplitude relationship at non-harmonic points in the spectrum.

Set instrument to normal operation mode (CONTINUOUS OPERATION light on).

Connect equipment shown in Figure 5-3.

To perform the check proceed as follows:

a. Connect 5 MHz output through 50-ohm Feed-thru to Spectrum Analyzer input. Check spectrum at 5 MHz  $\pm 5$  kHz. All sidebands should be at least 80 dB below the carrier.

b. Remove connection from instrument 5 MHz output and connect to 1 MHz output jack. Check spectrum at 1 MHz center  $\pm 5$  kHz. All sidebands should be 80 dB below the carrier.

c. Remove connection from instrument 1 MHz output and connect to 100 kHz output jack. Check spectrum at 100 kHz  $\pm 5$  kHz. All sidebands, except harmonically related, should be 80 dB below the carrier. Disconnect equipment from instrument.

6. CLOCK PULSE CHECK (OPTION 001 and 003)

a. Pulse Parameters. Connect 5065A 1 PPS output to Oscilloscope vertical input. Set instrument for normal operation (CONTINUOUS OPERATION light on, ALARM light off, DIVIDER MODE switch to AUTO START). Parameters should be as indicated:

- Rate: 1 pulse-per second
- Amplitude: +10V peak  $\pm 10\%$
- Width: 20  $\mu$ sec minimum
- Rise Time: <50 nsec
- Fall Time: <2  $\mu$ sec

b. Pulse Jitter. To verify pulse jitter specification (<5 nS rms pulse to pulse) one of two methods may be used. If the HP Model 5390A system is to be used for checking short term frequency stability, use the procedure described in Method 1 below. If the 5390A system is not available, use the procedure described in Method 2.

Method 1.

In this procedure the Model 9825A Computing Controller is used to control the Model 5345A frequency counter. The counter takes data under the direction of the Controller. The Controller performs the RMS calculation. Proceed as follows:

- (1) Set 5345A front panel controls as  
SAMPLE RATE ..... CCW  
FUNCTION ... TIME INT. A TO B  
GATE TIME ..... MIN  
CHANNEL A and B  
Input Resistance ..... 1M $\Omega$   
ATTEN ..... X20  
Coupling ..... DC  
SLOPE ..... +  
Input ..... COM A

(2) If a cable is connected to Channel B input remove it.

(3) Connect 1 PPS output from 5065A 50 ohm feedthrough termination to the Channel A input of the 5345A. Adjust Channel A and B LEVEL controls so that each channel triggers about in the middle of the pulse (+5V) and the counter displays approximately 1 second.

Table 5-2. In-Cabinet Performance Check (Cont'd)

- (4) Remove cassette from 9825A controller and turn power switch off.
- (5) Set 9825A controller power switch on and type the following program into controller. Press STORE after each line (do not type line number).

```

0: f1t 2
1: dim AC100]
2: wrt 710, "I2F3C5E8I1"
3: wait 50
4: for I=1 to 100
5: red 710,AC[I]
6: next I
7: 0+S*0+T
8: for I=1 to 99
9: S+(AC[I]-AC[I+1])^2+S
10: T+(AC[I]-AC[I+1])^2
11: next I
12: r(.01*S-(.01*T)^2)^.5
13: prt "RMS jitter =",D,"sec"
14: end
*29718
    
```

- (6) Press RUN. Controller will take measurements and print results. Measurement takes approximately 200 seconds.

Method 2.

Alternate method for checking pulse jitter. This method uses the HP Model 5370A Time Interval Counter to check pulse jitter. This procedure may be used if the 5345A/9825A combination is not available. The 5370A may also be used to check synchronization and time delay in Section 5 of this performance check.

- (1) Connect 5 MHz from 5061A under test to FREQ STD INPUT on 5370A rear panel. Set FREQ STD switch to EXT.
 

Slope .....	f
Attenuation .....	X10
Input Resistance .....	1MΩ
Coupling .....	DC
Com/Sep .....	START COM
- (2) On 5370A turn on AC power, and set START and STOP Channel Controls as follows:
- (3) Set FUNCTION: TRIG LVL. Set START and STOP trigger LEVEL controls for a reading of ≈0.5.
- (4) Connect 1 PPS from 5065A through 50 ohm feedthrough termination to START input.

- (5) Set FUNCTION: TI. 5370A should display approximately 1 second. Reading will change slightly every other second. START and STOP lights should be flashing at a 1 second rate.
- (6) Set STATISTICS: STD DEVIATION. SAMPLE SIZE will automatically go to 100.
- (7) Measurement of RMS pulse jitter takes about 3-1/2 minutes. During this time the display will not change. RMS pulse jitter must be less than 5 nanoseconds.

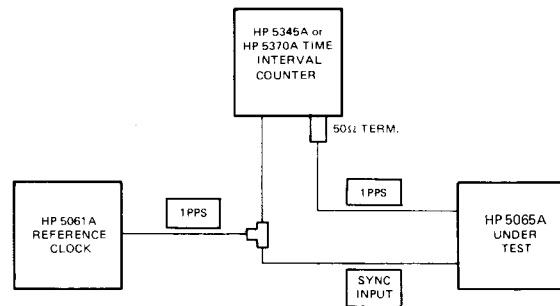
7. SYNCHRONIZATION AND TIME DELAY CHECK

The Digital Clock output pulse can be automatically synchronized with a reference pulse to within 10 ±1 μsecond. To check synchronization, proceed as follows:

- a. With 5061A in normal operation connect equipment as shown in Figure 5-4.
- NOTE: Reference pulse must be greater than +5V with a rise time of 50 ns or less.

Note: Set input trigger for + slope and +5V.

Figure 5-4. Equipment Setup for Synchronization and Delay Checks



- b. Press and hold Clock SYNC button located on Digital Divider Assembly A5 for at least one second. The digital clock will synchronize on the first pulse input after the SYNC button is pressed. The time interval counter will display a 10 ±1 μs time delay.
- c. Time Delay. To check the time delay thumbwheels, proceed as follows:
  1. Connect equipment as shown in Figure 5-4.

Table 5-2. In-Cabinet Performance Check (Cont'd)

- Check TIME DELAY by setting thumb-wheel switch to following positions and observing output pulse delay on Time Interval Counter. Time interval change should correspond with switch settings.

7 $\mu$ s	800 $\mu$ s	80 ms
8 $\mu$ s	7 ms	700 ms
70 $\mu$ s	8 ms	800 ms
80 $\mu$ s	70 ms	999.999 ms
700 $\mu$ s		

- Adjust 0-1  $\mu$ s TIME DELAY control. Time interval counter should show delay change of 1  $\mu$ s.

8. FREQUENCY STABILITY OF 5 MHz OUTPUT (Sigma y of Tau)

The rms deviation of the 5 MHz output is measured using the HP Model 5390A Frequency Stability Analyzer option 010, and the Model 105B option H66. This equipment enables measurements of Sigma y of Tau for averaging times as short as 50 ms.

In this procedure measurements will be made with averaging times between 50 msec and 100 seconds. Since the 100 second averaging time measurement takes over 3 hours to complete, this portion of the test may be deleted.

The information given below is designed to be used in conjunction with the 5390A FSA option 010 "Sigma y of Tau" users manual. System connection should be done per this manual. The following information provides the necessary operating parameters to enable the operator to verify the 5065A specification over the measurement range.

The test assumes that the reference standard is an HP Model 5061A with option 004 or another 5065A.

To perform the tests, connect to 5390A FSA System as shown in Figure 5-5. Input information to FSA System as follows:

Step	Data Requested	Input Data
1	Program name	ffddmtd (see Note 1)
2	Max data array size	100
	Max numb. tau's	10
3	Year	Last 2 digits of year
4	Key function	ENTER MEAS PARAMETERS (fo)
	tau	.05 CONTINUE .1 CONTINUE 1 CONTINUE 10 CONTINUE 100 CONTINUE 0 CONTINUE
	number of samples	100
	measurement bandwidth	100,000
	carrier frequency	5e6
	correction coefficient	1.414
5	Key function	START MEASUREMENT (f5)
	Measurement description	5065A s/n Performance Test

Note:

ffddmtd = fractional frequency difference dual-mixer time difference method.

The 5390A will type heading, measurement parameter data, and then proceed with the measurement. Measured values should be equal to or less than the corresponding values given in the specifications, Table 1-1.

Figure 5-5. 5 MHz Output Stability Test Setup

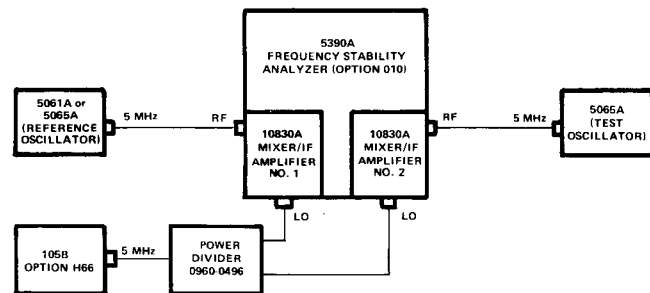


Table 5-2. In-Cabinet Performance Check (Cont'd)

6. FREQUENCY STABILITY CHECK

The specification for long-term frequency stability of the 5065A is less than  $1 \times 10^{-11}$  per month. To verify this frequency stability, the 5065A must be compared with a primary frequency standard to observe frequency change over a 30-day period.

a. Refer to Section 3-20, Frequency Offset and Calibration, for instructions on making a phase check between the 5065A and a reference standard.

b. Before proceeding with this check allow a 24-hour warmup.

c. At the beginning of this check adjust the 5065A front panel MAGNETIC FIELD control to set the 5065A frequency within 1 part in  $10^{11}$  of the reference standard frequency.

d. Run this check for 30 days or; make two separate checks with 30 days intervening.

e. Note any change in frequency of the 5065A with respect to the reference standard over the 30-day period. This change should be less than 1 part in  $10^{11}$ .

With practice, the operator will be able to verify frequency stability for most purposes by observing frequency change over a 48-hour period. However, if the 5065A frequency stability specification must be verified, a 30-day check will be required.

5-8. INSTRUMENT TROUBLESHOOTING

5-9. Introduction

5-10. When operational checks indicate a frequency change that is not within specifications for either UTC or A1 time scales according to the setting of the TIME SCALE thumbwheel and HI-LO switches, the following checks should be made prior to servicing:

a. If instrument is operating on A1 time scale, check Synthesizer TIME SCALE thumbwheel switch and HI-LO switch setting against the indicated A1 settings on the A12 RVFR decal.

b. If the instrument is operating on the UTC time scale, check Synthesizer TIME SCALE thumbwheel switch and HI-LO switch settings against the UTC settings on the operating card mounted on the front panel door.

c. Check synthesizer frequency according to the table on foldout page which lists synthesizer output frequencies versus TIME SCALE settings.

**NOTE**

If CONTINUOUS OPERATION light goes out after instrument has warmed up, the CIRCUIT CHECK meter switch should be set to the LAMP OVEN and CELL OVEN positions. If either meter indication is full scale, the instrument should be turned off immediately. If not, the RVFR Assembly could be damaged by excessive heat.

5-11. In troubleshooting the 5065A, it is helpful to consider the instrument as consisting of 3 sections: (1) RF section, (2) RVFR and, (3) the low-frequency section. These are shown in the simplified block diagram of Figure 5-6.

5-12. The RF Section, by multiplication and synthesis, generates the excitation signals for the RVFR. If the excitation frequencies and power levels are correct, the RVFR Assembly should respond. This response is a 137 Hz signal if the RF excitation is slightly off frequency, and a 274 Hz (2nd Harmonic) signal if the excitation is "on frequency". The RVFR will not operate properly if the cell heater circuit is not working. In the low frequency section, the error signal is amplified and phase detected to give a dc voltage proportional to the excitation frequency error. This error signal is processed by the integrating amplifier and sent to the Quartz oscillator as a control signal to hold the Quartz oscillator at the correct frequency.

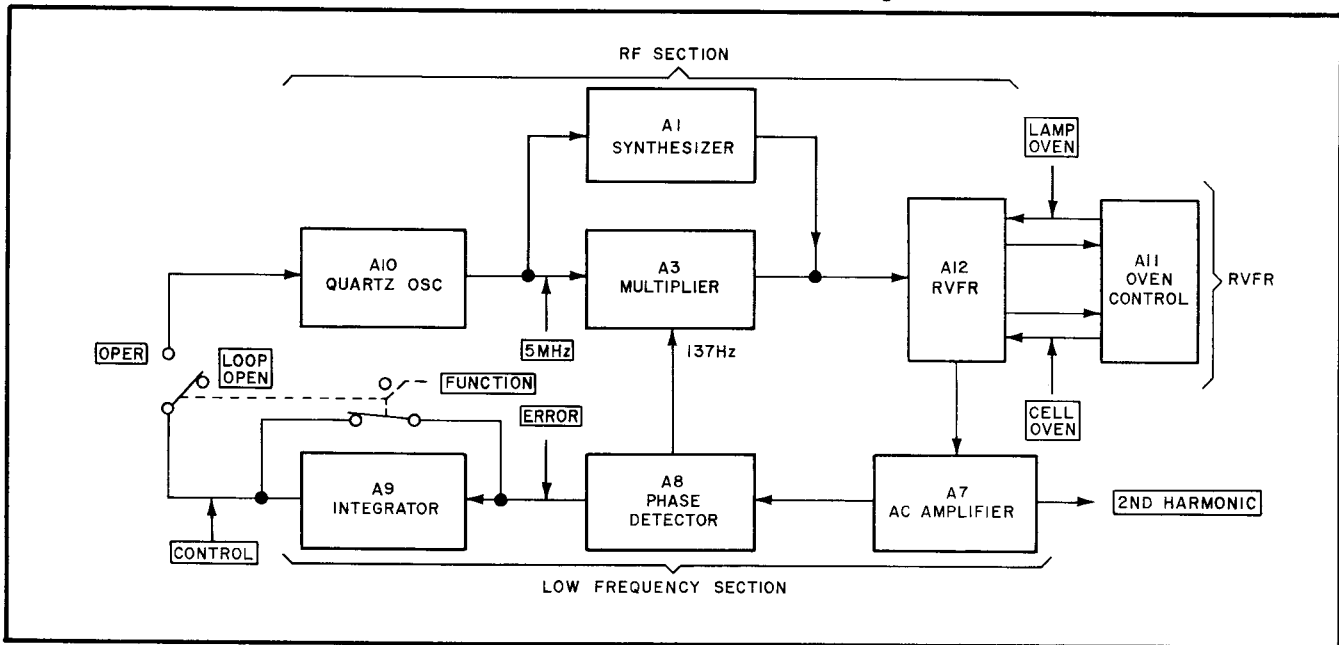
5-13. The front panel meter monitors various points in the loop. These are indicated in Figure 8-2. Four of the five input signals to the logic assembly (which can turn off the CONTINUOUS OPERATION light) may be monitored on the CIRCUIT CHECK meter. These are:

- a. The 2ND HARMONIC signal
- b. The CELL OVEN signal
- c. The LAMP OVEN signal
- d. The fundamental ERROR signal

The one alarm signal that is not monitored is the "Synthesizer lock" signal.



Figure 5-6. 5065A Simplified Block Diagram



5-14. The FUNCTION switch allows the servo loop to be opened for troubleshooting and instrument alignment. Once the servo loop has been opened, troubleshooting becomes fairly straightforward because the individual circuits can be checked without feedback present.

#### 5-15. Fault Finding

5-16. This section makes extensive use of Table 5-3, CIRCUIT CHECKS, and Table 5-4, SIGNAL CHECKS to provide a means of isolating the fault. For example, if a fault is indicated by the erroneous meter reading, the CIRCUIT CHECKS table provides the necessary tests to further pinpoint the trouble. Where pertinent, the CIRCUIT CHECKS table refers to the SIGNAL CHECKS table for further tests.

5-17. A fault is normally first seen when CONTINUOUS OPERATION light goes off. The first step in finding the trouble is to use the front-panel CIRCUIT CHECK meter. Table 5-3, CIRCUIT CHECKS, provides normal indication, as well as recommended procedure if a meter indication is not correct. The use of this meter together with the recommended procedures of the CIRCUIT CHECKS and SIGNAL CHECKS tables provides a useful first step in isolating a fault.

5-18. There is a small possibility that the 5065A may lose its calibration and go off frequency without turning off the CONTINUOUS OPERATION light. If this occurs: 1) check Synthesizer output frequency (see Section 3-10, Frequency Offset Settings) and, 2) Check for proper operation and setting of the MAGNETIC FIELD control.

Table 5-3. Circuit Checks

<p>Make checks in the order shown with function switch set to OPER and OSC FREQ ADJ FINE set to 250.</p> <p style="text-align: center;">NOTE</p> <p>If all meter readings are normal, but CONTINUOUS OPERATION light will not come on, check: 1) CONTINUOUS OPERATION light bulb, 2) A1 Synthesizer circuit (see foldout, Page 8-13), 3) A14 Logic Assembly (see foldout, Page 8-47).</p>			
CIRCUIT CHECK Switch Position	Normal Indication	Nature of Meter Indication	Checks to Make if Reading Abnormal
BATTERY	35 to 45	Meter signal supplied from positive side of internal battery (Option 002 only) through Terminal Board A17(1) to S4(A).	Standby Power Supply maintenance, Paragraph 5-32.
SUPPLY	38 to 42	Meter signal is regulated +20 V from A15 Power Supply through A17(2) to S4(B).	Check A15 Assembly, foldout page Check ac fuse.
LAMP OVEN	10 to 40 After about 1-hour	These signals indicate LAMP and CELL heater currents. These signals vary with ambient temperature. As ambient temperature decreases the meter signals will increase, indicating increased heater current.	NOTE: If either reading is full scale, remove power and allow oven to cool; then effect repairs. CONTINUED OPERATION WITH METER AT FULL SCALE (AFTER INITIAL WARMUP) CAN CAUSE DAMAGE TO RVFR ASSY.
CELL OVEN	10 to 45 After about 1-hour	These signals supplied by A11 Temperature Control through A17(3) to S4(C) (LAMP) and through A17(4) to S4(D) (CELL)	Check A11 Assembly, foldout page Note: If cell oven meter reading is zero, loss of signal from RVFR can result
OSC OVEN	35 to 45 (for ambient temperature of 25° C) After about 1-hour	This meter signal indicates power applied to proportional oven in A10 Oscillator Assembly. Routes through A17(5) to S4(E). Normal reading achieved after oven is at operating temperature (about 1-hour)	Check dc power connections to A10 Assembly; then check this section of metering circuit. If all check out, replace A10.
PHOTO I	25 to 50	Meter signal is A12 RVFR photo diode current; routes through A7 Assembly, and through A17(6) to S4(F). Normal reading indicates Rb <sup>97</sup> lamp is on.	Remove A7P1 and use meter such as HP 412A to measure Photo I directly. Value should be about twice meter reading; 80μa = a 40 meter reading. If measured current and meter reading do not correspond, trouble is in Q1, Q2, or IC1 circuits of A7. If current is much less than 50μa: 1) there is no dc power to A12 RVFR Assembly at A12J16 or, 2) the A12 RVFR Assembly is defective.

Table 5-3. Circuit Checks (Continued)

CIRCUIT CHECK Switch Position	Normal Indication	Nature of Meter Indication	Checks to Make if Reading Abnormal
5 MHz	38 to 42 with no load at front or rear 5 MHz jack	Meter signal comes from A13 Buffer Amplifier through A17(10) to S4(L). Signal represents 5 MHz output; is less when loaded.	If signal is low, but not zero: (1) Check front and rear jacks for loading (meter reading is established with no cables or other loads connected). (2) Perform "Output Voltage and Waveforms" check described in Figure 8-20.  If signal is zero: Check 5 MHz signal path from A10(1V) to A3J2, from A3J3 to A13J1, and from A13J2 and J4 to front and rear 5 MHz jacks. Check 5 MHz meter circuit in A13 Buffer Amplifier.
CONTROL	-50 to +50	Meter signal comes from A9 Integrator Amplifier through A17(11) to S4(M) and also to rear panel CONTROL jack. This signal represents the frequency correction voltage that steers the A10 Quartz Oscillator. When this meter signal exceeds about +2.5 V or -5.0 V, INTEGRATOR LIMIT light will come on. When this occurs; set OSC FREQ ADJ COARSE control for zero indication on meter.	Should be reset to zero with OSC FREQ ADJ COARSE (cw to make meter go-). If meter does not respond, set FUNCTION switch to LOOP OPEN. Meter should zero; 1) if it does, perform signal check in Table 5-4, 2) if meter does not zero, check FUNCTION switch circuit, meter circuit, and A9 Integrator Assembly (see foldout, Page 8-33).
ERROR	Zero	Meter signal comes from A8 Phase Detector (filtered from the A12 photo diode output and amplified in A7 (AC Amplifier). This signal is the fundamental 137 Hz ac error signal that is zero when "on frequency".	If reading is not normal, switch CIRCUIT CHECK switch to CONTROL and make "Control" checks above.
2ND HARMONIC	20 to 40	Meter signal comes from A14 Logic Assembly through A17(13) to S4(P). This signal represents 274 Hz voltage level from A7 AC Amplifier.	If meter reading has slowly dropped to less than 20, refer to instructions in Paragraph C of PERIODIC MAINTENANCE, Section 5-7. If meter reading has suddenly dropped, indicating a possible trouble in RVFR or RF sections of servo loop, see Table 5-4, SIGNAL CHECKS.
1 MHz and 100 kHz	38 to 42 with no load connected to front and rear jacks	These signals represent the amount of 1 MHz and 100 kHz at front and rear output jacks. 1 MHz signal routes from A6 Freq. Div. through A17(14) to S4(R). 100 kHz signal routes from A4 Freq. Div. through A17(15) to S4(S).	Check front and rear jacks for loads. Push START-AUTO START switch momentarily to START and then release. Signal should come up to proper value. If not, check A4 or A6 circuit as required.

Table 5-4. Signal Checks

The following checks test operation of the RF section, the RVFR section, and the preamplifier and 2nd harmonic detector sections of A7 AC Amplifier.

1. Set FUNCTION switch to LOOP OPEN.
2. Set CIRCUIT CHECK switch to 2ND HARMONIC.
3. Check to be sure OSC FREQ ADJ FINE is set to 250. Adjust OSC FREQ ADJ COARSE slowly over its entire range until an indication is seen on the meter. If no indication is observed, refer to the RVFR check on foldout, Page 8-62.

**NOTE**

If there is another frequency standard available, it should be used to set the 5065A internal oscillator. This setup will check operation of the OSC FREQ ADJ COARSE control; also it will insure proper frequency setting of the quartz oscillator in A10 Assembly.

**CAUTION**

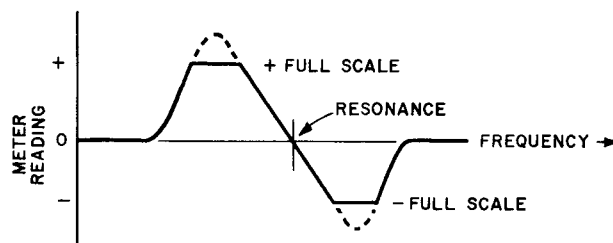
**THE REFERENCE FREQUENCY STANDARD MUST BE OPERATING ON THE SAME TIME SCALE AS THE 5065A UNDER TEST.**

4. If a response is seen, set CIRCUIT CHECK switch to ERROR. Slowly adjust OSC FREQ ADJ COARSE control. As the frequency of the quartz oscillator is adjusted through resonance, the meter will respond as shown in Figure 5-7. If meter response is erratic, check A1 Synthesizer Assembly as described on foldout, Page 8-11.

Continue adjustment until meter is at the resonant point. Then proceed to step 5.

If meter does not respond in the preceding ERROR adjustment, but reacted normally in step 3, check A7 output amplifier circuit, interconnection between A7 and A8, the phase detector circuit in A8, and also the ERROR metering circuit. (See Figure 5-7.)

Figure 5-7. Meter Response in ERROR Position



5. Set FUNCTION switch to OPER and CIRCUIT CHECK switch to CONTROL.
6. Control voltage meter indication should remain approximately at 0. If so, continue with step 7. If control voltage moves to full scale or wanders around erratically, the following are possible troubles:
  - a) No signal connection between A8 and A9 Assemblies.
  - b) Defective A9 Assembly (see foldout, Page 8-49).
  - c) No signal connection between A9 and A10 Assemblies.
  - d) Defective electronic control circuit in A10. If A10 is defective, it must be returned to the factory for repair. See foldout, Page 8-53 for removal instructions.
7. Adjust OSC FREQ ADJ COARSE control about 1/8-turn. CONTROL voltage should move a corresponding amount and then stop. If it does, press LOGIC RESET button. CONTINUOUS OPERATION light will come on; system is OK. If this light does not come on, check A14 Logic Assembly for proper input voltages and circuit operation. (See foldout, Page 8-67, also check A1 Synthesizer as described on foldout, Page 8-11.

Table 5-5. Recommended Test Equipment

Instrument	Required Characteristics	Use	Model
Primary Frequency Standard	Frequency: 5 MHz and 1 MHz Output Level: 1V rms at 50 ohms Accuracy: $\pm 1 \times 10^{-11}$	Performance Check	HP 5061A Option 004
Frequency Stability Analyzer system	Capable of automatically measuring short term frequency fluctuations with averaging times of 10 msec and greater	Performance Check	HP 5390A Opt 010 with HP 1051A (Option H66)
50-ohm Feedthru Termination	50 ohms shunt connections male and female BNC	Performance Check Troubleshooting	HP 11048B
RMS Voltmeter	Voltage Range: .3V to 3V full scale Frequency Range: 10 Hz to 10 MHz Accuracy: $\pm 5\%$ full scale	Performance Check Troubleshooting	HP 3400A
Oscilloscope	Vertical Frequency Response: dc to 50 MHz Sensitivity: .005V/cm Calibrated Sweeps: 2 sec to .05 $\mu$ sec/cm	Performance Check Troubleshooting Adjustments	HP 180 with HP 1820C and HP 1805A HP 10006A Probe
Spectrum Analyzer	Frequency Response: 1 kHz to 110 MHz Response: $\pm 0.5$ dB Sensitivity: -130 dBm Scan Width: 2 kHz to 100 MHz Stability: Residual FM less than 20 Hz peak-to-peak	Performance Check	HP 8552B and HP 8553B
Vector Voltmeter**	Frequency: 1 MHz to 1 GHz Voltage Range: 1.5 mV to 1V rms	Performance Check	HP 8405A**
Strip Chart Recorder	Chart Speed: 1, 2, 4, 8, in./hr. Spans: .1, .5, 1, and 5V full scale Input Resistance: 200k/volt Accuracy: .2% full scale	Performance Check	HP 680A
RF Voltmeter	Range: 10 mV to 10V rms Frequency Range: 500 kHz to 60 MHz Accuracy: $\pm 3$ full scale	Performance Check Troubleshooting	HP 411A
DC Power Supply	Range: 0 to 20 Vdc Output I: 0 to 1A Line Regulation: 0.001%	Troubleshooting	HP 6101A
Time Interval Counter	Resolution of $> 2$ nsec per measurement	Performance Check	HP 5370A*
DC Electronic Voltmeter	Resistance Range: 10 $\Omega$ to 10 M $\Omega$ Voltage Range: 0.1 to 100V full scale Voltage: $\pm 2\%$ full scale	Performance Check Troubleshooting Adjustments	HP 410C
Phase Comparator**	Frequency Range: 100 kHz to 10 MHz Input Sensitivity: .1V rms Output: 1V into 100K $\Omega$ for 360° phase change	Performance Check	K34-59991A**
Clip-on DC Milliammeter	Range: 3 mA to 30 mA Accuracy: $\pm 0.1$ mA $\pm 3\%$ full scale	Troubleshooting	HP 428B
Variable Line Source	Variable from 103V rms to 127V rms and 206V rms to 254V rms	Troubleshooting	Superior electric powerstat (115V line) 3PF116 or (230V line) 3PF216
Wave Analyzer	B.W. 10 Hz Frequency: 137 Hz Sensitivity: 100 nV	Troubleshooting	HP 3581A

\*Not needed if HP 5390A Frequency Stability Analyzer available.

\*\*The Model 8405A or the Model K34-59991A may be used for frequency offset and comparison measurements. It is not necessary to have both equipments.

### 5-19. LOOP ALIGNMENT PROCEDURE

#### 5-20. Introduction

5-21. If any loop adjustment has been changed, the frequency stabilizing loop of the 5065A should be re-aligned according to the procedures of the following sections. Allow at least 3 hours warmup to permit all circuits to become fully stabilized before proceeding with this alignment. The loop adjustments are as follows:

#### 5-22. +20 Volt Adjustment (A15 Power Supply and Regulator Assembly)

5-23. With power disconnected, remove A15 Power Supply circuit board. Mount it on an extender board. Connect power, and after a few minutes warmup, monitor +20 volts at A15C5. Adjust A15R17 as necessary. Be sure to disconnect line power before replacing the A15 Power Supply circuit board.

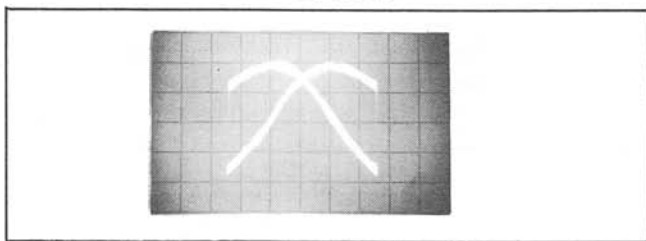
#### 5-24. A10 Frequency Adjustment

a. Set controls: FUNCTION switch at LOOP OPEN OSC FREQ ADJ FINE at 250.

b. Connect oscilloscope vertical input to A8TP3. Connect oscilloscope horizontal input to the sweep test output A8TP2. Set horizontal gain for about a 5 cm horizontal sweep. Set vertical gain at about .05 volts/cm through a 10:1 divider probe.

c. Adjust A3R3, A3R11 full ccw then cw  $\frac{1}{4}$  turn. Using a screwdriver, adjust front-panel OSC FREQ ADJ COARSE slowly until an oscilloscope pattern roughly similar to Figure 5-8 appears. This oscilloscope response is an indication that the 5065A is turned near resonance.

Figure 5-8. Waveform at A8TP3 with Severe Phase Shift



d. Note that when A10 Oscillator is adjusted through resonance, the oscilloscope pattern will change from a positive hump to a straight line (which is the resonance center); and then to a negative hump. Adjust OSC FREQ ADJ COARSE for the straight line center-resonance position between the positive and negative humps.

e. Set OSC FREQ ADJ FINE at 200 for a  $50 \times 10^{-10}$  frequency offset. An oscilloscope pattern similar to Figure 5-8 or 5-10 will appear.

f. Make a preliminary phase adjustment if necessary. Adjust A8R43 (on top of A8 board) so the ends of the waveform come together as shown in Figure 5-10.

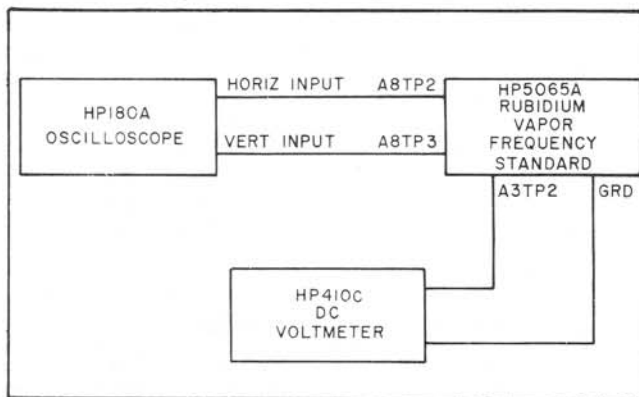
### 5-25. RF Alignment

a. Remove bottom cover for access to chassis bottom. Remove A5 Assembly if Option 001 is installed for access to the multiplier adjustments. Note that removal of the A5 Assembly in no way affects operation of the rest of the 5065A circuits.

b. Figure 5-9 shows the RF alignment test equipment setup.

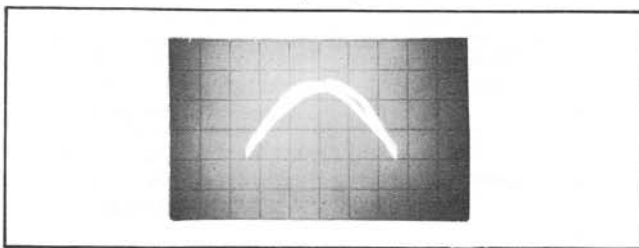
c. Before proceeding locate the resonance signal and set up a frequency offset as described in Paragraph 5-24.

Figure 5-9. R.F. Alignment Setup



d. Adjust A3R3 on the Multiplier Assembly for maximum amplitude of the oscilloscope signal. Then adjust A3R3 ccw until the oscilloscope pattern amplitude is reduced by  $\frac{1}{2}$  to prevent RVFR and amplifier saturation during this alignment.

Figure 5-10. Oscilloscope Indication at Resonance with A8R43 (Modulating Phase Adjustment) correctly adjusted



e. Adjust A8R43 (adjustment facing top of A8 board) for minimum phase shift on the wave form. A pattern without phase shift is shown in Figure 5-10. Phase shift will split the pattern at the two ends as in Figure 5-8.

f. Phase modulation adjustment. Adjust A3R11 cw until the oscilloscope pattern just reaches a maximum, then adjust A3R11 slightly ccw so the pattern is reduced by 5 or 10%.

#### NOTE

It may be necessary to readjust A8R43 for minimum phase shift.

g. On the chassis-bottom side of the unit, note the short jumper cable connected between J7 and J8 of the A3 Multiplier. Disconnect this jumper from A3J8 and note that the oscilloscope pattern will disappear.

h. Using the Micon-to-BNC test cable provided, connect a 50-ohm coaxial load to A3J8.

i. At the bottom of the A3 Multiplier is AGC testpoint A3TP2. Connect a dc voltmeter between this point and ground. Record the reading. Nominal AGC voltage is about +4.5 volts.

j. Remove the 50-ohm load from A3J8. Reconnect the short jumper cable to A3J8. The oscilloscope pattern will reappear. Leave the dc voltmeter connected to A3 TP2 so that the AGC voltage may be monitored.

#### NOTE

The following adjustments may peak the signal at several different points. In tuning you should select peaks which are fairly broad and easy to tune. In addition to easier tuning, this ensures maximum RF power stability over the specified operating temperature range of the 5065A.

k. The next step is the adjustment of matching network adjustments A3C59, A3C61, A3L25, and diode bias adjustment, A3R40. These adjustments are at the side of the A3 Multiplier Assembly and can be reached with the A5 Digital Divider removed. The restricted space calls for shortened tuning tools. A small mirror will be helpful. Adjust A3C59, A3C61, A3L25, and A3R40 for maximum signal on the oscilloscope. Ensure the AGC voltage does not fall below the value recorded. If it does, retune these adjustments as necessary. During this adjustment, the oscilloscope pattern should remain rounded at the top. If any clipping or distortion occurs, the RF drive should be reduced slightly by adjustment of A3R3. This adjustment will be reset later in this procedure.

l. Adjust A3R3 ccw. The pattern on the oscilloscope screen will get smaller. Continue to adjust A3R3 ccw with oscilloscope set to .02 V/cm through a 10:1 probe until there is just enough definition at the ends of the oscilloscope pattern to make a phase adjustment (typical level .03 V). Now adjust A8R43 so that the ends of the oscilloscope pattern coincide. When this adjustment is properly made the oscilloscope pattern will look similar to Figure 5-10 with the ends of the pattern coinciding, but with less amplitude. Adjust A3R3 cw until a phase shift starts (the end of the oscilloscope pattern just start to split).

m. Repeat step k to ensure the matching network (A3C59, A3C61, and A3L25) and diode bias (A3R40) are optimized. RF alignment is complete when (1) A3R3 is adjusted as far cw as possible without a phase shift occurring; (2) A3C59, A3C61, A3L25, and R3R40 are

adjusted for a broad peak and maximum amplitude signal; (3) after the preceding adjustments the AGC voltage is not less than the value recorded in step i; (4) the signal-to-noise ratio (see Section 5-26) is greater than 250.

n. Connect HP 302A to A7TP2. Set HP 302A MODE SELECTOR to BFO and adjust FREQUENCY control to 137 Hz. Set MODE SELECTOR to AFC; SCALE VALUE to ABSOLUTE, 300 mV full scale. Read 137 Hz signal level; typical correct level should be 130 to 160 mV.

o. Disconnect all test equipment and set OSC FREQ ADJ FINE to 250.

#### 5-26. Signal-to-Noise Ratio

a. This test requires the use of a low frequency wave analyzer such as an HP 3581A (if another wave analyzer is to be used, see step m).

#### NOTE

The purpose of this test is to insure that the signal-to-noise ratio of the RVFR, as installed in the instrument, is sufficient to give the Model 5065A its specified short-term stability. This test is not critical to the alignment of the 5065A and may be ignored insofar as alignment is concerned.

b. Set front-panel controls: OSC FREQ ADJ FINE at 250, FUNCTION switch . . . at LOOP OPEN.

c. Connect a dc voltmeter to A8TP3.

d. Adjust OSC FREQ ADJ COARSE for a reading of less than  $\pm 0.05$  volt.

e. Remove voltmeter from A8TP3.

f. Set OSC FREQ ADJ FINE at 300.

g. Set 5381A controls:

POWER ..... ON  
SCALE ..... VOLTS  
AMPLITUDE REF LEVEL ..... NORMAL  
dBv/LIN - dBm ..... dBv/LIN  
INPUT SENSITIVITY  
..... 3V (VERNIER TO CAL)  
SWEEP MODE ..... OFF  
RESOLUTION BANDWIDTH ..... 10 Hz  
DISPLAY SMOOTHING ..... MAX  
FREQUENCY ..... 137 Hz

h. Connect a 100K $\Omega$  resistor across the 3581A input terminals. Type, tolerance or rating of this resistor is not important in this application.

i. Connect 3581A input to A7TP2. Connect 3581A ground to 5065A chassis. Adjust 3581A FREQUENCY and INPUT SENSITIVITY for a maximum on-scale reading. Record this reading as  $V_s$ . It should be approximately 150 mV.

j. Disconnect the +20-volt red lead from the A3 Multiplier Assembly.

k. Set 3581A AMPLITUDE REFERENCE control to X.001. Noise reading should be in mid or lower half of scale. Meter should not peg on noise peaks. Adjust INPUT SENSITIVITY if necessary to achieve this. OVERLOAD light should remain out.

l. 3581A reading will be noisy. Watch meter for about 20 seconds to estimate the average reading. Record this reading as  $V_n$ . Typical value is approximately 300  $\mu$ V.

m. Multiply this reading by 0.72 and divide into  $V_s$  measured in step i. Note: the .72 factor converts the noise measured in the 3581A's 10 Hz resolution bandwidth (11.5 Hz noise bandwidth) to equivalent noise in a 6 Hz noise bandwidth. If another analyzer is used its noise measurement must be converted by use of the formula

$$V_n \sqrt{\frac{6}{B}}$$

where B = the noise bandwidth of the analyzer used for the measurement, and V is the measured noise voltage. Signal-to-noise ratio is given by

$$S/n = \frac{V_s}{.72 \times V_n}$$

For satisfactory operation, the signal-to-noise ratio should be 250 or greater. Low signal-to-noise ratio can be caused by improper alignment of the RF matching network in the A3 Multiplier Assembly or insufficient 137 Hz phase modulation (see step f of Section 5-25, RF Alignment, the preceding section).

n. Reconnect +20V red lead to the A3 Multiplier Assembly. Set OSC FREQ ADJ FINE Control at 250.

#### 5-27. Modulation Frequency Adjustment

a. Connect a frequency counter to A8TP2 and measure the frequency. If the frequency is between 136 Hz and 138 Hz do not make any adjustments.

b. If frequency of step a is outside 137 Hz  $\pm$ 1 Hz range. adjust A8R8 for a frequency of 137 Hz  $\pm$ 1 Hz.

#### 5-28. Phase Adjustment Recheck

a. Before proceeding further, locate the resonance signal and set up a frequency offset as described in Section 5-24, Frequency Adjustments.

b. If the oscilloscope pattern is split (out of phase) readjust A8R43 until the pattern looks like Figure 5-10.

c. Remove oscilloscope connections.

#### 5-29. Phase Detector and Integrator Zero Adjustment

a. Set FUNCTION switch to LOOP OPEN.

b. Disconnect yellow lead (slide-on connector) from A7 AC Amplifier.

c. Connect a dc voltmeter to A8TP3, and adjust A8R35 for a reading of less than 1 mV dc.

d. Disconnect dc voltmeter from A8TP3 and connect it to CONTROL jack on the rear panel.

e. Connect a short jumper between pins 14 and 15 on A9 Assembly socket (XA9) to short the A9 input.

f. Set FUNCTION switch to OPER and measure dc voltage at the rear panel CONTROL jack.

g. The voltage of the previous step will probably be drifting slightly. Adjust A9 Integrator zero control R10 (FINE) to stop this drift. If R10 does not have sufficient range to stop the drift, then R3 (COARSE) should be adjusted to bring R10 into range. To use the dc voltmeter on a lower range for finer adjustment, set FUNCTION switch to LOOP OPEN and then back to OPER. This will discharge the integrating capacitor and set the control voltage near zero. Observe the control voltage for a short period of time. If the drift exceeds 20 mV/minute, repeat the zeroing adjustments.

h. Remove shorting jumper from XA9 (14 and 15). Reconnect the yellow wire slide-on connector to A7. Dc voltmeter may be left connected for the next step.

#### 5-30. Loop Gain Adjustment

a. Check that the dc voltmeter is connected to rear-panel CONTROL jack and that controls are set as follows:

FUNCTION ..... OPER  
OSC FREQ ADJ FINE ..... 250

b. Observing the dc voltmeter, adjust OSC FREQ ADJ COARSE for less than 100 mV at the CONTROL jack.

c. Set FUNCTION switch to LOOP OPEN and connect the dc voltmeter to A8TP3.

d. Set OSC FREQ ADJ FINE to 200 and then adjust A7R17 for a reading of  $+0.5 \pm .05$  volts on the dc voltmeter.

e. Adjust OSC FREQ ADJ FINE to 300. Dc voltmeter should read approximately -.5 volts. If the reading is off appreciably, repeat this procedure.

f. Set OSC FREQ ADJ FINE at 250 and remove the dc voltmeter connections.

#### 5-31. Logic Assembly (A14) Alignment

a. Remove the A14 Logic Assembly circuit board and mount it on the extender board provided. It is not necessary to remove power when removing this board.

b. Set front-panel controls as follows:

FUNCTION ..... OPER  
OSC FREQ ADJ FINE ..... 250  
CIRCUIT CHECK switch .. 2ND HARMONIC



c. Connect a dc voltmeter to A14(1) and adjust A7R29 for a reading of +4.0 volts on the dc voltmeter. With this adjustment, the CIRCUIT CHECK meter reading (2ND HARMONIC) should be between 36 and 44.

d. Connect a jumper between XA9 pins 10 and 12 (bottom of chassis). Set OSC FREQ ADJ FINE at 310 and then adjust A14R8 just to the point where the CONTINUOUS OPERATION light is extinguished. Leave the jumper connected for the following checks:

e. Make the following checks of the A14 Logic Assembly:

- 1) Set OSC FREQ ADJ FINE at 250. Then press the LOGIC RESET button. CONTINUOUS OPERATION light should come on. Turn the OSC FREQ ADJ FINE control slowly cw and note when the CONTINUOUS OPERATION light extinguishes. The OSC FREQ ADJ FINE reading should be between 300 and 320. If not, repeat step a.
- 2) Remove jumper from XA9, reset OSC FREQ ADJ FINE to 250, and press the LOGIC RESET button. The CONTINUOUS OPERATION light should come on. Leave jumper disconnected.
- 3) Remove the cable from A3J1 (bottom of chassis). The CONTINUOUS OPERATION light should go out after about 5 seconds.
- 4) Reconnect the cable to A3J1 and press LOGIC RESET button. CONTINUOUS OPERATION light should come on.
- 5) Connect a dc VTVM such as a HP 412A to the CONTROL jack at the rear of the unit.
- 6) Adjust OSC FREQ ADJ COARSE slowly ccw. INTEGRATOR LIMIT light should come on between +2 and +4 volts as read on the meter.
- 7) Adjust OSC FREQ ADJ COARSE slowly cw. INTEGRATOR LIMIT light should come on between -4 and -7 volts.
- 8) Adjust OSC FREQ ADJ COARSE for a zero reading and then disconnect VTVM. This completes the procedure.

#### 5-32. OPTION 002, Standby Power Supply Maintenance

5-33. To insure maximum battery capacity the internal battery should be "exercised" at least every 90 days. To exercise the battery, disconnect the instrument power cord from ac power source. The front-panel BATTERY lamp will flash on and off to indicate ac power line failure. Operate the 5065A for 10 minutes, then reconnect the instrument to the ac power source. Set the "Battery" switch to RESET, then to FAST-CHARGE for at least 16 hours.

5-34. BATTERY lamp should be on for this time period. At the end of the charge period set the "Battery" switch to FLOAT.

#### NOTE

Several exercise cycles may have to be performed if the internal battery is left in TRICKLE CHARGE mode for long periods of time.

The meter reading in BATTERY position should be between 30 and 50.

5-35. During FAST CHARGE cycle, connect a clip-on milliammeter to the orange lead (+) of the internal battery. Charging current should be 90 to 150 mA. Set the BATTERY switch to FLOAT position. Current should be 12 to 34 mA depending on battery condition and line voltage.

5-36. If the internal battery supply fails to maintain a charge after several charge-discharge cycles, verify that the charging current is sufficient (Paragraph 5-35). If the current is as listed in Paragraph 5-35, replace the internal battery. Troubleshooting information for the A2 Battery Charger Board Assembly is located with the A2 schematic in Section VIII.

#### 5-37. Battery Removal and Replacement

a. Disconnect instrument from ac and/or dc power source, and remove top and bottom covers.

b. With instrument on its side remove internal battery fuse (F4) to electrically disconnect the internal battery. Do not reinstall the fuse.

c. Unsolder orange No. 14 AWG wire from XA2(4).

d. Unsolder brown No. 14 AWG wire from capacitor C1.

e. Remove 6 Hex-nuts securing the battery cover and battery to instrument chassis.

f. Remove the battery and cover.

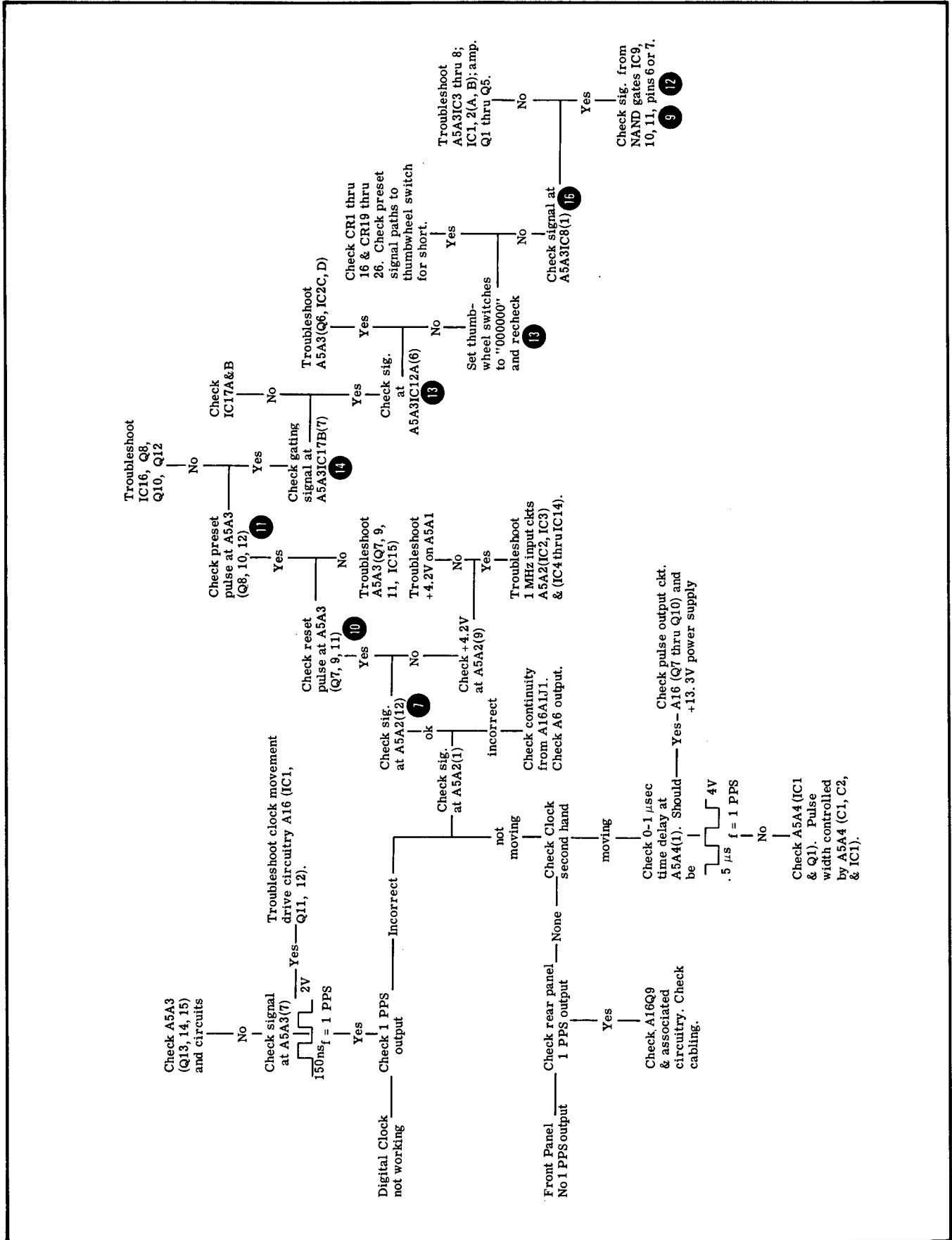
g. Unsolder orange wire from the + terminal of the battery and brown wire from the - terminal of the battery.

h. To install a new battery perform steps a to g in reverse order. When step b is performed, reinstall the fuse.

#### 5-38. CLOCK DISPLAY ASSEMBLY A19

5-39. The A19 LED Clock Display Assembly has no adjustments and requires no periodic maintenance. Should repair be necessary, the unit may be removed and operated on the bench while remaining connected to the instrument. When operating in this manner, however, the Clock Display chassis or circuit common **must be connected to the instrument chassis** with a CLIP LEAD OR JUMPER WIRE.

Table 5-6. A5 Troubleshooting



Hewlett-Packard Model 5065A  
Rubidium Vapor Frequency Standard  
Serial No. \_\_\_\_\_ - \_\_\_\_\_

Tests Performed by \_\_\_\_\_  
Date \_\_\_\_\_

PERFORMANCE CHECKS

Description	Check
1. CIRCUIT CHECK Meter	<input type="checkbox"/> See Table 5-3
2. 5 MHz, 1 MHz, 100 kHz Outputs	<input type="checkbox"/> Correct Frequency
3. Output Voltages/Waveforms	<input type="checkbox"/> at least 1 V rms.
4. Harmonic Distortion	<input type="checkbox"/> 40 dB
5. Non-Harmonic Distortion	<input type="checkbox"/> 80 dB
6. Frequency Stability	<input type="checkbox"/> $1 \times 10^{-11}$
7. Option 001 Time Standard	<input type="checkbox"/> Rate: 1PPS Width: 20 $\mu$ sec Level: +10 V p-p +10% Rise Time: 50 nsec Fall Time: 1 $\mu$ sec Jitter: 1 nsec Delay: 10 $\mu$ sec to 1 sec
8. RMS Deviation:	
1 sec averaging	<input type="checkbox"/> $5 \times 10^{-12}$
10 sec averaging	<input type="checkbox"/> $1.6 \times 10^{-12}$
100 sec averaging	<input type="checkbox"/> $5 \times 10^{-13}$

## SECTION VI

### REPLACEABLE PARTS

#### 6-1. INTRODUCTION

6-2. This section contains parts number information needed to order replacement parts. Table 6-2 to 6-6 lists parts by assembly reference designation and/or by option number/assembly designation. The part numbers also provide the following information on each part:

- a. Description of part (see abbreviations in Table 6-1).
- b. Typical manufacturer of the part in a five-digit code; see list of manufacturers in Table 6-7.
- c. Manufacturer's part number.
- d. Total quantity used in the instrument (TQ column).

6-3. Miscellaneous parts are listed at the end of each table.

#### 6-4. ORDERING INFORMATION

6-5. To obtain replacement parts, address order of inquiry to the nearest 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 not listed, include:

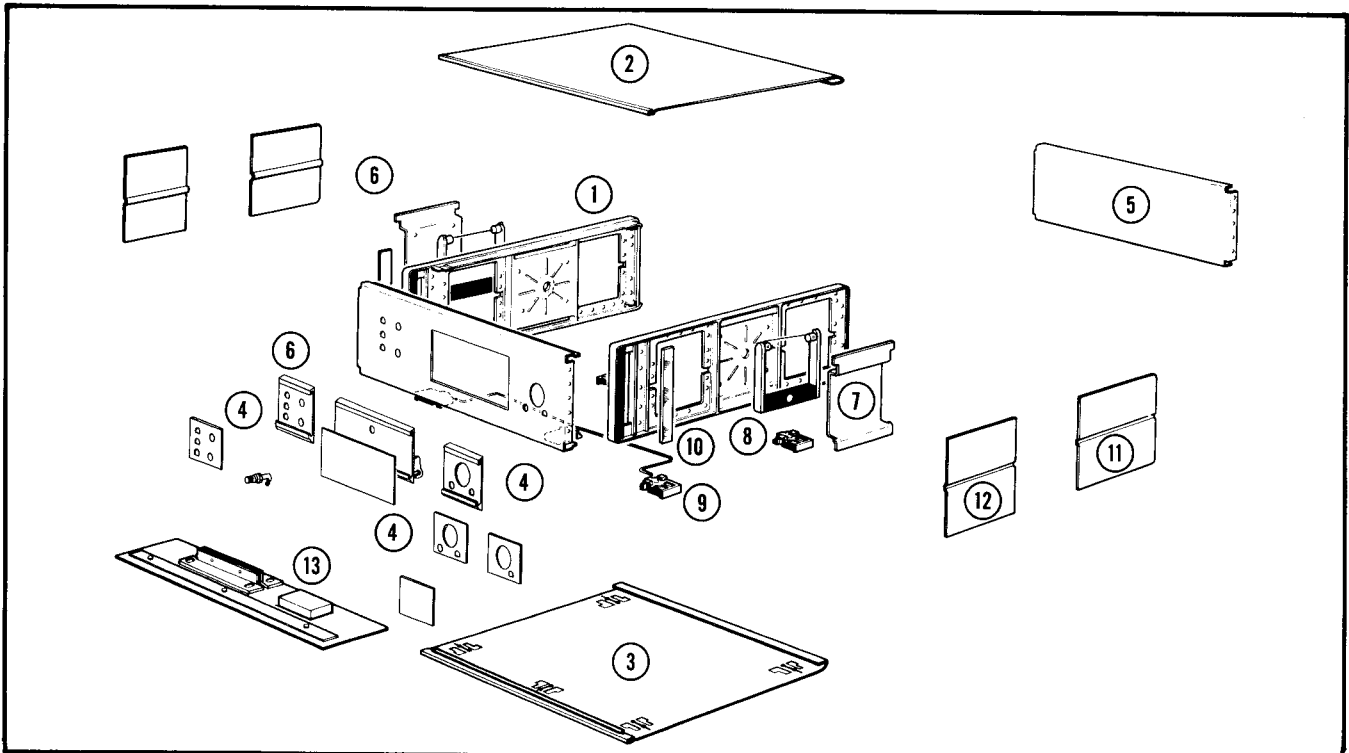
- a. Instrument model number.
- b. Instrument serial number.
- c. Description of the part.
- d. Function and location of the part.

Table 6-1. Table of Abbreviations

REFERENCE DESIGNATORS							
A	= assembly	F	= fuse	MP	= mechanical part	U	= integrated circuit
B	= motor	FL	= filter	P	= plug	V	= vacuum, tube, neon bulb, photocell, etc.
BT	= battery	IC	= integrated circuit	Q	= transistor	VR	= voltage regulator
C	= capacitor	J	= jack	R	= resistor	W	= cable
CP	= coupler	K	= relay	RT	= thermistor	X	= socket
CR	= diode	L	= inductor	S	= switch	Y	= crystal
DL	= delay line	LS	= loud speaker	T	= transformer	Z	= tuned cavity, network
DS	= device signaling (lamp)	M	= meter	TB	= terminal board		
E	= misc electronic part	MK	= microphone	TP	= test point		
ABBREVIATIONS							
A	= amperes	H	= henries	N/O	= normally open	RMO	= rack mount only
AFC	= automatic frequency control	HDW	= hardware	NOM	= nominal	RMS	= root-mean square
AMPL	= amplifier	HEX	= hexagonal	NPO	= negative positive zero (zero temperature coefficient)	RWV	= reverse working voltage
BFO	= beat frequency oscillator	HG	= mercury	NPN	= negative-positive-negative	S-B	= slow-blow
BE CU	= beryllium copper	HR	= hour(s)	NRFR	= not recommended for field replacement	SCR	= screw
BH	= binder head	HZ	= hertz	NSR	= not separately replaceable	SE	= selenium
BP	= bandpass	IF	= intermediate freq			SECT	= section(s)
BKS	= brass	IMPG	= impregnated			SEMICON	= semiconductor
BWO	= backward wave oscillator	INCD	= incandescent			SI	= silicon
CCW	= counter-clockwise	INCL	= include(s)			SIL	= silver
CER	= ceramic	INS	= insulation(ed)	OBD	= order by description	SL	= slide
CMO	= cabinet mount only	INT	= internal	OH	= oval head	SPG	= spring
COEF	= coefficient	K	= kilo = 1000	OX	= oxide	SPL	= special
COM	= common	LH	= left hand	P	= peak	SST	= stainless steel
COMP	= composition	LIN	= linear taper	PC	= printed circuit	SR	= split ring
COMPL	= complete	LK WASH	= lock washer	PF	= picofarads = 10 <sup>-12</sup> farads	STL	= steel
CONN	= connector	LOG	= logarithmic taper	PH BRZ	= phosphor bronze	TA	= tantalum
CP	= cadmium plate	LPF	= low pass filter	PHL	= Phillips	TD	= time delay
CRT	= cathode-ray tube	M	= milli = 10 <sup>-3</sup>	PIV	= peak inverse voltage	TGI	= toggle
CW	= clockwise	MEG	= meg = 10 <sup>6</sup>	PNP	= positive-negative-positive	THD	= thread
DEPC	= deposited carbon	MET FLM	= metal film	P/O	= part of	TI	= titanium
DR	= drive	MET OX	= metallic oxide	POLY	= polystyrene	TOL	= tolerance
ELECT	= electrolytic	MFR	= manufacturer	PORC	= porcelain	TRIM	= trimmer
ENCAP	= encapsulated	MHZ	= mega hertz	POS	= position(s)	TWT	= traveling wave tube
EXT	= external	MINAT	= miniature	POT	= potentiometer	U	= micro = 10 <sup>-6</sup>
F	= farads	MOM	= momentary	PP	= peak-to-peak	VAR	= variable
FH	= flat head	MOS	= metal oxide substrate	PT	= point	VDCW	= dc working volts
FIL H	= fillister head	MTG	= mounting	PWV	= peak working voltage	W /	= with
FXD	= fixed	MY	= "mylar"	RECT	= rectifier	W	= watts
G	= giga (10 <sup>9</sup> )	N	= nano (10 <sup>-9</sup> )	RF	= radio frequency	WIV	= working inverse voltage
GE	= germanium	N/C	= normally closed	RH	= round head or right hand	WW	= wirewound
GL	= glass	NE	= neon			W/O	= without
GRD	= ground(ed)	NI PL	= nickel plate				

01194-14

Figure 6-1. Modular Cabinet Parts



Item No.	Description	HP Part Number
1	Side Frame Assembly	5060-0732
2	Cover: Top	05061-2041
3	Cover: Bottom	05065-2048
4	Panel: Front	05065-0008
	Panel: Left Insert	05065-0050
	Door	05065-2018
	Door Panel	05054-0051
	Latch	05010-0582
	Plate, Center	05061-2022
	Standard Panel Insert	05065-0052
	Panel Option 001 Insert	05061-0022
	Panel Option 002 Insert	05065-0053
	5	Panel: Rear
6	Plate: Left Panel	05065-2017
7	Retainer: 5½" Mod. Handle	5060-0766
8	Handle: 5H Side	5060-0222
9	Foot Assembly: FM	5060-0767
10	Trim Strip	5000-0051
11	Rear Side Plate Cover	5000-0738
12	Front Side Plate Cover	5000-0739
13	Kit: 5H Rack Mount	5060-0775

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	05065-6076	2	1	MODULE ASSEMBLY, SYNTHESIZER (SERIES 1908)	28480	05065-6076
A1B1	3100-2652	9	1	SWITCH-THUMB WHEEL 4 MOD; 1-2-4-8 8CD (INCLUDES 31A, B, C, D)	28480	3100-2652
A1B2	3101-0045	2	1	SWITCH-SL DPDT STD .5A 125VAC/DC	28480	3101-0045
A1Y1	0410-0162	6	1	A1 MISCELLANEOUS PARTS CRYSTAL-QUARTZ 5,315 MHZ	28480	0410-0162
	0340-0119	4	2	TERMINAL-STUD 8GL-PIN PRESS-MTG	28480	0340-0119
	0510-0207	2	2	THREADED INSERT-STDF 4-40 .188-LG STL	28480	0510-0207
	1250-0901	2	5	CONNECTOR-RF SMB M 8GL-HOLE-PR 50-OHM	28480	1250-0901
	05065-0035	0	1	COVER, SYNTHESIZER	28480	05065-0035
	05060-0007	6	1	BRACKET, END	28480	05060-0007
	05065-2032	6	1	PLATE, END	28480	05065-2032
	05065-0036	2	1	CHASSI, SYNTHESIZER	28480	05065-0036
	05065-2043	9	1	PLATE, END	28480	05065-2043
A1A1	05065-6073	6	1	BOARD ASSEMBLY, SYNTHESIZER (NOT FOR REPLACEMENT) FOR REPLACEMENT ORDER 05065-6076	28480	05065-6073
A1A1C1	0150-0121	5	22	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A1A1C2*	0140-0223	7	1	CAPACITOR-FXD 260PF +-1% 300VDC MICA	72136	DM15F261F0300MV1C
A1A1C3*	0160-0127	2	10	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A1A1C4				DELETED		
A1A1C9				DELETED		
A1A1C10	0140-0192	9	1	CAPACITOR-FXD 68PF +-5% 300VDC MICA	72136	DM15E680J0300MV1CR
A1A1C11				DELETED		
A1A1C15	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A1A1C16	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A1A1C17	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A1A1C18	0140-0160	1	1	CAPACITOR-FXD 3400PF +-5% 500VDC MICA	72136	DM20F342J0500MV1CR
A1A1C19	0140-0196	3	2	CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300MV1CR
A1A1C20	0140-0225	9	1	CAPACITOR-FXD 300PF +-1% 300VDC MICA	72136	DM15F301F0300MV1C
A1A1C21	0160-0174	9	11	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A1A1C22	0160-0291	3	8	CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A1A1C23	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A1A1C24	0160-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A1A1C26	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A1A1C27	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A1A1C28	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A1A1C29	0150-0093	0	16	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A1A1C30	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A1A1C31	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A1A1C32	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A1A1C33	0140-0234	0	2	CAPACITOR-FXD 500PF +-1% 300VDC MICA	72136	DM15F501F0300MV1C
A1A1C34	0140-0179	2	3	CAPACITOR-FXD 1000PF +-2% 300VDC MICA	72136	DM19F1026J0300MV1CR
A1A1C35	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A1A1C36	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A1A1C37	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A1A1C38	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A1A1C39	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A1A1C40	0160-0106	9	4	CAPACITOR-FXD 60UF +-20% 6VDC TA	56289	150D606X0006B2
A1A1C41	0160-0155	8	1	CAPACITOR-FXD 2.2UF +-20% 20VDC TA	56289	150D225X0020A2
A1A1C42	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A1A1C43	0140-0234	0		CAPACITOR-FXD 500PF +-1% 300VDC MICA	72136	DM15F501F0300MV1C
A1A1C44	0160-0116	1	7	CAPACITOR-FXD 6.8UF +-10% 35VDC TA	56289	150D685X9035B2
A1A1C45	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A1A1C46				DELETED		
A1A1C47	0160-0342	3	1	CAPACITOR-FXD 800PF +-1% 300VDC MICA	28480	0160-0342
A1A1C48	0160-0137	6	1	CAPACITOR-FXD 100UF +-20% 10VDC TA	56289	150D107X0010R2
A1A1C49	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A1A1CR1	1902-3086	3	1	DIODE-ZNR 4.75V 2x DO-7 PD=.4W TC=-.019%	28480	1902-3086
A1A1CR2	1901-0025	2	10	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A1A1CR3	1910-0016	0	16	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A1CR4	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A1CR5	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A1CR6	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A1CR7	1902-3149	9	2	DIODE-ZNR 9.09V 5x DO-7 PD=.4W TC=+.057%	28480	1902-3149
A1A1CR8				DELETED		
A1A1CR9				DELETED		
A1A1CR10	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A1CR11	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A1CR12	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A1CR13	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A1A1CR14	1902-3193	3	1	DIODE-ZNR 13.3V 5x DO-7 PD=.4W TC=+.059%	28480	1902-3193
A1A1CR15	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A1CR16	1910-0016	0		DIODE-GE 60V 60MA 1U8 DO-7	28480	1910-0016
A1A1CR17	1910-0016	0		DIODE-GE 60V 60MA 1U8 DO-7	28480	1910-0016
A1A1CR18	1910-0016	0		DIODE-GE 60V 60MA 1U8 DO-7	28480	1910-0016
A1A1CR19				DELETED		
A1A1CR20				DELETED		
A1A1CR21	1910-0016	0		DIODE-GE 60V 60MA 1U8 DO-7	28480	1910-0016
A1A1CR22	1910-0016	0		DIODE-GE 60V 60MA 1U8 DO-7	28480	1910-0016
A1A1CR23	1910-0016	0		DIODE-GE 60V 60MA 1U8 DO-7	28480	1910-0016
A1A1CR24	1910-0016	0		DIODE-GE 60V 60MA 1U8 DO-7	28480	1910-0016
A1A1CR25	1902-3203	6	3	DIODE-ZNR 14.7V 5% DO-7 PDM,4W TC=+.057%	28480	1902-3203
A1A1CR26	1901-0040	1	39	DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR27	0122-0013	5	1	DIODE-VVC 39PF 5% DO-14 Q=7-MIN	28480	0122-0013
A1A1CR28				DELETED		
A1A1CR29	1902-3125	1	2	DIODE-ZNR 6.98V 2% DO-7 PDM,4W TC=+.045%	28480	1902-3125
A1A1CR30	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR31	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR32	1901-0050	1	2	DIODE-SWITCHING 80V 200MA 2N8 DO-35	28480	1901-0050
A1A1CR33	1901-0050	3		DIODE-SWITCHING 80V 200MA 2N8 DO-35	28480	1901-0050
A1A1CR34	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR35	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR36	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR37	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR38	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR39	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR40	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1CR41	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A1A1IC1	1820-0322	0	4	IC CNTR TTL DECD NEG-EDGE-TRIG	18324	N8280N
A1A1IC2	1820-0322	0		IC CNTR TTL DECD NEG-EDGE-TRIG	18324	N8280N
A1A1IC3	1820-0070	5	1	IC GATE TTL NAND 8-INP	01295	SN7430N
A1A1IC4	1820-0315	1	1	IC MV DTL MONOSTBL	07263	951MC
A1A1IC5	1820-0322	0		IC CNTR TTL DECD NEG-EDGE-TRIG	18324	N8280N
A1A1IC6	1820-0322	0		IC CNTR TTL DECD NEG-EDGE-TRIG	18324	N8280N
A1A1L1	9100-1618	1	1	COIL-MLD 5.6UH 10% Q=45 .155DX,375LG-NOM	28480	9100-1618
A1A1L2	9140-0112	2	1	COIL-MLD 4.7UH 10% Q=33 .155DX,375LG-NOM	28480	9140-0112
A1A1L3	9140-0029	0	1	COIL-MLD 100UH 10% Q=30 .25DX,313LG-NOM	28480	9140-0029
A1A1L4	9140-0114	4	1	COIL-MLD 10UH 10% Q=55 .155DX,375LG-NOM	28480	9140-0114
A1A1L6	9140-0137	1	4	COIL-MLD 1MH 5% Q=60 .190X,44LG-NOM	28480	9140-0137
A1A1L7	9140-0096	1	1	COIL-MLD 1UH 10% Q=50 .155DX,375LG-NOM	28480	9140-0096
A1A1L8	9140-0137	1		COIL-MLD 1MH 5% Q=60 .190X,44LG-NOM	28480	9140-0137
A1A1L9	9100-1669	2	1	COIL-MLD 4.7MH 5% Q=60 .24DX,74LG-NOM	28480	9100-1669
A1A1Q1	1854-0072	8	1	TRANSISTOR NPN 2N3054 SI TO-66 PD=25W	01928	2N3054
A1A1Q2	1854-0009	1	3	TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
A1A1Q3	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
A1A1Q4	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
A1A1Q5-			2			
A1A1Q16				DELETED		
A1A1Q17	1854-0013	7	2	TRANSISTOR NPN 2N2218A SI TO-5 PD=600MW	04713	2N2218A
A1A1Q18	1854-0092	2	7	TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A1A1Q19	1854-0013	7		TRANSISTOR NPN 2N2218A SI TO-5 PD=600MW	04713	2N2218A
A1A1Q20	1854-0547	2	1	TRANSISTOR NPN 2N3725 SI TO-5 PD=800MW	01295	2N3725
A1A1Q21	1854-0092	2		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A1A1Q22	1854-0092	2		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A1A1Q23	1854-0023	9	24	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A1A1Q24	1854-0003	5	22	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A1A1Q25	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A1A1Q26	1854-0092	2		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A1A1Q27	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A1A1R1	0757-0818	3	1	RESISTOR 825 1% .5W F TC=0+-100	28480	0757-0818
A1A1R2	0757-0900	4	10	RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A1A1R3	0698-3311	1	1	RESISTOR 51 5% 2W MO TC=0+-200	28480	0698-3311
A1A1R4	0757-0924	2	32	RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A1A1R5	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A1A1R6	0757-0948	0	46	RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R7	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R8	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R9	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R10	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R11	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R12	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R13	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R14	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A1A1R15	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1A1R16	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R17	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R18	0757-0917	3	9	RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0=511-G
A1A1R19	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R20	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A1A1R21	0757-0940	2	5	RESISTOR 4.7K 2% .125W F TC=0+-100	24546	C4-1/8-T0=4701-G
A1A1R22	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A1A1R23	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R24	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R25	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R26	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R27-				DELETED		
A1A1R53				DELETED		
A1A1R54	0757-0967	3	1	RESISTOR 62K 2% .125W F TC=0+-100	24546	C4-1/8-T0=6202-G
A1A1R55	0757-0962	8	3	RESISTOR 39K 2% .125W F TC=0+-100	24546	C4-1/8-T0=3902-G
A1A1R56	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R57	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0=51R0-G
A1A1R58				DELETED		
A1A1R59	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R60	0757-0933	3	2	RESISTOR 2.4K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2401-G
A1A1R61	0757-0907	1	5	RESISTOR 200 2% .125W F TC=0+-100	24546	C4-1/8-T0=201-G
A1A1R62	0721-0011	3	2	RESISTOR 500K 1% .125W CF TC=0-500	91637	DC1/8=501-F
A1A1R63	0757-0910	6	1	RESISTOR 270 2% .125W F TC=0+-100	24546	C4-1/8-T0=271-G
A1A1R64	0757-0931	1	8	RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2001-G
A1A1R65	0757-0969	5	1	RESISTOR 75K 2% .125W F TC=0+-100	24546	C4-1/8-T0=7502-G
A1A1R66	0757-0957	1	15	RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2402-G
A1A1R67	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0=51R0-G
A1A1R68	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0=51R0-G
A1A1R69	0757-0929	7	7	RESISTOR 1.6K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1601-G
A1A1R70	0757-0936	6	4	RESISTOR 3.3K 2% .125W F TC=0+-100	24546	C4-1/8-T0=3301-G
A1A1R71*						
A1A1R72	0757-0972	0	8	RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R73	0698-3130	2	3	RESISTOR 2.7M 1% .125W CF TC=0-800	91637	DC=1/8=2704-F
A1A1R74	0698-3130	2		RESISTOR 2.7M 1% .125W CF TC=0-800	91637	DC=1/8=2704-F
A1A1R75	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A1A1R76	0757-0929	7		RESISTOR 1.6K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1601-G
A1A1R77	0757-0902	6	1	RESISTOR 120 2% .125W F TC=0+-100	24546	C4-1/8-T0=121-G
A1A1R78	0757-0935	5	6	RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0=3001-G
A1A1R79	0698-3129	9	3	RESISTOR 1M 1% .125W CF TC=0-500	91637	DC=1/8=1004-F
A1A1R80	0721-0011	3		RESISTOR 500K 1% .125W CF TC=0-500	91637	DC1/8=501-F
A1A1R81	0757-0960	6	4	RESISTOR 33K 2% .125W F TC=0+-100	24546	C4-1/8-T0=3302-G
A1A1R82	0698-3126	6	1	RESISTOR 2.21M 1% .125W CF TC=0-800	91637	DC=1/8=2214-F
A1A1R83	0698-3127	7	2	RESISTOR 4.75M 2% .125W CF TC=0-1300	91637	DC=1/8=4754-G
A1A1R84	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A1A1R85*	0757-0944	6	3	RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0=6801-G
A1A1R86	0698-3130	2		RESISTOR 2.7M 1% .125W CF TC=0-800	91637	DC=1/8=2704-F
A1A1R87	0757-0943	5	1	RESISTOR 6.2K 2% .125W F TC=0+-100	24546	C4-1/8-T0=6201-G
A1A1R88	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A1A1R89	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A1A1R90	0757-0942	4	3	RESISTOR 5.6K 2% .125W F TC=0+-100	24546	C4-1/8-T0=5601-G
A1A1R91	0757-0929	7		RESISTOR 1.6K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1601-G
A1A1R92	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0=51R0-G
A1A1R93	0757-0934	4	1	RESISTOR 2.7K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2701-G
A1A1R94	0757-0962	8		RESISTOR 39K 2% .125W F TC=0+-100	24546	C4-1/8-T0=3902-G
A1A1R95	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0=101-G
A1A1R96-				DELETED		
A1A1R99				DELETED		
A1A1R100	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0=511-G
A1A1T1	05065-8012	0	1	TRANSFORMER, BLOCKING OSCILLATOR	28480	05065-8012
A1A1T2	05065-8011	8	2	TRANSFORMER, 5.3 MHZ	28480	05065-8011
A1A1T3	05065-8011	8		TRANSFORMER, 5.3 MHZ	28480	05065-8011
A1A1XY1	1200-0159	7	1	SOCKET-XTAL 2-CONT MC-6/U DIP-SLDR	28480	1200-0159
	0340-0037	5	2	TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0037
	0340-0039	7	2	TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039
	0340-0162	7	1	INSULATOR-XBTR ALUMINUM	28480	0340-0162
A2				OPT 002 OR 003 FOR CALLOUTS SEE TABLE 6-3.		
A3	05065-6078	6	1	MODULE ASSEMBLY, MULTIPLIER	28480	05065-6078
A3C1	0160-3036	8	5	CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A3C2	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A3C3	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036

See introduction to this section for ordering information  
\*Indicates factory selected value



Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3J1	1250-0258	2	5	CONNECTOR-RF SMB M 8GL-HOLE-FR 50-OHM	28480	1250-0258
A3J2	1250-0258	2		CONNECTOR-RF SMB M 8GL-HOLE-FR 50-OHM	28480	1250-0258
A3J3	1250-0258	2		CONNECTOR-RF SMB M 8GL-HOLE-FR 50-OHM	28480	1250-0258
A3J4	1250-0829	3	3	CONNECTOR-RF SMC M 8GL-HOLE-FR 50-OHM	28480	1250-0829
A3J5	1250-0258	2		CONNECTOR-RF SMB M 8GL-HOLE-FR 50-OHM	28480	1250-0258
A3J6	1250-0258	2		CONNECTOR-RF SMB M 8GL-HOLE-FR 50-OHM	28480	1250-0258
A3J7	1250-0829	3		CONNECTOR-RF SMC M 8GL-HOLE-FR 50-OHM	28480	1250-0829
A3J8	1250-0829	3		CONNECTOR-RF SMC M 8GL-HOLE-FR 50-OHM	28480	1250-0829
	0403-0114	3	1	GUIDE-PC BD BE-CU .094-BD-TMKN5 3-LG	28480	0403-0114
	05065-0045	1	1	COVER, MULTIPLIER	28480	05065-0045
	05065-2052	8	1	RIB, MULTIPLIER MODULE	28480	05065-2052
	05065-2054	2	1	SPACER, PLASTIC	28480	05065-2054
	05065-2055	4	1	PLATE, END	28480	05065-2055
	05065-2056	6	1	PLATE, BOTTOM	28480	05065-2056
A3A1	05065-6009	1	1	BOARD ABBY, MULTIPLIER(NOT FOR REPLACEMENT, FOR REPLACEMENT ORDER 05065-6078)	28480	05065-6009
A3A1C1	0121-0046	2	11	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C2	0160-2055	9	11	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C3	0140-0147	4	1	CAPACITOR-FXD 180PF +-5% 500VDC MICA	72136	DM15F181J0500MV1CR
A3A1C4	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C5	0170-0094	3	5	CAPACITOR-FXD .047UF +-20% 50VDC POLYE	84411	602-4730R5W2
A3A1C6	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C7	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C8	0160-2020	8	10	CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C9	0170-0094	3		CAPACITOR-FXD .047UF +-20% 50VDC POLYE	84411	602-4730R5W2
A3A1C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C11	0160-2535	0	1	CAPACITOR-FXD 320PF +-1% 300VDC MICA	28480	0160-2535
A3A1C12	0160-0116	1		CAPACITOR-FXD 6.8UF +-10% 35VDC TA	56289	150D685X903562
A3A1C13	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C14	0170-0094	3		CAPACITOR-FXD .047UF +-20% 50VDC POLYE	84411	602-4730R5W2
A3A1C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C16	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C17	0170-0082	9	5	CAPACITOR-FXD .01UF +-20% 50VDC POLYE	84411	601PE1030R5W1
A3A1C18	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C19	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C20	0160-2013	9	1	CAPACITOR-FXD 36PF +-5% 300VDC MICA	28480	0160-2013
A3A1C21	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C22	0170-0083	0	2	CAPACITOR-FXD .022UF +-20% 50VDC POLYE	84411	601PE2230R5W1
A3A1C23	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C24	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C25	0170-0094	3		CAPACITOR-FXD .047UF +-20% 50VDC POLYE	84411	602-4730R5W2
A3A1C26	0160-2025	3	1	CAPACITOR-FXD 220PF +-5% 500VDC MICA	28480	0160-2025
A3A1C27	0160-0950	9	1	CAPACITOR-FXD 60PF +-5% 300VDC MICA	28480	0160-0950
A3A1C28	0170-0082	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	84411	601PE1030R5W1
A3A1C29	0170-0082	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	84411	601PE1030R5W1
A3A1C30	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C31	0170-0082	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	84411	601PE1030R5W1
A3A1C32	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C33	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C34	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C35	0150-0050	9	4	CAPACITOR-FXD 1000PF +80-20% 1KVDC CER	28480	0150-0050
A3A1C36	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C37	0160-0113	8	10	CAPACITOR-FXD 100UF+-20-15% 30VDC TA	06001	69F355G7
A3A1C38	0170-0083	0		CAPACITOR-FXD .022UF +-20% 50VDC POLYE	84411	601PE2230R5W1
A3A1C39	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C40	0150-0050	9		CAPACITOR-FXD 1000PF +80-20% 1KVDC CER	28480	0150-0050
A3A1C41	0170-0082	9		CAPACITOR-FXD .01UF +-20% 50VDC POLYE	84411	601PE1030R5W1
A3A1C42	0150-0050	9		CAPACITOR-FXD 1000PF +80-20% 1KVDC CER	28480	0150-0050
A3A1C43	0150-0050	9		CAPACITOR-FXD 1000PF +80-20% 1KVDC CER	28480	0150-0050
A3A1C44	0160-0974	7	2	CAPACITOR-FXD 80PF +-2% 300VDC MICA	28480	0160-0974
A3A1C45	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C46	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C47	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C48	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C49	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C50	0160-2251	7	1	CAPACITOR-FXD 5.6PF +-25PF 500VDC CER	28480	0160-2251
A3A1C51	0160-0179	4	1	CAPACITOR-FXD 33PF +-5% 300VDC MICA	28480	0160-0179
A3A1C52	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C53	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C54	0160-2020	8		CAPACITOR-FXD 910PF +-5% 100VDC MICA	28480	0160-2020
A3A1C55	0160-2218	6	2	CAPACITOR-FXD 1000PF +-5% 300VDC MICA	28480	0160-2218
A3A1C56	0160-0949	6	1	CAPACITOR-FXD 68PF +-5% 300VDC MICA	28480	0160-0949
A3A1C57	0160-0974	7		CAPACITOR-FXD 80PF +-2% 300VDC MICA	28480	0160-0974
A3A1C58	0160-0182	9	1	CAPACITOR-FXD 47PF +-5% 300VDC MICA	28480	0160-0182
A3A1C59	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1C60	0160-2218	6		CAPACITOR-FXD 1000PF +-5% 300VDC MICA	28480	0160-2218

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A1C61	0121-0046	2		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A3A1CR1	1901-0535	9	8	DIODE-SCHOTTKY	28480	1901-0535
A3A1CR2	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR3	0122-0221	7	4	DIODE-VVC 100PF 10% C4/C25-MIN=2 BVR=30V	28480	0122-0221
A3A1CR4	0122-0221	7		DIODE-VVC 100PF 10% C4/C25-MIN=2 BVR=30V	28480	0122-0221
A3A1CR5	0122-0221	7		DIODE-VVC 100PF 10% C4/C25-MIN=2 BVR=30V	28480	0122-0221
A3A1CR6	0122-0221	7		DIODE-VVC 100PF 10% C4/C25-MIN=2 BVR=30V	28480	0122-0221
A3A1CR7	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR8	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR9	1901-0179	7	2	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3A1CR10	1901-0179	7		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3A1CR11	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR12	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR13	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR14	1901-0535	9		DIODE-SCHOTTKY	28480	1901-0535
A3A1L1	9100-2284	9	5	COIL-MLD 470UH 10% Q=30 .095DX.25LG-NOM	28480	9100-2284
A3A1L2	9140-0145	1	6	COIL-MLD 8.2UH 10% Q=60 .095DX.25LG-NOM	28480	9140-0145
A3A1L3	9100-2284	9		COIL-MLD 470UH 10% Q=30 .095DX.25LG-NOM	28480	9100-2284
A3A1L4	9100-2284	9		COIL-MLD 470UH 10% Q=30 .095DX.25LG-NOM	28480	9100-2284
A3A1L5	9140-0145	1		COIL-MLD 8.2UH 10% Q=60 .095DX.25LG-NOM	28480	9140-0145
A3A1L6	05065-8016	2	1	COIL, FILTER AMPLIFIER	28480	05065-8016
A3A1L7	9100-2284	9		COIL-MLD 470UH 10% Q=30 .095DX.25LG-NOM	28480	9100-2284
A3A1L8	9140-0145	1		COIL-MLD 8.2UH 10% Q=60 .095DX.25LG-NOM	28480	9140-0145
A3A1L9	9140-0145	1		COIL-MLD 8.2UH 10% Q=60 .095DX.25LG-NOM	28480	9140-0145
A3A1L10	9100-2284	9		COIL-MLD 470UH 10% Q=30 .095DX.25LG-NOM	28480	9100-2284
A3A1L11	9140-0145	1		COIL-MLD 8.2UH 10% Q=60 .095DX.25LG-NOM	28480	9140-0145
A3A1L12	9100-2279	2	2	COIL-MLD 180UH 10% Q=30 .095DX.25LG-NOM	28480	9100-2279
A3A1L13	9100-1619	2	3	COIL-MLD 6.8UH 10% Q=50 .155DX.375LG-NOM	28480	9100-1619
A3A1L14	9100-1661	4	1	COIL-MLD 2.2MH 5% Q=70 .215DX.56LG-NOM	28480	9100-1661
A3A1L15	05065-8020	7	1	TRANSFORMER, 60 MHZ DRIVE	28480	05065-8020
A3A1L16	9100-2279	2		COIL-MLD 180UH 10% Q=30 .095DX.25LG-NOM	28480	9100-2279
A3A1L17	9100-1619	2		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG-NOM	28480	9100-1619
A3A1L18	9100-2272	5	2	COIL-MLD 47UH 10% Q=45 .095DX.25LG-NOM	28480	9100-2272
A3A1L19	9100-1619	2		COIL-MLD 6.8UH 10% Q=50 .155DX.375LG-NOM	28480	9100-1619
A3A1L20	05065-8016	8	1	COIL, 20 MHZ	28480	05065-8016
A3A1L21	05065-8019	4	1	TRANSFORMER, POWER AMPLIFIER	28480	05065-8019
A3A1L22	9140-0145	1		COIL-MLD 8.2UH 10% Q=60 .095DX.25LG-NOM	28480	9140-0145
A3A1L23	9100-2272	5		COIL-MLD 47UH 10% Q=45 .095DX.25LG-NOM	28480	9100-2272
A3A1L24	05065-8017	0	1	COIL, 60 MHZ	28480	05065-8017
A3A1L25	05065-8013	2	1	COIL, MATCHING HARMONIC GENERATOR	28480	05065-8013
A3A1O1	1854-0005	7	16	TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
A3A1O2	1855-0327	8	4	TRANSISTOR J-FET 2N4416 N-CHAN D-MODE	01295	2N4416
A3A1O3	1855-0306	3	1	TRANSISTOR MOSFET 3N128 N-CHAN D-MODE	01928	3N128
A3A1O4	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A3A1O5	1855-0327	6		TRANSISTOR J-FET 2N4416 N-CHAN D-MODE	01295	2N4416
A3A1O6	1855-0327	8		TRANSISTOR J-FET 2N4416 N-CHAN D-MODE	01295	2N4416
A3A1O7	1853-0203	5	1	TRANSISTOR PNP SI PD=360MW FT=700MHZ	28480	1853-0203
A3A1O8	1853-0327	8		TRANSISTOR J-FET 2N4416 N-CHAN D-MODE	01295	2N4416
A3A1O9	1854-0233	3	1	TRANSISTOR NPN 2N3866 SI TO-39 PD=1W	01928	2N3866
A3A1R1	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A3A1R2	0757-0909	3	2	RESISTOR 240 2% .125W F TC=0+-100	24546	C4-1/8-T0-241-G
A3A1R3	2100-1756	1	1	RESISTOR-TRMR 200 5% WW SIDE-ADJ 1-TRN	28480	2100-1756
A3A1R4	0757-0920	8	2	RESISTOR 680 2% .125W F TC=0+-100	24546	C4-1/8-T0-681-G
A3A1R5	0757-0928	6	6	RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
A3A1R6	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
A3A1R7	0757-0974	2	1	RESISTOR 120K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1202-G
A3A1R8	0757-0897	8		RESISTOR 75 2% .125W F TC=0+-100	24546	C4-1/8-T0-75R0-G
A3A1R9	0757-0901	5	1	RESISTOR 110 2% .125W F TC=0+-100	24546	C4-1/8-T0-111-G
A3A1R10	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0-51R0-G
A3A1R11	2100-1762	9	1	RESISTOR-TRMR 20K 5% WW SIDE-ADJ 1-TRN	28480	2100-1762
A3A1R12	0757-0925	3	3	RESISTOR 1.1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1101-G
A3A1R13	0757-0959	3	10	RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
A3A1R14	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A3A1R15	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A3A1R16	0757-0959	3		RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
A3A1R17	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A3A1R18	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A3A1R19	0757-0959	3		RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
A3A1R20	0757-0959	3		RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
A3A1R21	0757-0925	3		RESISTOR 1.1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1101-G
A3A1R22	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A3A1R23	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A3A1R24	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A3A1R25	0757-0959	3		RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3A1R26	0757-0924	2	20	RESISTOR 1K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1001-G
A3A1R27	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1001-G
A3A1R28	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4=1/8-T0=2002-G
A3A1R29	0757-0925	3		RESISTOR 1.1K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1101-G
A3A1R30	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A3A1R31	0757-0959	3	3	RESISTOR 30K 2% .125W F TC=0+-100	24546	C4=1/8-T0=3002-G
A3A1R32	0757-0964	0		RESISTOR 47K 2% .125W F TC=0+-100	24546	C4=1/8-T0=4702-G
A3A1R33	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4=1/8-T0=2001-G
A3A1R34	0757-0951	5		RESISTOR 13K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1302-G
A3A1R35	0757-0954	8		RESISTOR 18K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1802-G
A3A1R36	0757-0924	2	1	RESISTOR 1K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1001-G
A3A1R37	0698-3432	7		RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0=26R1-F
A3A1R38	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4=1/8-T0=287R-F
A3A1R39	0757-0294	9		RESISTOR 17.8 1% .125W F TC=0+-100	19701	MF4C1/8-T0=17R8-F
A3A1R40	2100-1777	6		RESISTOR=TRMR 20K 5% MW TOP=ADJ 1-TRN	28480	2100-1777
A3A1R41	0698-3443	0	RESISTOR 287 1% .125W F TC=0+-100	24546	C4=1/8-T0=287R-F	
A3A1T1	00105-8003	0	1	TRANSFORMER, POWER AMP	28480	00105-8003
A3A1T2	05065-8014	4		TRANSFORMER, 5-10 MHZ	28480	05065-8014
A3A1T3	05065-8015	6		TRANSFORMER, 10-20 MHZ	28480	05065-8015
	1205-0033	6	1	HEAT SINK T0-5/T0-39-C8	28480	1205-0033
A4	05065-6070	0	1	BOARD ASSEMBLY, 100 KHZ DIVIDER	28480	05065-6070
A4C1	0180-0113	6	1	CAPACITOR-FXD 100UF+20-15% 30VDC TA	06001	69F355G7
A4C2	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A4C3	0160-2566	7		CAPACITOR-FXD 2000PF +-2% 300VDC MICA	28480	0160-2566
A4C4	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A4C5	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A4C6	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A4C7	0180-0194	3		CAPACITOR-FXD .015UF +-10% 200VDC POLYE	28480	0180-0194
A4C8	0180-0291	3		CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A4C9	0160-0340	1		CAPACITOR-FXD 600PF +-1% 300VDC MICA	28480	0160-0340
A4C10	0160-3064	2		CAPACITOR-FXD 1000PF +-5% 300VDC MICA	28480	0160-3064
A4C11	0180-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A4C12	0160-2305	2		CAPACITOR-FXD 5000PF +-2% 300VDC MICA	28480	0160-2305
A4C13	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C14	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C15	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C16	0160-0174	9	2	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C17	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C18	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C19	0160-2331	4		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A4C20	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4C21	0160-2331	4	7	CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A4C22	0160-0161	4		CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A4C23	0160-0174	9		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A4CR1	1902-3105	7	1	DIODE-ZNR 5.62V 2% DO-7 PDM.4W TC=+.016X	28480	1902-3105
A4CR2	1901-0040	1		DIODE=SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4IC1	1820-0055	6	1	IC CNTR TTL DECD 8YNCHRO POS=EDGE-TRIG	01295	9N7490AN
A4L1	9140-0129	1	6	COIL-MLD 220UH 5% Q=65 .155DX.375LG-NOM	28480	9140-0129
A4L2	9140-0129	1		COIL-MLD 220UH 5% Q=65 .155DX.375LG-NOM	28480	9140-0129
A4L3	9140-0129	1		COIL-MLD 220UH 5% Q=65 .155DX.375LG-NOM	28480	9140-0129
A4L4	9100-1647	6		COIL-MLD 470UH 5% Q=65 .19DX.44LG-NOM	28480	9100-1647
A4L5	9100-1647	6		COIL-MLD 470UH 5% Q=65 .19DX.44LG-NOM	28480	9100-1647
A4Q1	1854-0005	7	2	TRANSISTOR NPN 2N708 SI T0=18 PD=360MW	04713	2N708
A4Q2	1854-0005	7		TRANSISTOR NPN 2N708 SI T0=18 PD=360MW	04713	2N708
A4Q3	1854-0003	5		TRANSISTOR NPN 8I T0=39 PD=800MW	28480	1854-0003
A4Q4	1854-0005	7		TRANSISTOR NPN 2N708 SI T0=18 PD=360MW	04713	2N708
A4Q5	1853-0010	2		TRANSISTOR PNP 8I T0=18 PD=360MW	28480	1853-0010
A4Q6	1853-0010	2	7	TRANSISTOR PNP 8I T0=18 PD=360MW	28480	1853-0010
A4Q7	1854-0005	7		TRANSISTOR NPN 2N708 SI T0=18 PD=360MW	04713	2N708
A4Q8	1854-0005	7		TRANSISTOR NPN 2N708 SI T0=18 PD=360MW	04713	2N708
A4Q9	1854-0005	7		TRANSISTOR NPN 2N708 SI T0=18 PD=360MW	04713	2N708
A4R1	0757-0951	5	3	RESISTOR 13K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1302-G
A4R2	0757-0944	6		RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4=1/8-T0=6801-G
A4R3	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4=1/8-T0=51R0-G
A4R4	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4=1/8-T0=51R0-G
A4R5	0757-0927	5		RESISTOR 1.3K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1301-G
A4R6	0757-0927	5	2	RESISTOR 1.3K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1301-G
A4R7	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4=1/8-T0=511-G
A4R8	0757-0915	1		RESISTOR 430 2% .125W F TC=0+-100	24546	C4=1/8-T0=431-G
A4R9	0757-0927	5		RESISTOR 1.3K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1301-G
A4R10	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4=1/8-T0=101-G

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4R11	0757-1060	9	1	RESISTOR 196 1X .5W F TC0+-100	28480	0757-1060
A4R12	0757-0938	8	3	RESISTOR 3.9K 2X .125W F TC0+-100	24546	C4-1/8-T0-3901-G
A4R13	0757-0935	5	5	RESISTOR 3K 2X .125W F TC0+-100	24546	C4-1/8-T0-3001-G
A4R14	0757-0924	2	2	RESISTOR 1K 2X .125W F TC0+-100	24546	C4-1/8-T0-1001-G
A4R15	0757-0941	3	6	RESISTOR 5.1K 2X .125W F TC0+-100	24546	C4-1/8-T0-5101-G
A4R16	0757-0941	3	3	RESISTOR 5.1K 2X .125W F TC0+-100	24546	C4-1/8-T0-5101-G
A4R17	0757-0935	5	5	RESISTOR 3K 2X .125W F TC0+-100	24546	C4-1/8-T0-3001-G
A4R18	0757-0900	4	4	RESISTOR 100 2X .125W F TC0+-100	24546	C4-1/8-T0-101-G
A4R19	0757-0917	3	3	RESISTOR 510 2X .125W F TC0+-100	24546	C4-1/8-T0-511-G
A4R20	0757-0929	7	4	RESISTOR 1.6K 2X .125W F TC0+-100	24546	C4-1/8-T0-1601-G
A4R21	0757-0940	2	7	RESISTOR 4.7K 2X .125W F TC0+-100	24546	C4-1/8-T0-4701-G
A4R22	0757-0929	7	7	RESISTOR 1.6K 2X .125W F TC0+-100	24546	C4-1/8-T0-1601-G
A4R23	0757-0936	6	6	RESISTOR 3.3K 2X .125W F TC0+-100	24546	C4-1/8-T0-3301-G
A4R24	0757-0907	1	1	RESISTOR 200 2X .125W F TC0+-100	24546	C4-1/8-T0-201-G
A4R25	0757-0918	4	2	RESISTOR 560 2X .125W F TC0+-100	24546	C4-1/8-T0-561-G
A4R26	0757-0900	4	4	RESISTOR 100 2X .125W F TC0+-100	24546	C4-1/8-T0-101-G
A4R27	0757-0926	4	2	RESISTOR 1.2K 2X .125W F TC0+-100	24546	C4-1/8-T0-1201-G
A4R28	0757-0918	4	4	RESISTOR 560 2X .125W F TC0+-100	24546	C4-1/8-T0-561-G
A4R29	0757-0932	2	1	RESISTOR 2.2K 2X .125W F TC0+-100	24546	C4-1/8-T0-2201-G
A4R30	0757-0907	1	1	RESISTOR 200 2X .125W F TC0+-100	24546	C4-1/8-T0-201-G
A4R31	0757-0911	7	3	RESISTOR 300 2X .125W F TC0+-100	24546	C4-1/8-T0-301-G
A4R32	0757-0915	1	3	RESISTOR 430 2X .125W F TC0+-100	24546	C4-1/8-T0-431-G
A4R33*	0757-0897	8	3	RESISTOR 75 2X .125W F TC0+-100	24546	C4-1/8-T0-75R0-G
A4R34	0757-0922	0	2	RESISTOR 820 2X .125W F TC0+-100	24546	C4-1/8-T0-821-G
A4R35	0757-0942	4	4	RESISTOR 5.6K 2X .125W F TC0+-100	24546	C4-1/8-T0-5601-G
A4T1	05061-8007	5	2	TRANSFORMER, 1 MHZ OUTPUT	28480	05061-8007
A4T2	107A-9C	1	1	TRANSFORMER ASSEMBLY, 100 KHZ	28480	107A-9C
A5				FOR CALL-OUTS OF COMP., SEE TABLE 6-4.		
A6	05065-6016	6	1	BOARD ASSEMBLY, 1 MHZ DIVIDER	28480	05065-6016
A6C1	0160-0161	4	4	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A6C2	0160-0113	8	8	CAPACITOR-FXD 100UF+20-15% 30VDC TA	06001	69F35507
A6C3	0160-0127	2	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A6C4	0160-0127	2	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A6C5	0140-0176	1	1	CAPACITOR-FXD 560PF +-2% 300VDC MICA	72136	DM15F56160300WV1CR
A6C6	0160-0161	4	4	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A6C7	0150-0121	5	5	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A6C8	0160-0161	4	4	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A6C9	0150-0121	5	5	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A6C10	0140-0176	9	4	CAPACITOR-FXD 100PF +-2% 300VDC MICA	72136	DM15F10160300WV1CR
A6C11	0140-0179	2	2	CAPACITOR-FXD 1000PF +-2% 300VDC MICA	72136	DM19F10260300WV1CR
A6C12	0140-0208	8	1	CAPACITOR-FXD 680PF +-5% 300VDC MICA	72136	DM15F681J0300WV1CR
A6C13	0160-0161	4	4	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A6C14	0140-0221	5	1	CAPACITOR-FXD 220PF +-1% 300VDC MICA	72136	DM15F221F0300WV1C
A6C15	0160-0161	4	4	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A6C16	0140-0231	7	1	CAPACITOR-FXD 440PF +-1% 300VDC MICA	72136	DM15F441F0300WV1C
A6C17	0150-0121	5	5	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A6C18	0150-0121	5	5	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A6C19	0160-2221	1	1	CAPACITOR-FXD 1300PF +-5% 300VDC MICA	28480	0160-2221
A6C20	0140-0204	4	2	CAPACITOR-FXD 47PF +-5% 500VDC MICA	72136	DM15E470J0500WV1CR
A6C21	0121-0046	2	2	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304322 9/35PF N650
A6C22	0140-0179	2	2	CAPACITOR-FXD 1000PF +-2% 300VDC MICA	72136	DM19F10260300WV1CR
A6C23	0150-0121	5	5	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A6C24	0140-0159	8	1	CAPACITOR-FXD 3000PF +-2% 300VDC MICA	72136	DM19F30260300WV1CR
A6C25	0160-0127	2	2	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A6C26	0140-0180	5	1	CAPACITOR-FXD 2000PF +-2% 300VDC MICA	72136	DM19F20260300WV1CR
A6C27	0150-0121	5	5	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A6C28	0150-0121	5	5	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A6C29	0150-0121	5	5	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A6CR1	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A6CR2	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A6CR3	1902-3125	1	1	DIODE-ZNR 6.98V 2X DO-7 PD=.4W TC=+.045X	28480	1902-3125
A6CR4	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A6CR5	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A6CR6	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A6CR7	1901-0040	1	1	DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040
A6L1	9140-0129	1	1	COIL-MLD 220UH 5% Q#65 .1550X.375LG-NOM	28480	9140-0129
A6L2	9140-0107	5	1	COIL-MLD 27UH 10% Q#65 .1850X.437LG-NOM	28480	9140-0107
A6L3	9140-0129	1	1	COIL-MLD 220UH 5% Q#65 .1550X.375LG-NOM	28480	9140-0129
A6L4	9140-0118	8	2	COIL-MLD 500UH 5% Q#65 .19DX.44LG-NOM	28480	9140-0118
A6L5	9140-0118	8	2	COIL-MLD 500UH 5% Q#65 .19DX.44LG-NOM	28480	9140-0118

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6L6	9140-0129	1		COIL-MLD 220UH 5% Q=65 .155DX.375LG-NOM	28480	9140-0129
A6Q1	1854-0005	7		TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
A6Q2	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A6Q3	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A6Q4	1854-0005	7		TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
A6Q5	1855-0056	0	1	TRANSISTOR J-FET P-CHAN D-MODE TO-92 SI	07263	2N4342
A6Q6	1854-0005	7		TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
A6Q7	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A6Q8	1854-0005	7		TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
A6Q9	1854-0005	7		TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
A6Q10	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A6R1	0757-0900	4		RESISTOR 100 2% .125W F TC=0+/-100	24546	C4-1/8-T0-101-G
A6R2	0757-0940	2		RESISTOR 4.7K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-4701-G
A6R3	0757-0921	9	1	RESISTOR 750 2% .125W F TC=0+/-100	24546	C4-1/8-T0-751-G
A6R4	0757-0936	6		RESISTOR 3.3K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-3301-G
A6R5	0757-0893	4		RESISTOR 51 2% .125W F TC=0+/-100	24546	C4-1/8-T0-51R0-G
A6R6	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1001-G
A6R7	0757-0897	8		RESISTOR 75 2% .125W F TC=0+/-100	24546	C4-1/8-T0-75R0-G
A6R8	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1001-G
A6R9	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1001-G
A6R10	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-2402-G
A6R11	0757-0929	7		RESISTOR 1.6K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1601-G
A6R12	0757-0916	2	2	RESISTOR 470 2% .125W F TC=0+/-100	24546	C4-1/8-T0-471-G
A6R13	0757-0893	4		RESISTOR 51 2% .125W F TC=0+/-100	24546	C4-1/8-T0-51R0-G
A6R14	0757-0963	9	2	RESISTOR 43K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-4302-G
A6R15	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-2002-G
A6R16	0757-0944	6		RESISTOR 6.8K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-6801-G
A6R17	0757-0930	0	2	RESISTOR 1.8K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1801-G
A6R18	0757-0958	2	3	RESISTOR 27K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-2702-G
A6R19	0757-0976	4	6	RESISTOR 150K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1502-G
A6R20	0757-0893	4		RESISTOR 51 2% .125W F TC=0+/-100	24546	C4-1/8-T0-51R0-G
A6R21	0757-0917	3		RESISTOR 510 2% .125W F TC=0+/-100	24546	C4-1/8-T0-511-G
A6R22	0757-0474	7	1	RESISTOR 243K 1% .125W F TC=0+/-100	24546	C4-1/8-T0-2433-F
A6R23	0757-0893	4		RESISTOR 51 2% .125W F TC=0+/-100	24546	C4-1/8-T0-51R0-G
A6R24	0757-0929	7		RESISTOR 1.6K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1601-G
A6R25	0757-0940	2		RESISTOR 4.7K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-4701-G
A6R26	0757-0893	4		RESISTOR 51 2% .125W F TC=0+/-100	24546	C4-1/8-T0-51R0-G
A6R27	0757-0952	6	8	RESISTOR 15K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1502-G
A6R28	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1002-G
A6R29	0757-0900	4		RESISTOR 100 2% .125W F TC=0+/-100	24546	C4-1/8-T0-101-G
A6R30	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1001-G
A6R31	0757-0920	8		RESISTOR 680 2% .125W F TC=0+/-100	24546	C4-1/8-T0-681-G
A6R32*	0757-0893	4	18	RESISTOR 51 2% .125W F TC=0+/-100	24546	C4-1/8-T0-51R0-G
A6R33	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-1002-G
A6R34	0757-0922	0		RESISTOR 820 2% .125W F TC=0+/-100	24546	C4-1/8-T0-821-G
A6R35	0757-0942	4		RESISTOR 5.6K 2% .125W F TC=0+/-100	24546	C4-1/8-T0-5601-G
A6T1	05061-8006	3	1	TRANSFORMER, 5 MHZ INPUT	28480	05061-8006
A6T2	05061-8005	1	1	TRANSFORMER, 1 MHZ=4 MHZ	28480	05061-8005
A6T3	05061-8007	5	1	TRANSFORMER, 1 MHZ OUTPUT	28480	05061-8007
A7	05065-6080	1	1	MODULE ASSEMBLY, AC AMPLIFIER	28480	05065-6080
	0340-0119	4		TERMINAL-STUD 8GL-PIN PRESS-MTG	28480	0340-0119
	0510-0207	2		THREADED INSERT-STDF 4=40 .188-LG STL	28480	0510-0207
	1250-1262	0	1		28480	1250-1262
	5065-0032	1	1	COVER, SIGNAL AMPLIFIER	28480	5065-0032
	05065-0033	6	1	CHASSIS, SIGNAL AMPLIFIER	28480	05065-0033
	05065-2024	9	1	PLATE, END	28480	05065-2024
A7A1	05065-6079	8	1	BOARD ASSEMBLY, AC AMPLIFIER (NOT FOR REPLACEMENT) FOR REPLACEMENT ORDER 05065-6080	28480	05065-6079
A7A1C1	0180-0116	1		CAPACITOR-FXD 6.8UF+/-10% 35VDC TA	56289	150D685X903582
A7A1C2	0180-0106	9		CAPACITOR-FXD 60UF+/-20% 6VDC TA	56289	150D606X000682
A7A1C3	0180-0113	8		CAPACITOR-FXD 100UF+/-20% 30VDC TA	08001	69F355G7
A7A1C4	0180-0291	3		CAPACITOR-FXD 1UF+/-10% 35VDC TA	56289	150D105X9035A2
A7A1C5	0170-0086	3	2	CAPACITOR-FXD .22UF +/-20% 50VDC POLYE	84411	601CPE2240R5H2
A7A1C6	0160-0981	6	2	CAPACITOR-FXD .068UF +/-5% 200VDC POLYE	56289	292P68352
A7A1C7	0160-0180	7	4	CAPACITOR-FXD .033UF +/-5% 200VDC POLYE	28480	0160-0180
A7A1C8	0160-0180	7		CAPACITOR-FXD .033UF +/-5% 200VDC POLYE	28480	0160-0180
A7A1C9	0180-0116	1		CAPACITOR-FXD 6.8UF+/-10% 35VDC TA	56289	150D685X903582
A7A1C10	0180-0116	1		CAPACITOR-FXD 6.8UF+/-10% 35VDC TA	56289	150D685X903582
A7A1C11	0180-0097	7	4	CAPACITOR-FXD 47UF+/-10% 35VDC TA	56289	150D476X903582
A7A1C12	0170-0091	0	3	CAPACITOR-FXD .01213UF +/-2% 50VDC	28480	0170-0091
A7A1C13	0170-0090	9	2	CAPACITOR-FXD .0252UF +/-1% 50VDC POLYSTY	28480	0170-0090
A7A1C14	0170-0091	0		CAPACITOR-FXD .01213UF +/-2% 50VDC	28480	0170-0091
A7A1C15	0180-0116	1		CAPACITOR-FXD 6.8UF+/-10% 35VDC TA	56289	150D685X903582

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7A1C16	0180-0197	8	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1C17	0180-0160	5	1	CAPACITOR-FXD 22UF+-20% 35VDC TA	56289	150D226X0035R2
A7A1C18	0160-0981	6		CAPACITOR-FXD .068UF +-5% 200VDC POLYE	56289	292P68352
A7A1C19	0160-0180	7		CAPACITOR-FXD .033UF +-5% 200VDC POLYE	28480	0160-0180
A7A1C20	0160-0180	7		CAPACITOR-FXD .033UF +-5% 200VDC POLYE	28480	0160-0180
A7A1C21	0180-0097	7		CAPACITOR-FXD 47UF+-10% 35VDC TA	56289	150D476X9035R2
A7A1C22	0180-0097	7		CAPACITOR-FXD 47UF+-10% 35VDC TA	56289	150D476X9035R2
A7A1C23	0180-0197	8		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A7A1CR1	1902-3203	6		DIODE-ZNR 14.7V 5% DO-7 PDM.4W TC=+.057X	28480	1902-3203
A7A1CR2	1902-3203	6		DIODE-ZNR 14.7V 5% DO-7 PDM.4W TC=+.057X	28480	1902-3203
A7A1CR3				NOT ASSIGNED		
A7A1CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A7A1CR5	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A7A1IC1	1820-0216	1	3	IC OP AMP GP 8-DIP=P	28480	1820-0216
A7A1IC2	1820-0216	1		IC OP AMP GP 8-DIP=P	28480	1820-0216
A7A1IC3	1820-0216	1		IC OP AMP GP 8-DIP=P	28480	1820-0216
A7A1Q1	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A7A1Q2	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A7A1Q3				NOT ASSIGNED		
A7A1Q4				NOT ASSIGNED		
A7A1Q5	1854-0003	5		TRANSISTOR NPN SI TO-18 PD=800MW	28480	1854-0003
A7A1Q6	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A7A1Q7	1854-0003	5		TRANSISTOR NPN SI TO-18 PD=800MW	28480	1854-0003
A7A1Q8				NOT ASSIGNED		
A7A1Q9	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A7A1R1	0757-0965	1	10	RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5102-G
A7A1R2	0698-3459	8	2	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A7A1R3	2100-1659	3	1	RESISTOR-TRMR 5K 5% WW SIDE-ADJ 22-TRN	32997	3057P-1-502
A7A1R4	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5102-G
A7A1R5	0698-3459	8		RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A7A1R6	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5102-G
A7A1R7	0757-0903	7	1	RESISTOR 130 2% .125W F TC=0+-100	24546	C4-1/8-T0-131-G
A7A1R8	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5102-G
A7A1R9	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A7A1R10	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A7A1R11	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A7A1R12	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A7A1R13	0757-0959	3		RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
A7A1R14	0698-4308	8	4	RESISTOR 16.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1692-G
A7A1R15	0698-5469	4	2	RESISTOR 8.665K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8665R-F
A7A1R16	0698-4308	8		RESISTOR 16.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1692-F
A7A1R17	2100-1758	3	1	RESISTOR-TRMR 1K 5% WW SIDE-ADJ 1-TRN	28480	2100-1758
A7A1R18	0757-0976	4		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
A7A1R19	0757-0976	4		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
A7A1R20	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A7A1R21	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A7A1R22	0757-0911	7		RESISTOR 300 2% .125W F TC=0+-100	24546	C4-1/8-T0-301-G
A7A1R23	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A7A1R24	0698-3129	9		RESISTOR 1M 1% .125W CF TC=0-500	91637	DC-1/8-1004-F
A7A1R25	0698-0077	0	2	RESISTOR 93.1K 1% .125W F TC=0+-100	03888	PME55-1/8-T0-9312-F
A7A1R26	0757-0457	6	2	RESISTOR 47.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4752-F
A7A1R27	0698-0077	0		RESISTOR 93.1K 1% .125W F TC=0+-100	03888	PME55-1/8-T0-9312-F
A7A1R28	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A7A1R29	2100-1761	8	1	RESISTOR-TRMR 10K 5% WW SIDE-ADJ 1-TRN	28480	2100-1761
A7A1R30	0757-0976	4		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
A7A1R31	0757-0976	4		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
A7A1R32	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A7A1R33	0757-0952	6		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
A7A1R34	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A7A1R35	0698-4308	8		RESISTOR 16.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1692-F
A7A1R36	0698-5469	4		RESISTOR 8.665K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8665R-F
A7A1R37	0698-4308	8		RESISTOR 16.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1692-F
A7A1R38	0757-0976	4		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
A7A1R39	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A7A1R40	0757-0911	7		RESISTOR 300 2% .125W F TC=0+-100	24546	C4-1/8-T0-301-G
A7A1R41	0698-3129	9		RESISTOR 1M 1% .125W CF TC=0-500	91637	DC-1/8-1004-F
A7A1R42	0757-0941	3		RESISTOR 5.1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5101-G
A7A1R43	0757-0941	3		RESISTOR 5.1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5101-G
				A7A1 MISCELLANEOUS PARTS		
	0340-0037	5		TERMINAL-STUD DBL-TUR PRESS-MTG	28480	0340-0037
	0340-0039	7		TERMINAL BUSHING - TEFLON; MOUNTS IN	28480	0340-0039

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number	
	05065-6013	0	1	BOARD ASSEMBLY, PHASE DETECTOR	28480	05065-6013	
A8C1	0170-0091	0	6	CAPACITOR-FXD .01213UF +/-2% 50VDC	28480	0170-0091	
A8C2	0180-0117	2		CAPACITOR-FXD 2.7UF+/-10% 35VDC TA	56289	150D275X9035B2	
A8C3	0170-0090	9		CAPACITOR-FXD .0252UF +/-1% 50VDC POLYSTY	28480	0170-0090	
A8C4	0180-0116	1		CAPACITOR-FXD 6.8UF+/-10% 35VDC TA	56289	150D685X9035B2	
A8C5	0140-0209	9		CAPACITOR-FXD 5PF +/-10% 500VDC MICA	72136	DM15C050K0500MV1CR	
A8C6	0150-0121	5	3	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121	
A8C7	0140-0176	9		CAPACITOR-FXD 100PF +/-2% 300VDC MICA	72136	DM15F101G0300MV1CR	
A8C8	0160-0370	7		CAPACITOR-FXD 20PF +/-5% 500VDC MICA	28480	0160-0370	
A8C9	0180-0113	8		CAPACITOR-FXD 100UF+20-15% 35VDC TA	06001	69F355G7	
A8C10	0180-0113	8		CAPACITOR-FXD 100UF+20-15% 30VDC TA	06001	69F355G7	
A8C11	0140-0204	4	16	CAPACITOR-FXD 47PF +/-5% 500VDC MICA	72136	DM15E470J0500MV1CR	
A8C12	0160-0370	7		CAPACITOR-FXD 20PF +/-5% 500VDC MICA	28480	0160-0370	
A8C13	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093	
A8C14	0160-0370	7		CAPACITOR-FXD 20PF +/-5% 500VDC MICA	28480	0160-0370	
A8C15	0180-0100	3		CAPACITOR-FXD 4.7UF+/-10% 35VDC TA	56289	150D475X9035B2	
A8C16	0180-0100	3	2	CAPACITOR-FXD 4.7UF+/-10% 35VDC TA	56289	150D475X9035B2	
A8C17	0180-0869	9		CAPACITOR-FXD .47UF +/-10% 50VDC POLYE	01002	65F17AA474	
A8C18	0180-0869	9		CAPACITOR-FXD .47UF +/-10% 50VDC POLYE	01002	65F17AA474	
A8C19	0170-0086	3		CAPACITOR-FXD .22UF +/-20% 50VDC POLYE	84411	601CPE2240R5W2	
A8C20	0180-0113	8		CAPACITOR-FXD 100UF+20-15% 30VDC TA	06001	69F355G7	
A8C21	0180-0291	3	3	CAPACITOR-FXD 1UF+/-10% 35VDC TA	56289	150D105X9035A2	
A8C22	0170-0085	2		CAPACITOR-FXD .1UF +/-20% 50VDC POLYE	84411	601PE1040R5W3	
A8C23	0180-0291	3		CAPACITOR-FXD 1UF+/-10% 35VDC TA	56289	150D105X9035A2	
A8C24	0170-0094	3		CAPACITOR-FXD .047UF +/-20% 50VDC POLYE	84411	602-4730R5W2	
A8C25	0170-0085	2		CAPACITOR-FXD .1UF +/-20% 50VDC POLYE	84411	601PE1040R5W3	
A8C26	0170-0085	2	CAPACITOR-FXD .1UF +/-20% 50VDC POLYE	84411	601PE1040R5W3		
A8CR1	1901-0033	2	6	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033	
A8CR2	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033	
A8CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040	
A8CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040	
A8CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 DO-35	28480	1901-0040	
A8CR6	1901-0033	2	2	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033	
A8CR7	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033	
A8E1	9170-0029	3	3	CORE-SHIELDING BEAD	28480	9170-0029	
A8E2	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029	
A8E3	9170-0029	3		CORE-SHIELDING BEAD	28480	9170-0029	
A8G1	1854-0023	9	2	TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023	
A8G2	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023	
A8G3	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023	
A8G4	1854-0005	7		TRANSISTOR NPN 2N708 8I TO-18 PD=360MW	04713	2N708	
A8G5	1854-0005	7		TRANSISTOR NPN 2N708 8I TO-18 PD=360MW	04713	2N708	
A8G6	1854-0005	7		TRANSISTOR NPN 2N708 8I TO-18 PD=360MW	04713	2N708	
A8G7	1854-0005	7		TRANSISTOR NPN 2N708 8I TO-18 PD=360MW	04713	2N708	
A8G8	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023	
A8G9	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023	
A8G10	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023	
A8G11	1854-0023	9		2	TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023
A8G12	1853-0005	5			TRANSISTOR PNP 2N941 8I TO-18 PD=250MW	28480	1853-0005
A8G13	1853-0005	5			TRANSISTOR PNP 2N941 8I TO-18 PD=250MW	28480	1853-0005
A8R1	0757-0948	0		3	RESISTOR 10K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G
A8R2	0757-0957	1			RESISTOR 24K 2% .125W F TC0+/-100	24546	C4-1/8-T0-2402-G
A8R3	0757-0957	1	RESISTOR 24K 2% .125W F TC0+/-100		24546	C4-1/8-T0-2402-G	
A8R4	0757-0457	6	RESISTOR 47.5K 1% .125W F TC0+/-100		24546	C4-1/8-T0-4752-F	
A8R5	0757-0959	3	RESISTOR 30K 2% .125W F TC0+/-100		24546	C4-1/8-T0-3002-G	
A8R6	0757-0444	1	1	RESISTOR 12.1K 1% .125W F TC0+/-100	24546	C4-1/8-T0-1212-F	
A8R7	0757-0450	9		RESISTOR 22.1K 1% .125W F TC0+/-100	24546	C4-1/8-T0-2212-F	
A8R8	2100-1775	4		RESISTOR-TRMR 5K 5% WHP ADJ 1-TRN	28480	2100-1775	
A8R9	0757-0894	5		RESISTOR 56 1% .125W F TC0+/-100	24546	C4-1/8-T0-56R0-G	
A8R10	0757-0948	0		RESISTOR 10K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G	
A8R11	0757-0945	7	2	RESISTOR 7.5K 2% .125W F TC0+/-100	24546	C4-1/8-T0-7501-G	
A8R12	0757-0972	0		RESISTOR 100K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G	
A8R13	0757-0948	0		RESISTOR 10K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G	
A8R14	0757-0972	0		RESISTOR 100K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G	
A8R15	0757-0914	0		RESISTOR 390 2% .125W F TC0+/-100	24546	C4-1/8-T0-391-G	
A8R16	0757-0957	1	0	RESISTOR 24K 2% .125W F TC0+/-100	24546	C4-1/8-T0-2402-G	
A8R17	0757-0948	0		RESISTOR 10K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G	
A8R18	0757-0948	0		RESISTOR 10K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G	
A8R19	0757-0907	1		RESISTOR 200 2% .125W F TC0+/-100	24546	C4-1/8-T0-201-G	
A8R20	0757-0948	0		RESISTOR 10K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G	
A8R21	0757-0948	0	0	RESISTOR 10K 2% .125W F TC0+/-100	24546	C4-1/8-T0-1002-G	
A8R22	0757-0935	5		RESISTOR 3K 2% .125W F TC0+/-100	24546	C4-1/8-T0-3001-G	
A8R23	0757-0957	1		RESISTOR 24K 2% .125W F TC0+/-100	24546	C4-1/8-T0-2402-G	
A8R24	0757-0958	2		RESISTOR 27K 2% .125W F TC0+/-100	24546	C4-1/8-T0-2702-G	
A8R25	0757-0914	0		RESISTOR 390 2% .125W F TC0+/-100	24546	C4-1/8-T0-391-G	

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A8R26	0757-0958	2		RESISTOR 27K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2702-G
A8R27	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2402-G
A8R28	0757-0955	5		RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0=3001-G
A8R29	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1501-G
A8R30	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1501-G
A8R31	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1501-G
A8R32	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1501-G
A8R33	0757-0952	6		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1502-G
A8R34	0757-0952	6		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1502-G
A8R35	2100-1777	6		RESISTOR-TRMR 20K 5% HW TOP=ADJ 1-TRN	28480	2100-1777
A8R36	0698-3431	6	2	RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0=23R7-F
A8R37	0757-0952	6		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1502-G
A8R38	0757-0952	6		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1502-G
A8R39	0757-0964	0		RESISTOR 47K 2% .125W F TC=0+-100	24546	C4-1/8-T0=4702-G
A8R40	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0=5102-G
A8R41	0757-0964	0		RESISTOR 47K 2% .125W F TC=0+-100	24546	C4-1/8-T0=4702-G
A8R42	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2002-G
A8R43	2100-1923	4	1	RESISTOR-TRMR 50K 5% HW SIDE=ADJ 1-TRN	28480	2100-1923
A8R44	0727-0002	4	1	RESISTOR 3 1% .5W CF TC=0-500	28480	0727-0002
A8R45	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0=5102-G
A8R46	0698-3431	6		RESISTOR 23.7 1% .125W F TC=0+-100	03888	PME55-1/8-T0=23R7-F
A8R47	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0=5102-G
A8R48	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2001-G
A8T1	9100-0340	4	1	TRANSFORMER 1 V; 60 CPS	28480	9100-0340
A9	05065-6015	4	1	BOARD ASSEMBLY, INTEGRATOR	28480	05065-6015
A9C1	0160-0168	1	1	CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
A9C2	0150-0121	5		CAPACITOR-FXD .1UF +-80-20% 50VDC CER	28480	0150-0121
A9C3	0170-0044	3	1	CAPACITOR-FXD .5UF +-10% 600VDC POLYE	28480	0170-0044
A9C4	0160-0161	4		CAPACITOR-FXD .01UF +-10% 200VDC POLYE	28480	0160-0161
A9CR1	1902-0025	4	1	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
A9CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9CR6	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9CR7	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9CR8	1902-0040	3	2	DIODE-ZNR 14V 5% DO-7 PD=.4W TC=+.056%	28480	1902-0040
A9CR9	1902-0040	3		DIODE-ZNR 14V 5% DO-7 PD=.4W TC=+.056%	28480	1902-0040
A9CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A9Q1A	1855-0049	1	2	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0049
A9Q1B	1855-0049	1		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0049
A9Q2	1854-0003	5		TRANSISTOR NPN SI T0-39 PD=800MW	28480	1854-0003
A9Q3	1853-0066	8	1	TRANSISTOR PNP SI T0-92 PD=625MW	28480	1853-0066
A9R1	0757-0972	0		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A9R2	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0=5102-G
A9R3	2100-1655	9	1	RESISTOR-TRMR 200 5% HW SIDE=ADJ 22-TRN	32997	3057P-1-201
A9R4	0757-0966	2	2	RESISTOR 56K 2% .125W F TC=0+-100	24546	C4-1/8-T0=5602-G
A9R5	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4-1/8-T0=5102-G
A9R6	0757-0972	0		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A9R7	0757-0909	3		RESISTOR 240 2% .125W F TC=0+-100	24546	C4-1/8-T0=241-G
A9R8	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A9R9	0698-3127	7		RESISTOR 4.75M 2% .125W CF TC=0-1300	91637	DC-1/8-4754-G
A9R10	2100-1662	8	1	RESISTOR-TRMR 50K 5% HW SIDE=ADJ 22-TRN	32997	3057P-1-503
A9R11	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A9R12	0757-0959	3		RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0=3002-G
A9R13	0757-0941	3		RESISTOR 5.1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=5101-G
A9R14	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A9R15	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A9R16	0757-0930	0		RESISTOR 1.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1801-G
A9R17	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1002-G
A9R18	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A9R19	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0=1001-G
A9R20	0757-0940	2		RESISTOR 4.7K 2% .125W F TC=0+-100	24546	C4-1/8-T0=4701-G
A9R21	0757-0935	5		RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0=3001-G
A9R22	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2001-G
A9R23	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2002-G
A9R24	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2002-G
A9R25	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0=2002-G
A10	00105-6013	1		OSCILLATOR ASSY: 5 MHz FACTORY REPAIR ONLY. FOR REPLACEMENT, ORDER HP PART NO. 00105-6034	28480	00105-6013

See introduction to this section for ordering information  
\*Indicates factory selected value



Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A11	05065-6024	3	1	BOARD ASSEMBLY, CONTROLLER	28480	05065-6024
A11C1	0140-0188	3	1	CAPACITOR-FXD .05UF +-1% 300VDC MICA	72136	DM42F503F0300MV1CR
A11C2	0180-2278	8	2	CAPACITOR-FXD .034UF +-2% 100VDC MICA	28480	0160-2278
A11C3	0180-2278	8		CAPACITOR-FXD .034UF +-2% 100VDC MICA	28480	0160-2278
A11C4	0140-0188	1	1	CAPACITOR-FXD .02UF +-1% 300VDC MICA	72136	DM30F203F0300MV1CR
A11C5	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C6	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C7	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C8	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C9	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C10	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C11	0140-0176	9		CAPACITOR-FXD 100PF +-2% 300VDC MICA	72136	DM15F101G0300MV1CR
A11C12	0140-0176	9		CAPACITOR-FXD 100PF +-2% 300VDC MICA	72136	DM15F101G0300MV1CR
A11C13	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C14	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C15	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C16	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C17	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C18	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C19	0180-0228	6	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A11C20	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A11C21	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C22	0180-0100	3		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11C23	0180-0049	9	2	CAPACITOR-FXD 20UF+75-10% 50VDC AL	56289	30D206G050CC2
A11C24	0180-0049	9		CAPACITOR-FXD 20UF+75-10% 50VDC AL	56289	30D206G050CC2
A11CR1	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A11CR2	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A11CR3	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A11CR4	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A11CR5	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A11CR6	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A11CR7	1901-0028	5	2	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A11CR8	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A11Q1	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023
A11Q2	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023
A11Q3	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023
A11Q4	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023
A11Q5	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023
A11Q6	1854-0023	9		TRANSISTOR NPN 8I TO-18 PD=360MW	28480	1854-0023
A11Q7	1854-0039	7	5	TRANSISTOR NPN 2N30538 8I TO-39 PD=1W	0192B	2N30538
A11Q8	1854-0039	7		TRANSISTOR NPN 2N30538 8I TO-39 PD=1W	0192B	2N30538
A11R1	0811-1777	1	2	RESISTOR 962.475 .1% .05W PWH TC=0+-10	28480	0811-1777
A11R2	0811-1777	1		RESISTOR 962.475 .1% .05W PWH TC=0+-10	28480	0811-1777
A11R3	0811-2603	4	2	RESISTOR 390 1% .125W PWH TC=0+-10	20940	135-1/8-D-391-F
A11R4	0811-2603	4		RESISTOR 390 1% .125W PWH TC=0+-10	20940	135-1/8-D-391-F
A11R5*	0811-2596	4	1	RESISTOR 430 1% .125W PWH TC=0+-10	20940	135-1/8-D-431-F
A11R6*	0811-2604	5	1	RESISTOR 180 1% .125W PWH TC=0+-10	20940	135-1/8-D-181-F
A11R7	0757-0939	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0-51R-G
A11R8	0757-0939	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0-51R-G
A11R9	0757-0939	9	4	RESISTOR 4.3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4301-G
A11R10	0757-0939	9		RESISTOR 4.3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4301-G
A11R11	0757-0939	9		RESISTOR 4.3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4301-G
A11R12	0757-0939	9		RESISTOR 4.3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4301-G
A11R13	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A11R14	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A11R15	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A11R16	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A11R17	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A11R18	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A11R19	0757-0904	8	2	RESISTOR 150 2% .125W F TC=0+-100	24546	C4-1/8-T0-151-G
A11R20	0757-0904	8		RESISTOR 150 2% .125W F TC=0+-100	24546	C4-1/8-T0-151-G
A11R21	0757-0913	9		RESISTOR 360 2% .125W F TC=0+-100	24546	C4-1/8-T0-361-G
A11R22	0757-0913	9		RESISTOR 360 2% .125W F TC=0+-100	24546	C4-1/8-T0-361-G
A11R23	0757-0913	9		RESISTOR 360 2% .125W F TC=0+-100	24546	C4-1/8-T0-361-G
A11R24	0757-0913	9		RESISTOR 360 2% .125W F TC=0+-100	24546	C4-1/8-T0-361-G
A11R25	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A11R26	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A11R27	0757-0954	8		RESISTOR 18K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1802-G
A11R28	0757-0954	8		RESISTOR 18K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1802-G
A11R29	0757-0928	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A11R30	0757-0928	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A11R31	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A11R32	0811-1668	9	2	RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J
A11R33	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A11R34	0811-1668	9		RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A12				FOR CALL-OUTS OF COMP., SEE PAGE 6-20.		
A13	05065-6020	5	1	MODULE ASSEMBLY, BUFFER AMPLIFIER	28480	05065-6020
A13C1	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A13C2	0160-3036	8		CAPACITOR-FDTHRU 5000PF +80 -20% 200V	28480	0160-3036
A13J1	1250-0901	2		CONNECTOR-RF 8MB M 8GL-HOLE-FR 50-OHM	28480	1250-0901
A13J2	1250-0901	2		CONNECTOR-RF 8MB M 8GL-HOLE-FR 50-OHM	28480	1250-0901
A13J3	1250-0901	2		CONNECTOR-RF 8MB M 8GL-HOLE-FR 50-OHM	28480	1250-0901
A13J4	1250-0901	2		CONNECTOR-RF 8MB M 8GL-HOLE-FR 50-OHM	28480	1250-0901
				A13 MISCELLANEOUS PARTS		
	5060-2059	6	1	PLATE, END	28480	5060-2059
	05065-0001	9	1	CHASSIS, BUFFER AMPLIFIER	28480	05065-0001
	05065-0002	1	1	COVER, BUFFER AMPLIFIER	28480	05065-0002
A13A1	05065-6021	7	1	BOARD ASSEMBLY, BUFFER AMPLIFIER (NOT FOR REPLACEMENT) FOR REPLACEMENT ORDER 05065-6020	28480	05065-6021
A13A1C1	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1C2	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1C3	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1C4	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1C5	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1C6	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1C7*	0160-0198	7	1	CAPACITOR-FXD 4UF +-20% 1KVDC PPR	53021	7110-4
A13A1C8*	0160-2204	0	1	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A13A1C9	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1C10	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1C11	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A13A1C12	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A13A1CR1	1902-3149	9		DIODE-ZNR 9.09V 5% DO-7 PD=.4W TC=+.057%	28480	1902-3149
A13A1CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A13A1L1	9140-0137	1		COIL-MLD 1MH 5% Q=60 .19DX.44LG-NOM	28480	9140-0137
A13A1Q1	1854-0092	2		TRANSISTOR NPN 8I PD=200MW FT=600MHZ	28480	1854-0092
A13A1Q2	1854-0092	2		TRANSISTOR NPN 8I PD=200MW FT=600MHZ	28480	1854-0092
A13A1Q3	1854-0092	2		TRANSISTOR NPN 8I PD=200MW FT=600MHZ	28480	1854-0092
A13A1R1	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0-51R0-G
A13A1R2*	0757-0913	9	5	RESISTOR 360 2% .125W F TC=0+-100	24546	C4-1/8-T0-361-G
A13A1R3	0757-0936	6		RESISTOR 3.3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3301-G
A13A1R4	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0-51R0-G
A13A1R5	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0-511-G
A13A1R6	0757-0907	1		RESISTOR 200 2% .125W F TC=0+-100	24546	C4-1/8-T0-201-G
A13A1R7	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A13A1R8	0757-0385	3	1	RESISTOR 22.1 1% .125W F TC=0+-100	19701	MF4C1/8-T0-22R1-F
A13A1R9	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0-511-G
A13A1R10	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0-511-G
A13A1R11	0757-0923	1	2	RESISTOR 910 2% .125W F TC=0+-100	24546	C4-1/8-T0-911-G
A13A1R12	0757-0923	1		RESISTOR 910 2% .125W F TC=0+-100	24546	C4-1/8-T0-911-G
A13A1R13	0757-0898	9	2	RESISTOR 82 2% .125W F TC=0+-100	24546	C4-1/8-T0-82R0-G
A13A1R14	0757-0898	9		RESISTOR 82 2% .125W F TC=0+-100	24546	C4-1/8-T0-82R0-G
A13A1R15	0757-0893	4		RESISTOR 51 2% .125W F TC=0+-100	24546	C4-1/8-T0-51R0-G
A13A1R16	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0-511-G
A13A1R17	0757-0938	8		RESISTOR 3.9K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3901-G
A13A1R18	0757-0938	8		RESISTOR 3.9K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3901-G
A13A1T1	00105-8007	8	2	TRANSFORMER, POWER AMPLIFIER	28480	00105-8007
A13A1T2	00105-8007	8		TRANSFORMER, POWER AMPLIFIER	28480	00105-8007
A14	05065-6012	8	1	BOARD ASSEMBLY, LOGIC	28480	05065-6012
A14C1	0180-0117	2		CAPACITOR-FXD 2.7UF+-10% 35VDC TA	56289	150D275X9035B2
A14C2	0150-0121	5		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A14C3	0180-0117	2		CAPACITOR-FXD 2.7UF+-10% 35VDC TA	56289	150D275X9035B2
A14C4	0180-0106	9		CAPACITOR-FXD 60UF+-20% 6VDC TA	56289	150D606X0006B2
A14C5	0180-0106	9		CAPACITOR-FXD 60UF+-20% 6VDC TA	56289	150D606X0006B2
A14CR1	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR3	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR4	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR5	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR6	1902-0034	5	1	DIODE-ZNR 5.76V 10% DO-7 PD=.4W	28480	1902-0034
A14CR7	1902-0041	4	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	28480	1902-0041
A14CR8	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A14CR11	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR12	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A14CR13	1854-0003	8		THYRISTOR-8CS 3N58 TO-39 VRRM=40	03508	3N58
A14CR14	1902-3024	9	1	DIODE-ZNR 2.87V 5% DO-7 PD=.4W TC=-.07%	28480	1902-3024
A14Q1				NOT ASSIGNED		
A14Q2	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A14Q3	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A14Q4	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q5	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q6	1853-0001	1	3	TRANSISTOR PNP SI TO-39 PD=600MW	28480	1853-0001
A14Q7	1854-0023	9		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A14Q8	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q9	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q10	1853-0001	1		TRANSISTOR PNP SI TO-39 PD=600MW	28480	1853-0001
A14Q11	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q12	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q13	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q14	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q15	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q16	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q17	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14Q18	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A14R1				NOT ASSIGNED		
A14R2	0757-0959	3		RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
A14R3	0757-0972	0		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A14R4	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A14R5				NOT ASSIGNED		
A14R6	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A14R7	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
A14R8	2100-1775	4		RESISTOR-TRMR 5K 5% WW TOP=ADJ 1-TRN	28480	2100-1775
A14R9	0757-0963	9		RESISTOR 43K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4302-G
A14R10	0757-0916	2		RESISTOR 470 2% .125W F TC=0+-100	24546	C4-1/8-T0-471-G
A14R11	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A14R12	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A14R13	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
A14R14	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
A14R15				NOT ASSIGNED		
A14R16	0757-0972	0		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A14R17	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A14R18	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
A14R19	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A14R20	0757-0933	3		RESISTOR 2.4K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2401-G
A14R21	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
A14R22	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
A14R23	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A14R24	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
A14R25	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A14R26	0757-0960	6		RESISTOR 33K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3302-G
A14R27	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A14R28	0757-0960	6		RESISTOR 33K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3302-G
A14R29	0757-0941	3		RESISTOR 5.1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5101-G
A14R30	0757-0968	4	1	RESISTOR 68K 2% .125W F TC=0+-100	24546	C4-1/8-T0-6802-G
A14R31	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A14R32	0757-0952	6		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
A14R33	0757-0957	1		RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
A14R34	0757-0945	7		RESISTOR 7.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-7501-G
A14R35	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
A14R36	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
A14R37	0757-0975	3	1	RESISTOR 130K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1302-G
A15	05065-6023	1	1	BOARD ASSEMBLY, VOLTAGE REGULATOR (SERIES 1840)	28480	05065-6023
A15C1	0150-0052	1	1	CAPACITOR-FXD .05UF +-20% 400VDC CER	28480	0150-0052
A15C2	0180-0117	2		CAPACITOR-FXD 2.7UF+-10% 35VDC TA	56289	150D275X903582
A15C3	0140-0196	3		CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	D15F151J0300HV1CR
A15C4	0180-0117	2		CAPACITOR-FXD 2.7UF+-10% 35VDC TA	56289	150D275X903582
A15C5	0180-0117	2		CAPACITOR-FXD 2.7UF+-10% 35VDC TA	56289	150D275X903582
A15C6	0180-0097	7		CAPACITOR-FXD 47UF+-10% 35VDC TA	56289	150D476X903582
A15C7	0180-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0180-0127
A15C8	0180-0113	8		CAPACITOR-FXD 100UF+20-15% 30VDC TA	06001	69F355G7
A15C9	0180-0113	8		CAPACITOR-FXD 100UF+20-15% 30VDC TA	06001	69F355G7
A15C10	0180-0113	8		CAPACITOR-FXD 100UF+20-15% 30VDC TA	06001	69F355G7
A15C11	0180-1704	5	1	CAPACITOR-FXD 47UF+-10% 6VDC TA	56289	150D476X900682

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A15CR1	1901-0200	5	6	DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A15CR2	1901-0200	5		DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A15CR3	1901-0200	5		DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A15CR4	1901-0200	5		DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A15CR5	1902-0787	5	1	DIODE-ZNR 1N938 9V 5% DO-7 PD=.5W	28480	1902-0787
A15CR6	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A15CR7	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A15CR8	1901-0025	2		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
A15CR9A				PART OF A15CR9A		
A15CR9A	1902-0247	2	1	DIODE-ZNR 20V 1% DO-7 PD=.4W TC=+.005X	28480	1902-0247
A15L1	9140-0137	1		COIL-MLD 1MH 5% Q=60 .19DX.44LG-NOM	28480	9140-0137
A15L2	9140-0179	1	1	COIL-MLD 22UH 10% Q=75 .155DX.375LG-NOM	28480	9140-0179
A15Q1	1854-0039	7		TRANSISTOR NPN 2N3053B SI TO-39 PD=1W	01928	2N3053B
A15Q2	1854-0003	5		TRANSISTOR NPN SI TO-39 PD=600MW	28480	1854-0003
A15Q3	1853-0001	1		TRANSISTOR PNP SI TO-39 PD=600MW	28480	1853-0001
A15Q4	1855-0081	1	1	TRANSISTOR J-FET N-CHAN D-MODE SI	01295	2N5245
A15Q5A	1854-0221	9	2	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A15Q5B				PART OF A15Q5A		
A15Q6A	1854-0221	9		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0221
A15Q6B				PART OF A15Q6A		
A15Q7	1853-0006	6	1	TRANSISTOR PNP 2N3134 SI TO-5 PD=600MW	04713	2N3134
A15Q8	1854-0039	7		TRANSISTOR NPN 2N3053B SI TO-39 PD=1W	01928	2N3053B
A15Q9	1854-0039	7		TRANSISTOR NPN 2N3053B SI TO-39 PD=1W	01928	2N3053B
A15Q10	1853-0024	8	1	TRANSISTOR PNP 2N4234 SI TO-5 PD=1W	04713	2N4234
A15R1	0757-0926	4		RESISTOR 1.2K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1201-G
A15R2	0811-1661	2	1	RESISTOR .39 5% 2W PW TC=0+-800	75042	BWM2=39/100-J
A15R3	0757-0968	2		RESISTOR 5K 2% .125W F TC=0+-100	24546	C4=1/8-T0=5602-G
A15R4	0811-2593	1	1	RESISTOR 9K 1% .125W PWH TC=0+-10	20940	135=1/8-D=9001-F
A15R5	0757-0973	1	1	RESISTOR 110K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1102-G
A15R6	0811-2592	0	1	RESISTOR 11K 1% .125W PWH TC=0+-10	28480	0811-2592
A15R7	0811-2591	9	1	RESISTOR 925 1% .125W PWH TC=0+-10	20940	135=1/8-D=925R-F
A15R8	0811-2590	8	1	RESISTOR 1.333K 1% .125W PWH TC=0+-5	20940	135=1/8-C=1333R-F
A15R9	0757-0956	0	1	RESISTOR 22K 2% .125W F TC=0+-100	24546	C4=1/8-T0=2202-G
A15R10						
A15R11	0811-2588	4	1	RESISTOR 725 1% .125W PWH TC=0+-2.5	20940	135=1/6-A=725R-B
A15R12	0811-2589	5	1	RESISTOR 333 1% .125W PWH TC=0+-5	20940	135=1/8-C=333R-F
A15R13	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A15R14	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4=1/8-T0=10R0-F
A15R15	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	24546	C4=1/8-T0=10R0-F
A15R16	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4=1/8-T0=101-G
A15R17	2100-1774	3	1	RESISTOR-TRMR 2K 5% WW TOP-ADJ 1-TRN	28480	2100-1774
A15T1	9100-2478	3	1	TRANSFORMER XFMR,1KHZ,10VCT-12VCT	28480	9100-2478
A16				FOR CALL-OUTS OF COMP., SEE TABLE 6-4.		
A17	05065-6014	2	1	BOARD ASSEMBLY, TERMINAL	28480	05065-6014
A17R1	0757-0485	0	2	RESISTOR 681K 1% .125W F TC=0+-100	28480	0757-0485
A17R2	0757-0482	7	1	RESISTOR 511K 1% .125W F TC=0+-100	28480	0757-0482
A17R3	0757-0952	6		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1502-G
A17R4	0757-0485	0		RESISTOR 681K 1% .125W F TC=0+-100	28480	0757-0485
A17R5	0757-0475	8	1	RESISTOR 274K 1% .125W F TC=0+-100	24546	C4=1/8-T0=2743-F
A17R6	0698-3453	2	1	RESISTOR 196K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1963-F
A17R7	0757-0965	1		RESISTOR 51K 2% .125W F TC=0+-100	24546	C4=1/8-T0=5102-G
A17R8	0757-0972	0		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A17R9	0757-0955	9		RESISTOR 20K 2% .125W F TC=0+-100	24546	C4=1/8-T0=2002-G
A17R10	0757-0470	3	1	RESISTOR 162K 1% .125W F TC=0+-100	24546	C4=1/8-T0=1623-F
A17R11	0757-0962	8		RESISTOR 39K 2% .125W F TC=0+-100	24546	C4=1/8-T0=3902-G
A17R12	0757-0960	6		RESISTOR 33K 2% .125W F TC=0+-100	24546	C4=1/8-T0=3302-G
A18	05065-6057	2	1	JUMPER BOARD ASSEMBLY	28480	05065-6057
A18CR1	1901-0200	5		DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A18CR2	1901-0200	5		DIODE-PWR RECT 100V 1.5A	28480	1901-0200
				A18 MISCELLANEOUS PARTS		
	05065-6066	1	1	KIT, ACCESSORY	28480	05065-6066
	1250-0813	5	1	ADAPTER-COAX STR M=8MB M=8MB	28480	1250-0813
	1251-0126	5	1	CONNECTOR 5-PIN F CIRC STANDARD	28480	1251-0126
	8710-0033	4	1	ALIGNMENT TOOL	28480	8710-0033
	05060-6116	3	1	CABLE ASSEMBLY, TEST	28480	05060-6116
	05061-6073	2	1	BOARD ASSEMBLY, EXTENDER	28480	05061-6073
	05065-6064	7	1	BOARD ASSEMBLY, EXTENDER 15-PIN	28480	05065-6064
	05065-6065	9	1	BOARD ASSEMBLY, EXTENDER 15-PIN	28480	05065-6065

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
CHASSIS PARTS						
C1	0180-0204	8	2	CAPACITOR-FXD 2800UF+100-10X 40VDC AL	28480	0180-0204
C2	0180-0204	8		CAPACITOR-FXD 2800UF+100-10X 40VDC AL	28480	0180-0204
C3				NOT ASSIGNED		
C4	0180-0056	8	1	CAPACITOR-FXD 1000UF+100-10X 50VDC AL	28480	0180-0056
C5A	0160-3611	5	1	CAPACITOR-FXD 7200PF/7200PF +-10X	28480	0160-3611
C5B			1	PART OF C5A		
C6	0160-2218	6	1	CAPACITOR-FXD 1000PF +-5X 300VDC MICA	28480	0160-2218
	1520-0001	6	1	PLATE-MOUNTING FOR TWIST LOCK TYPE CAP	28480	1520-0001
C7	0170-0064	7	1	CAPACITOR-FXD .47UF +-10X 100VDC POLYE	84411	6630W47491W
CR1	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2N8 00-35	28480	1901-0040
CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2N8 00-35	28480	1901-0040
CR3	1901-0327	7	1	DIODE-PWR RECT 200V 1A 6U8	03508	A14B
DB1	2140-0025	9	2	LAMP-INCAND 327 28VDC 40MA T-1-3/4-BULB	28480	2140-0025
	1450-0705	8	1	LAMPHOLDER GRN-TP .332-DIA MINTR-FLG-SKT	28480	1450-0705
DB2	2140-0025	9		LAMP-INCAND 327 28VDC 40MA T-1-3/4-BULB	28480	2140-0025
	1450-0114	3	1	LAMPHOLDER AMB-TP .332-DIA	28480	1450-0114
F1	2110-0564	8	2	FUSEHOLDER BODY 12A MAX FOR UL	H9027	031.1657
	2110-0569	3	2		28480	2110-0569
	00310-48801	0	2	SHOULDER WASHER FOR FUSEHOLDERS	28480	00310-48801
F2	2110-0564	8		FUSEHOLDER BODY 12A MAX FOR UL	H9027	031.1657
	2110-0565	9		FUSEHOLDER CAP 12A MAX FOR UL	28480	2110-0565
	2110-0565	9	2	FUSEHOLDER CAP 12A MAX FOR UL	28480	2110-0565
	2110-0569	3			28480	2110-0569
	00310-48801	0		SHOULDER WASHER FOR FUSEHOLDERS	28480	00310-48801
J1	1250-0140	1	5	CONNECTOR-RF BNC FEM 8GL-HOLE-RR 50-OHM	28480	1250-0140
J2	1250-0140	1		CONNECTOR-RF BNC FEM 8GL-HOLE-RR 50-OHM	28480	1250-0140
J3	1250-0140	1		CONNECTOR-RF BNC FEM 8GL-HOLE-RR 50-OHM	28480	1250-0140
J4	1250-0140	1		CONNECTOR-RF BNC FEM 8GL-HOLE-RR 50-OHM	28480	1250-0140
J5	1250-0140	1		CONNECTOR-RF BNC FEM 8GL-HOLE-RR 50-OHM	28480	1250-0140
J6				NOT ASSIGNED		
J7				NOT ASSIGNED		
J8	1251-2458	0	1	CONNECTOR 3-PIN M CIRC STANDARD	28480	1251-2458
J9	1251-0111	8	1	CONNECTOR 5-PIN M CIRC STANDARD	28480	1251-0111
J10	1250-0102	5	4	CONNECTOR-RF BNC FEM 8GL-HOLE-FR 50-OHM	28480	1250-0102
J11	1250-0102	5		CONNECTOR-RF BNC FEM 8GL-HOLE-FR 50-OHM	28480	1250-0102
J12	1250-0102	5		CONNECTOR-RF BNC FEM 8GL-HOLE-FR 50-OHM	28480	1250-0102
J13				PART OF OPTION 001		
J14	1250-0102	5		CONNECTOR-RF BNC FEM 8GL-HOLE-FR 50-OHM	28480	1250-0102
L1	9100-0337	9	1	TRANSFORMER-AUDIO 1 V; 120 CPS; 50 MH	28480	9100-0337
M1	1120-1472	9	1	METER 1.75-IN; 100 UA FSD; PVT & JEWEL	28480	1120-1472
Q1	1854-0020	6	1	TRANSISTOR NPN SI TO-8 PD=25W	28480	1854-0020
Q2	1854-0300	5	3	TRANSISTOR NPN SI PD=25W FT=4MHZ	28480	1854-0300
Q3	1854-0300	5		TRANSISTOR NPN SI PD=25W FT=4MHZ	28480	1854-0300
Q4	1854-0300	5		TRANSISTOR NPN SI PD=25W FT=4MHZ	28480	1854-0300
R1*	0757-0952	6	1	RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
R2	2100-2425	3	1	RESISTOR-VAR PREC HW 5-TRN 20K 3X	28480	2100-2425
R3	1140-0014	5	1	URNS DIAL 15 TURNS (MOD. 2606)	28480	1140-0014
R4	0757-0948	0	1	RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
R5	0757-0972	0	1	RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
R6	2100-2575	4	1	RESISTOR-VAR PREC HW 10-TRN 1K 5X	28480	2100-2575
R7	0757-0959	3	1	RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
S1	3101-1234	3	1	SWITCH-8L DPDT STD 1.5A 250VAC SLDR-LUG	28480	3101-1234
S2	3101-1155	7	1	SWITCH-TGL SUBMIN SPDT 5A 115VAC	28480	3101-1155
S3	3101-0052	1	1	SWITCH-PB SPST-NO MOM .25A 30VAC BLK-BTN	82389	961
S4	3100-0893	6	1	SWITCH-ROTARY 0.812 STRUT CTR SPCG; 12	28480	3100-0893
	0370-0077	6	1	KNOB 3HRTD BARI-BLKIFOR .2508HFT1.625D	28480	0370-0077
S5	3100-2910	2	1	SWITCH-ROTARY 0.812 STRUT CTR SPCG; 2	28480	3100-2910
T1	9100-2742	4	1	TRANSFORMER-POWER 115/230V 50-1000MHZ	28480	9100-2742
W1	05065-6032	0	1	CABLE ASSEMBLY, A3 TO A1	28480	05065-6032
	1250-0921	6	12	CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9	19	CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
W2	05065-6033	2	1	CABLE ASSEMBLY, A3 TO A10	28480	05065-6033
	1250-0921	6		CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9		CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
W3	05065-6034	4	1	CABLE ASSEMBLY, A3 TO A13	28480	05065-6034
	1250-0921	6		CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9		CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
W4	05065-6075	0	1	CABLE ASSEMBLY, A3 TO A3	28480	05065-6075
	1250-0921	6		CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9		CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
W5	05065-6036	8	1	CABLE ASSEMBLY, A13 TO A1 CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	05065-6036
	1250-0921	6			28480	1250-0921
	8120-0229	9			28480	8120-0229
W6	05065-6037	0	1	CABLE ASSEMBLY, REAR PANEL TO A13 NUT-RF CONNECTOR BNC1,562 L1,062ID	28480	05065-6037
	1250-0050	2			02660	31-2125-2
	1250-0051	3			02660	31-2109
	8120-0229	9			28480	8120-0229
W7	05065-6038	2	1	CABLE ASSEMBLY, REAR PANEL TO A6 NUT-RF CONNECTOR BNC1,562 L1,062ID	28480	05065-6038
	1250-0050	2			02660	31-2125-2
	1250-0051	3			02660	31-2109
	8120-0229	9			28480	8120-0229
W8	05065-6039	4	1	CABLE ASSEMBLY, REAR PANEL TO A4 NUT-RF CONNECTOR BNC1,562 L1,062ID	28480	05065-6039
	1250-0050	2			02660	31-2125-2
	1250-0051	3			02660	31-2109
	8120-0229	9			28480	8120-0229
W10	05065-6040	7	1	CABLE ASSEMBLY, FRONT PANEL TO A4 NUT-RF CONNECTOR BNC1,562 L1,062ID	28480	05065-6040
	1250-0050	2			02660	31-2125-2
	1250-0051	3			02660	31-2109
	8120-0229	9			28480	8120-0229
W11	05065-6041	9	1	CABLE ASSEMBLY, FRONT PANEL TO W11 NUT-RF CONNECTOR BNC1,562 L1,062ID	28480	05065-6041
	1250-0050	2			02660	31-2125-2
	8120-0229	9			28480	8120-0229
	05065-6042	1			28480	05065-6042
W12	1250-0921	6	1	CABLE ASSEMBLY, A10 TO A6 CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9			28480	8120-0229
	05065-6043	3			28480	05065-6043
W13	1250-0921	6	1	CABLE ASSEMBLY, A10 TO A9 CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9			28480	8120-0229
	05065-6044	5			28480	05065-6044
	1250-0921	6			28480	1250-0921
W14	8120-0229	9	1	CABLE ASSEMBLY, A10 TO A10 (+EPC) CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	8120-0229
	05065-6045	7			28480	05065-6045
	1250-0921	6			28480	1250-0921
	8120-0229	9			28480	8120-0229
W15	05065-6045	7	1	CABLE ASSEMBLY, A3 TO A8 CONNECTOR-RF 8MB FEM UNMTD 50-OHM	28480	05065-6045
	1250-0921	6			28480	1250-0921
	8120-0229	9			28480	8120-0229
	05065-6046	2			28480	05065-6046
W16	1250-0050	9	1	CABLE ASSEMBLY, REAR PANEL TO A13 NUT-RF CONNECTOR BNC1,562 L1,062ID	02660	31-2125-2
	1250-0051	3			02660	31-2109
	1250-0921	6			28480	1250-0921
	8120-0229	9			28480	8120-0229
W17	05065-6047	1	1	CABLE ASSEMBLY, FRONT PANEL TO A13 NUT-RF CONNECTOR BNC1,562 L1,062ID	28480	05065-6047
	1250-0050	2			02660	31-2125-2
	1250-0051	3			02660	31-2109
	1250-0921	6			28480	1250-0921
W18	8120-0229	9	1	CONNECTOR-RF 8MB FEM UNMTD 50-OHM CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
	05065-6048	3			28480	05065-6048
	1250-0050	2			02660	31-2125-2
	1250-0051	3			02660	31-2109
W19	1250-0921	6	1	CONNECTOR-RF 8MB FEM UNMTD 50-OHM CABLE-COAX 50-OHM 29PF/FT	28480	1250-0921
	8120-0229	9			28480	8120-0229
	05065-6049	5			28480	05065-6049
	8120-0229	9			28480	8120-0229
W20	05065-6050	8	1	SAME AS W19, USE PREFIX W20 CABLE ASSEMBLY, A9 TO 85	28480	05065-6050
	8120-0229	9			28480	8120-0229
XA1	1251-0160	7	8	NOT ASSIGNED	28480	1251-0160
				CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW		
				NOT ASSIGNED		
				CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW		
				NOT ASSIGNED		
XA6	1251-0160	7	7	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-0160
				NOT ASSIGNED		
				CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW		
				CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW		
				NOT ASSIGNED		
XA11	1251-0160	7	7	CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW	28480	1251-0160
				NOT ASSIGNED		
				NOT ASSIGNED		
				CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW		
				CONNECTOR-PC EDGE 15-CONT/ROW 1-ROW		
Miscellaneous Parts	1251-0159	4	1	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	28480	1251-0159
	1251-0214	2	1	CONNECTOR 9-PIN F D SERIES	28480	1251-0214
	5020-0176	0	1	INSULATOR FOR SNAP-ON PINS	28480	5020-0176
	5060-0766	8	1	HANDLE ASSY:RETAINER(LIGHT GRAY)	28480	5060-0766
	05061-6091	0	1	CABLE ASSEMBLY, POWER	28480	05061-6091

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-2. Replaceable Parts (Continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	05060-2083	8	1	COVER, FIELD DIAL	28480	05060-2083
	05065-0016	0	1	DECK, R.V.F.R.	28480	05065-0016
	05065-0018	4	1	DECK, MAIN	28480	05065-0018
	05065-0017	2	1	DECK, OSCILLATOR	28480	05065-0017
	05065-0027	3	1	CLAMP, R.V.F.R.	28480	05065-0027
	05065-0041	3	1	PAD, CLAMP	28480	05065-0041
	05065-2018	6	1	DOOR, FRONT	28480	05065-2018
				CABINET PARTS		
1	5060-0732	8	1	SIDE FRAME ASSY	28480	5060-0732
2	05061-2041	1	1	COVER, TOP	28480	05061-2041
3	05065-2048	9	1	COVER, BOTTOM	28480	05065-2048
4	05065-0008	3	1	PANEL, FRONT	28480	05065-0008
5	05065-0009	5	1	PANEL, REAR	28480	05065-0009
6	05065-2017	4	1	PLATE, LEFT PANEL	28480	05065-2017
7	5060-0766	8	2	HANDLE ASSY/RETAINER(LIGHT GRAY)	28480	5060-0766
8	5060-0222	1	1	HANDLE ASSY/ISH SIDE	28480	5060-0222
9	5060-0767	9	1	FOOT ASSY/IFM	28480	5060-0767
10	5000-0051	8	1	TRIM STRIP	28480	5000-0051
11	5060-0775	9	1	KIT/RACK MOUNT, 5H(LIGHT GRAY)	28480	5060-0775
A12	05065-6001	5	1	RUBIDIUM VAPOR FREQUENCY REFERENCE FACTORY REPAIR ONLY. FOR REPLACEMENT ORDER HP PART NO. 05065-6071 REPLACEMENT R.V.F.R. KIT.	28480	05065-6001
	05065-6074	6	1	CABLE ASSEMBLY TO HARMONIC GENERATOR CABLE ASSEMBLY, HARMONIC GENERATOR TO MULTI. & SOLAR CELL TO SIGNAL AMPL. CABLE ASSEMBLY TO DECK	28480	05065-6074
	05065-6051	0	1		28480	05065-6051
A12C1	0160-2049	1	1	CAPACITOR-PDTHRU 5000PF +80 -20% 500V	33095	54-743-009-XSV0-5022
A12A1	05065-6004	1	1	BOARD ASSEMBLY, LAMP OSCILLATOR PART OF A12A1 LAMP ASSEMBLY	28480	05065-6004
A12A1C1	0150-0093	0	1	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A12A1C2	0140-0194	1	1	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300HV1CR
A12A1C3	0160-2258	4	1	CAPACITOR-FXD 11PF +-5% 500VDC CER 0+-30	28480	0160-2258
A12A1C4	0160-2247	1	1	CAPACITOR-FXD 3.9PF +--.25PF 500VDC CER	28480	0160-2247
A12A1CR1	1901-0460	9	1	DIODE-STABILISITOR 30V 150MA DO-7	28480	1901-0460
A12A1L2	9140-0112	2	2	COIL-MLD 4.7UH 10% Q=33 .155DX.375LG-NOM	28480	9140-0112
A12A1L3	9140-0112	2	2	COIL-MLD 4.7UH 10% Q=33 .155DX.375LG-NOM	28480	9140-0112
A12A1Q1	1854-0308	3	1	TRANSISTOR NPN 2N3553 SI TO-39 PD=1W	0192B	2N3553
A12A1R1	0698-3406	5	1	RESISTOR 1.33K 1% .5W F TC=0+-100	28480	0698-3406
A12A1R2	0757-0931	1	1	RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
A12A1R3	0757-0346	2	1	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A12A2	05065-6005	3	1	TUNER ASSEMBLY, CAVITY	28480	05065-6005
	05065-8005	5	1	LAMP AND COIL ASSEMBLY PART OF A12A2 LAMP & COIL ASSEMBLY	28480	05065-8005
	05065-2010	0	1	SUPPORT, LAMP	28480	05065-2010
A12A2D81	05065-8002	9	1	LAMP	28480	05065-8002
A12A3	05065-6002	7	1	OVEN ASSEMBLY NOT RECOMMENDED FOR FIELD REPAIR	28480	05065-6002

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-3. Option 002 and 003 Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2	05065-6022	9	1	OPTION 002 & 003 BOARD ASSEMBLY, CHARGER	28480	05065-6022
A2C1	0150-0052	1	1	CAPACITOR-FXD .05UF +/-20% 400VDC CER	28480	0150-0052
A2C2	0180-0049	9	2	CAPACITOR-FXD 20UF+75-10% 50VDC AL	56289	30D2066050CC2
A2C3	0180-0049	9	2	CAPACITOR-FXD 20UF+75-10% 50VDC AL	56289	30D2066050CC2
A2C4	0180-0097	7	1	CAPACITOR-FXD 47UF+/-10% 35VDC TA	56289	150D476X903582
A2C5	0150-0121	5	1	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A2CR1	1901-0028	5	5	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR2	1901-0028	5	5	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR3	1901-0028	5	5	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR4	1901-0028	5	5	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR5	1901-0028	5	5	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A2CR6	1902-3070	5	1	DIODE-ZNR 4.22V 5X DO-7 PD=.4W TC=-.038X	28480	1902-3070
A2CR7	1902-3290	1	1	DIODE-ZNR 31.6V 5X DO-7 PD=.4W TC=+.074X	28480	1902-3290
A2CR8	1884-0003	8	1	THYRISTOR-8C8 3N58 TO-72 VRRM=40	03508	3N58
A2CR9	1902-3172	8	1	DIODE-ZNR 11V 2X DO-7 PD=.4W TC=+.062X	28480	1902-3172
A2CR10				DELETED		
A2CR11	1902-3224	1	1	DIODE-ZNR 17.8V 5X DO-7 PD=.4W TC=+.067X	28480	1902-3224
A2CR12				DELETED		
A2CR13	1901-0200	5	1	DIODE-PWR RECT 100V 1.5A	28480	1901-0200
A2CR14				DELETED		
A2CR15	1902-3104	6	1	DIODE-ZNR 5.62V 5X DO-7 PD=.4W TC=+.016X	28480	1902-3104
A2CR16	1902-3203	6	1	DIODE-ZNR 14.7V 5X DO-7 PD=.4W TC=+.057X	28480	1902-3203
A2K1	0490-0475	2	1	RELAY 2C 24VDC-COIL 2A 28VDC	28480	0490-0475
A2Q1	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q2	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q3	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q4	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q5	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q6	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q7	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q8	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q9	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q10	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q11	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2Q12	1853-0001	1	1	TRANSISTOR PNP SI TO-39 PD=600MW	28480	1853-0001
A2Q13	1853-0024	8	1	TRANSISTOR PNP 2N4234 SI TO-5 PD=1W	04713	2N4234
A2Q14	1854-0020	6	1	TRANSISTOR NPN SI TO-8 PD=25W	28480	1854-0020
A2Q15	1854-0003	5	12	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A2R1	0757-0930	0	1	RESISTOR 1.8K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1801-G
A2R2	0757-0955	9	3	RESISTOR 20K 2X .125W F TC=0+-100	24546	C4=1/8-T0=2002-G
A2R3	0757-0907	1	2	RESISTOR 200 2X .125W F TC=0+-100	24546	C4=1/8-T0=201-G
A2R4	0757-0955	9	3	RESISTOR 20K 2X .125W F TC=0+-100	24546	C4=1/8-T0=2002-G
A2R5	0757-0972	0	2	RESISTOR 100K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R6	0757-0911	7	1	RESISTOR 300 2X .125W F TC=0+-100	24546	C4=1/8-T0=301-G
A2R7	0757-0929	7	1	RESISTOR 1.6K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1601-G
A2R8	0757-0955	9	3	RESISTOR 20K 2X .125W F TC=0+-100	24546	C4=1/8-T0=2002-G
A2R9	0757-0900	4	1	RESISTOR 100 2X .125W F TC=0+-100	24546	C4=1/8-T0=101-G
A2R10	0757-0948	0	7	RESISTOR 10K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R11	0757-0948	0	7	RESISTOR 10K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R12	0727-0004	6	1	RESISTOR 5 1X .5W CF TC=0=500	28480	0727-0004
A2R13	0685-0365	8	1	RESISTOR 3.6 5X .25W FC TC=400/+500	01121	C83665
A2R14	0757-0948	0	7	RESISTOR 10K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R15*			1			
A2R16	0757-0948	0	7	RESISTOR 10K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R18	0757-0926	4	1	RESISTOR 1.2K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1201-G
A2R19	0757-0931	1	1	RESISTOR 2K 2X .125W F TC=0+-100	24546	C4=1/8-T0=2001-G
A2R20	0757-0948	0	7	RESISTOR 10K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R21	0757-0948	0	7	RESISTOR 10K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R22	0757-0907	1	1	RESISTOR 200 2X .125W F TC=0+-100	24546	C4=1/8-T0=201-G
A2R23	0757-0288	1	1	RESISTOR 9.09K 1X .125W F TC=0+-100	19701	MF4C1/8-T0=9091-F
A2R24	0757-0924	2	1	RESISTOR 1K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1001-G
A2R25	0757-0447	4	1	RESISTOR 16.2K 1X .125W F TC=0+-100	24546	C4=1/8-T0=1622-G
A2R26	0757-0443	0	1	RESISTOR 11K 1X .125W F TC=0+-100	24546	C4=1/8-T0=1102-F
A2R27	0757-0948	0	7	RESISTOR 10K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R28	0757-0941	3	2	RESISTOR 5.1K 2X .125W F TC=0+-100	24546	C4=1/8-T0=5101-G
A2R29	0757-0941	3	2	RESISTOR 5.1K 2X .125W F TC=0+-100	24546	C4=1/8-T0=5101-G
A2R30	0757-0972	0	7	RESISTOR 100K 2X .125W F TC=0+-100	24546	C4=1/8-T0=1002-G
A2R31	0757-0934	4	1	RESISTOR 2.7K 2X .125W F TC=0+-100	24546	C4=1/8-T0=2701-G
A2XF1	2110-0564	8	1	FUSEHOLDER BODY 12A MAX FOR UL	H9027	031.1657
	2110-0565	9	1	FUSEHOLDER CAP 12A MAX FOR UL	28480	2110-0565
	2110-0569	3	1		28480	2110-0569

See introduction to this section for ordering information  
\*Indicates factory selected value



Table 6-3. Option 002 and 003 Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	05065-0026	1	1	HOLDER, BATTERY	28480	05065-0026
071	05065-6062	3	1	CABLE ASSEMBLY, BATTERY	28480	05065-6062
083	2140-0025	9	1	LAMP-INCAND 327 28VDC 40MA T-1-3/4-BULB	28480	2140-0025
	1420-0066	1	1	BATTERY 25,2V 1.25A-HR NI-CD W-FLEX	28480	1420-0066
86	3101-1164	8	1	SWITCH-TGL SUBMIN DPDT 5A 115VAC	28480	3101-1164
	1430-0114	3	1	LAMPHOLDER AMB-TP .332-DIA	28480	1430-0114

See introduction to this section for ordering information  
 \*Indicates factory selected value

Table 6-4. Option 001 Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A5	05065-6084	9	1	FOR OPTION 001 ONLY MODULE ASSEMBLY, DIGITAL DIVIDER (SERIES 1904)	28480	05065-6084
A5J4	1250-0102	5	1	CONNECTOR-RF BNC FEM 8GL-HOLE-FR 50-OHM	28480	1250-0102
A5B2	3101-1159	1	1	SWITCH-PB SPDT MOM .25A BLK-8TN	62389	963
A5W22	05065-6055	8	1	CABLE ASSEMBLY, 1 PPS	28480	05065-6055
	1250-0051	3	2	CONTACT-RF CONN SERIES BNC: FEMALE	02660	31-2109
	1250-0921	6	3	CONNECTOR-RF SMB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9	5	CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
A5W23	05065-6056	0	1	CABLE ASSEMBLY, CLOCK MOVEMENT	28480	05065-6056
	8120-0101	6	1	CABLE-SHLD 26AWG 3-CNDCT JGK-JKY	28480	8120-0101
	5020-0176	0	1	INSULATOR FOR SNAP-ON PINS	28480	5020-0176
A5W24	05065-6053	4	1	CABLE ASSEMBLY, DIGITAL DIVIDER	28480	05065-6053
	1250-0050	2	1	NUT-RF CONNECTOR BNC: 1.562 L1.062ID	02660	31-2125-2
	1250-0051	3	3	CONTACT-RF CONN SERIES BNC: FEMALE	02660	31-2109
	1250-0259	3	4	CONNECTOR-RF SMB FEM UNMTD 50-OHM	28480	1250-0259
	1250-0260	6	4	CONT-RF CONN SUBMIN SERIES	28480	1250-0260
	1250-0261	7	4	INSULATOR-RF CONN SUBMIN: .040 ID	28480	1250-0261
	1250-0263	9	4	WASHER-RF CONN SUBMIN: .104 ID	28480	1250-0263
	1250-0264	0	4	WASHER-RF CONN SUBMIN: 112 ID	28480	1250-0264
	1250-0265	1	4	NUT-RF CONN SUBMIN: FOR 50 OHM	28480	1250-0265
	8120-0229	9	9	CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
A5W25	05065-6052	2	1	CABLE ASSEMBLY, DIGITAL DIVIDER	28480	05065-6052
	1250-0259	3	3	CONNECTOR-RF SMB FEM UNMTD 50-OHM	28480	1250-0259
	1250-0260	6	2	CONT-RF CONN SUBMIN SERIES	28480	1250-0260
	1250-0261	7	2	INSULATOR-RF CONN SUBMIN: .040 ID	28480	1250-0261
	1250-0262	8	2	FERRULE-RF CONN SUBMIN: .065 ID	28480	1250-0262
	1250-0263	9	2	WASHER-RF CONN SUBMIN: .104 ID	28480	1250-0263
	1250-0264	0	2	WASHER-RF CONN SUBMIN: 112 ID	28480	1250-0264
	1250-0265	1	2	NUT-RF CONN SUBMIN: FOR 50 OHM	28480	1250-0265
	8120-0229	9	9	CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
A5W26	05065-6054	6	1	CABLE ASSEMBLY, DIGITAL DIVIDER	28480	05065-6054
	1250-0259	3	3	CONNECTOR-RF SMB FEM UNMTD 50-OHM	28480	1250-0259
	1250-0260	6	2	CONT-RF CONN SUBMIN SERIES	28480	1250-0260
	1250-0261	7	2	INSULATOR-RF CONN SUBMIN: .040 ID	28480	1250-0261
	1250-0263	9	2	WASHER-RF CONN SUBMIN: .104 ID	28480	1250-0263
	1250-0264	0	2	WASHER-RF CONN SUBMIN: 112 ID	28480	1250-0264
	1250-0265	1	2	NUT-RF CONN SUBMIN: FOR 50 OHM	28480	1250-0265
	1250-0921	6	6	CONNECTOR-RF SMB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9	9	CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
A5W27	05065-6063	5	1	CABLE ASSEMBLY, DIGITAL DIVIDER	28480	05065-6063
	1250-0259	3	3	CONNECTOR-RF SMB FEM UNMTD 50-OHM	28480	1250-0259
	1250-0260	6	2	CONT-RF CONN SUBMIN SERIES	28480	1250-0260
	1250-0261	7	2	INSULATOR-RF CONN SUBMIN: .040 ID	28480	1250-0261
	1250-0262	8	2	FERRULE-RF CONN SUBMIN: .065 ID	28480	1250-0262
	1250-0263	9	2	WASHER-RF CONN SUBMIN: .104 ID	28480	1250-0263
	1250-0264	0	2	WASHER-RF CONN SUBMIN: 112 ID	28480	1250-0264
	1250-0265	1	2	NUT-RF CONN SUBMIN: FOR 50 OHM	28480	1250-0265
	1250-0921	6	6	CONNECTOR-RF SMB FEM UNMTD 50-OHM	28480	1250-0921
	8120-0229	9	9	CABLE-COAX 50-OHM 29PF/FT	28480	8120-0229
A5 MISCELLANEOUS PARTS						
	05061-0022	9	1	PANEL, CENTER	28480	05061-0022
	05061-0013	0	1	BRACKET, DIGITAL DIVIDER	28480	05061-0013
	05065-0028	5	1	BRACKET, SWITCH MOUNTING	28480	05065-0028
	05065-0048	7	1	CHASSIS, DIGITAL DIVIDER	28480	05065-0048
	05065-0038	6	1	COVER, DIGITAL DIVIDER	28480	05065-0038
	05065-2006	1	1	PLATE, END, DIGITAL DIVIDER	28480	05065-2006
A5A1	05065-6027	9	1	BOARD ASSEMBLY, ADAPTER	28480	05065-6027
	05065-6026	7	1	BOARD ASSEMBLY, INTERCONNECTING	28480	05065-6026
A5A1J1	1250-0257	1	4	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A5A1J2	1250-0257	1	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A5A1J3	1250-0257	1	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A5A1J4	1250-0257	1	1	CONNECTOR-RF SMB M PC 50-OHM	28480	1250-0257
A5A2	05061-6014	8	1	BOARD ASSEMBLY, MAST CLOCK (SERIES 1840)	28480	05061-6014
A5A2C1	0150-0121	5	2	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A5A2C2	0150-0093	0	2	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A5A2C3	0160-0127	2	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A5A2C4	0140-0180	5	1	CAPACITOR-FXD 2000PF +-2% 300VDC MICA	72136	DM19F2020G0300WVICR
A5A2C5	0150-0121	5	1	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0150-0121
A5A2C6	0140-0234	0	2	CAPACITOR-FXD 500PF +-1% 300VDC MICA	72136	DM15F501F0300WVIC
A5A2C7	0160-0196	5	1	CAPACITOR-FXD 24PF +-5% 300VDC MICA	28480	0160-0196
A5A2C8	0140-0234	0	1	CAPACITOR-FXD 500PF +-1% 300VDC MICA	72136	DM15F501F0300WVIC
A5A2C9	0121-0105	4	1	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	52763	304324 9/35PF N650
A5A2C10	0140-0208	8	1	CAPACITOR-FXD 680PF +-5% 300VDC MICA	72136	DM15F681J0300WVICR

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-4. Option 001 Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
ASA2C11	0150-0093	0		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
ASA2C12	0140-0202	2	1	CAPACITOR-FXD 15PF +-5% 500VDC MICA	72136	DM15C150J0500MV1CR
ASA2C13	0160-2197	0	1	CAPACITOR-FXD 10PF +-5% 300VDC MICA	28480	0160-2197
ASA2CR1	1901-0040	1	6	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
ASA2CR2	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
ASA2CR3	1902-0064	1	1	DIODE-ZNR 7.5V 5% DO-7 PD=.4W TC=+.05%	28480	1902-0064
ASA2CR4	1901-0028	5	4	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
ASA2CR5	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
ASA2CR6	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
ASA2CR7	1901-0028	5		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
ASA2CR8	1902-3193	3	1	DIODE-ZNR 13.3V 5% DO-7 PD=.4W TC=+.05%	28480	1902-3193
ASA2CR9	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
ASA2CR10	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
ASA2CR11	1902-0554	4	1	DIODE-ZNR 10V 5% DO-15 PD=.1W TC=+.06%	28480	1902-0554
ASA2IC1	1820-0315	1	6	IC MV DTL MONOSTBL	07263	951HC
ASA2IC2	1820-0315	1		IC MV DTL MONOSTBL	07263	951HC
ASA2IC3	1820-0315	1		IC MV DTL MONOSTBL	07263	951HC
ASA2IC4	1820-0094	3	4	IC GATE DTL NAND QUAD 2-INP	01295	8N15846N
ASA2IC5	1820-0094	3		IC GATE DTL NAND QUAD 2-INP	01295	8N15846N
ASA2IC6	1820-0329	7	12	IC CNTR TTL DECD	28480	1820-0329
ASA2IC7	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA2IC8	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA2IC9	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA2IC10	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA2IC11	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA2IC12	1820-0086	3	4	IC GATE DTL NAND DUAL 4-INP	01295	8N15830N
ASA2IC13	1820-0086	3		IC GATE DTL NAND DUAL 4-INP	01295	8N15830N
ASA2IC14	1820-0086	3		IC GATE DTL NAND DUAL 4-INP	01295	8N15830N
ASA2L2	9140-0137	1	1	COIL=MLD 1MH 5% Q=60 .19DX.44LG=NOM	28480	9140-0137
ASA2L3	9140-0154	2	1	COIL=MLD 53.8UH 1% Q=55 .156DX.375LG=NOM	28480	9140-0154
ASA2Q1	1854-0005	7	3	TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
ASA2Q2	1854-0005	7		TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
ASA2Q3	1854-0009	1	16	TRANSISTOR NPN SI PD=300MHZ FT=600MHZ	04713	2N709
ASA2Q4	1854-0009	1		TRANSISTOR NPN SI PD=300MHZ FT=600MHZ	04713	2N709
ASA2Q5	1854-0009	1		TRANSISTOR NPN SI PD=300MHZ FT=600MHZ	04713	2N709
ASA2Q6	1854-0009	1		TRANSISTOR NPN SI PD=300MHZ FT=600MHZ	04713	2N709
ASA2Q7	1854-0009	1		TRANSISTOR NPN SI PD=300MHZ FT=600MHZ	04713	2N709
ASA2R1	0757-0924	2	23	RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R2	0757-0946	8	1	RESISTOR 8.2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-8201-G
ASA2R3	0757-0948	0	9	RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA2R4	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R5	0757-0900	4	5	RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
ASA2R6	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
ASA2R7	0757-0920	8	1	RESISTOR 680 2% .125W F TC=0+-100	24546	C4-1/8-T0-681-G
ASA2R8	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
ASA2R9	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R10	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
ASA2R11	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R12	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R13	0757-0931	1	45	RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R14	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA2R15	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA2R16	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA2R17	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R18	0757-0917	3	4	RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0-511-G
ASA2R19	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R20	0757-0972	0	1	RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA2R21	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R22	0757-0938	8	2	RESISTOR 3.9K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3901-G
ASA2R23	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R24	0757-0900	4		RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
ASA2R25	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA2R26	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R27	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA2R28	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA2R29	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R30	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R31	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R32	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R33	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R34	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA2R35	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-4. Option 001 Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
ASA2R36	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R37	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R38	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R39	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R40	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R41	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R42	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R43	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R44	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R45	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2R46	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+/-100	24546	C4-1/8-T0=2001-G
ASA2T1	05061-8005	1	1	TRANSFORMER, 1 MHZ = 4 MHZ	28480	05061-8005
ASA2T2	05061-8009	9	1	TRANSFORMER, SYNC	28480	05061-8009
ASA2XY1	1200-0159	7	1	SOCKET-XTAL 2-CONT HC-6/U DIP-SLDR	28480	1200-0159
ASA2Y1	0410-0012	5	1	CRYSTAL-QUARTZ 1,00000 MHZ	28480	0410-0012
ASA3	05061-6013	6	1	BOARD ASSEMBLY, PRESET-CLOCK	28480	05061-6013
ASA3C1	0140-0196	3		CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300HV1CR
ASA3C2	0140-0191	8	1	CAPACITOR-FXD 56PF +-5% 300VDC MICA	72136	DM15E56J0300HV1CR
ASA3C3	0140-0196	3		CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300HV1CR
ASA3CR1	1910-0016	0	24	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR2	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR3	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR4	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR5	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR6	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR7	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR8	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR9	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR10	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR11	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR12	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR13	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR14	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR15	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR16	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR17	1901-0040	1		DIODE-SWITCHING 30V 50MA 2Ns DO-35	28480	1901-0040
ASA3CR18	1901-0040	1		DIODE-SWITCHING 30V 50MA 2Ns DO-35	28480	1901-0040
ASA3CR19	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR20	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR21	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR22	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR23	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR24	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR25	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3CR26	1910-0016	0		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
ASA3IC1	1820-0094	3		IC GATE DTL NAND QUAD 2-INP	01295	SN15846N
ASA3IC2	1820-0094	3		IC GATE DTL NAND QUAD 2-INP	01295	SN15846N
ASA3IC3	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA3IC4	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA3IC5	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA3IC6	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA3IC7	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA3IC8	1820-0329	7		IC CNTR TTL DECD	28480	1820-0329
ASA3IC9	1820-0080	7	4	IC GATE RTL NOR DUAL 2-INP	04713	MC810G
ASA3IC10	1820-0080	7		IC GATE RTL NOR DUAL 2-INP	04713	MC810G
ASA3IC11	1820-0080	7		IC GATE RTL NOR DUAL 2-INP	04713	MC810G
ASA3IC12	1820-0086	3		IC GATE DTL NAND DUAL 4-INP	01295	SN15830N
ASA3IC13	1820-0315	1		IC MV DTL MONOSTBL	07263	951MC
ASA3IC14				NOT ASSIGNED		
ASA3IC15	1820-0315	1		IC MV DTL MONOSTBL	07263	951MC
ASA3IC16	1820-0315	1		IC MV DTL MONOSTBL	07263	951MC
ASA3IC17	1820-0080	7		IC GATE RTL NOR DUAL 2-INP	04713	MC810G
ASA3Q1	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
ASA3Q2	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
ASA3Q3	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
ASA3Q4	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
ASA3Q5	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
ASA3Q6	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
ASA3Q7	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
ASA3Q8	1854-0018	2	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0018
ASA3Q9	1854-0009	1		TRANSISTOR NPN SI PD=300MW FT=600MHZ	04713	2N709
ASA3Q10	1854-0018	2		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0018

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-4. Option 001 Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
ASA3011	1854-0009	1		TRANSISTOR NPN SI PD=300MH FT=600MHZ	04713	2N709
ASA3012	1854-0018	2		TRANSISTOR NPN SI TO-18 PD=360MH	28480	1854-0018
ASA3013	1854-0009	1		TRANSISTOR NPN SI PD=300MH FT=600MHZ	04713	2N709
ASA3014	1854-0003	5	1	TRANSISTOR NPN SI TO-39 PD=800MH	28480	1854-0003
ASA3015	1854-0009	1		TRANSISTOR NPN SI PD=300MH FT=600MHZ	04713	2N709
ASA3R1	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R2	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R3	0757-0928	6	12	RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R4	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R5	0757-0935	5	5	RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3001-G
ASA3R6	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R7	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R8	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R9	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R10	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R11	0757-0935	5		RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3001-G
ASA3R12	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R13	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R14	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R15	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R16	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R17	0757-0935	5		RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3001-G
ASA3R18	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R19	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R20	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R21	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R22	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R23	0757-0935	5		RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3001-G
ASA3R24	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R25	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R26	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R27	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R28	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R29	0757-0935	5		RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3001-G
ASA3R30	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R31	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R32	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R33	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R34	0757-0928	6		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
ASA3R35	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R36	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R37	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R38	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R39	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R40	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R41	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R42	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0-511-G
ASA3R43	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA3R44	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R45	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R46	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA3R47	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R48	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R49	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R50	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0-511-G
ASA3R51	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R52	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R53	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R54	0757-0917	3		RESISTOR 510 2% .125W F TC=0+-100	24546	C4-1/8-T0-511-G
ASA3R55	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R56	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R57	0757-0948	0		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
ASA3R58	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R59	0757-0938	8		RESISTOR 3.9K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3901-G
ASA3R60	0757-0931	1		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
ASA3R61	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA3R62	0757-0924	2		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
ASA381	3100-2061	4	1	SWITCH-THUMBWHEEL MOD; 8CD WITH ONE	28480	3100-2061
A5A4	05061-6152	0	1	BOARD ASSEMBLY, SWITCH CIRCUIT (SERIES 1904)	28480	05061-6152
A5A4C1*	0140-0196	3	3	CAPACITOR-FXD 150PF +-5% 300VDC MICA	72136	DM15F151J0300WV1CR
A5A4Q1	1854-0005	7		TRANSISTOR NPN 2N708 SI TO-18 PD=360MH	04713	2N708
A5A4R1	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A5A4R2	0757-0283	6	1	RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A5A4R3	0757-0442	9	1	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A5A4R4	2100-0896	8	1	RESISTOR-TRMR 15K 5% WW TOP-ADJ 1-TRN	28480	2100-0896
A5A4UC1	1820-1437	0	1	IC MV TTL LS MONOSTBL DUAL	01295	SN74LS221N

See introduction to this section for ordering information  
 \*Indicates factory selected value

Table 6-5. Options 001, 003 Only Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
FOR OPTIONS 001,003 ONLY						
A16	05065-6085	1	1	MODULE ASSEMBLY, CLOCK POWER SUPPLY (SERIES 1912)	28480	05065-6085
	05065-6055	8	1	CABLE ASSEMBLY, 1 PPS	28480	05065-6055
A16J1	1250-0901	2	2	CONNECTOR-RF 8MB M 8GL-HOLE-FR 50-OHM	28480	1250-0901
A16J2	1250-0901	2	2	CONNECTOR-RF 8MB M 8GL-HOLE-FR 50-OHM	28480	1250-0901
A16J3	1250-0258	2	2	CONNECTOR-RF 8MB M 8GL-HOLE-FR 50-OHM	28480	1250-0258
A16J4	1250-0258	2	2	CONNECTOR-RF 8MB M 8GL-HOLE-FR 50-OHM	28480	1250-0258
A16 MISCELLANEOUS PARTS						
	0340-0119	4	1	TERMINAL-STUD 8GL-PIN PRESS-MTG	28480	0340-0119
	05065-0039	8	1	COVER, POWER SUPPLY	28480	05065-0039
	05065-0040	1	1	CHASSIS, POWER SUPPLY	28480	05065-0040
	05065-2039	0	1	PLATE, POWER SUPPLY	28480	05065-2039
A16A1	05065-6082	5	1	BOARD ASSEMBLY, POWER SUPPLY (NOT FOR REPLACEMENT) FOR REPLACEMENT ORDER NEXT HIGHER ASSY	28480	05065-6082
A16A1C1	0180-0113	8	1	CAPACITOR-FXD 100UF+20-15% 30VDC TA	06001	69F35507
A16A1C2	0180-0097	7	1	CAPACITOR-FXD 47UF+10% 35VDC TA	56289	150D476X903582
A16A1C3	0180-0162	5	1	CAPACITOR-FXD .022UF +10% 200VDC POLYE	28480	0160-0162
A16A1C4	0150-0096	3	2	CAPACITOR-FXD .05UF +80-20% 100VDC CER	28480	0150-0096
A16A1C5	0150-0096	3	2	CAPACITOR-FXD .05UF +80-20% 100VDC CER	28480	0150-0096
A16A1C6	0180-0098	8	3	CAPACITOR-FXD 100UF+20% 20VDC TA	56289	150D107X002082
A16A1C7	0180-0098	8	3	CAPACITOR-FXD 100UF+20% 20VDC TA	56289	150D107X002082
A16A1C8	0180-0117	2	4	CAPACITOR-FXD 2.7UF+10% 35VDC TA	56289	150D275X903582
A16A1C9	0180-0117	2	4	CAPACITOR-FXD 2.7UF+10% 35VDC TA	56289	150D275X903582
A16A1C10	0150-0093	0	2	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A16A1C11	0180-0117	2	2	CAPACITOR-FXD 2.7UF+10% 35VDC TA	56289	150D275X903582
A16A1C12	0140-0203	3	1	CAPACITOR-FXD 30PF +-5% 500VDC MICA	72136	DM15E300J0500MV1CR
A16A1C13	0160-0127	2	1	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A16A1C14	0180-0117	2	2	CAPACITOR-FXD 2.7UF+10% 35VDC TA	56289	150D275X903582
A16A1C15	0180-0174	9	1	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A16A1C16	0180-0116	1	2	CAPACITOR-FXD 6.8UF+10% 35VDC TA	56289	150D685X903582
A16A1C17	0150-0093	0	1	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0150-0093
A16A1C18	0180-0098	8	1	CAPACITOR-FXD 100UF+20% 20VDC TA	56289	150D107X002082
A16A1C19	0180-0116	1	1	CAPACITOR-FXD 6.8UF+10% 35VDC TA	56289	150D685X903582
A16A1CR1	1901-0040	1	4	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A16A1CR2	1901-0410	9	2	DIODE-PWR RECT 1N4720 100V 1.5A	04713	1N4720
A16A1CR3	1901-0410	9	2	DIODE-PWR RECT 1N4720 100V 1.5A	04713	1N4720
A16A1CR4	1901-0049	0	4	DIODE-PWR RECT 50V 750MA DO-29	28480	1901-0049
A16A1CR5	1901-0049	0	4	DIODE-PWR RECT 50V 750MA DO-29	28480	1901-0049
A16A1CR6	1901-0049	0	4	DIODE-PWR RECT 50V 750MA DO-29	28480	1901-0049
A16A1CR7	1901-0049	0	4	DIODE-PWR RECT 50V 750MA DO-29	28480	1901-0049
A16A1CR8	1902-3193	3	1	DIODE-ZNR 13.3V 5% DO-7 PD=4W TC=+.059%	28480	1902-3193
A16A1CR9	1901-0040	1	4	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A16A1CR10	1901-0040	1	4	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A16A1CR11	1902-0554	4	2	DIODE-ZNR 10V 5% DO-15 PD=1W TC=+.06%	28480	1902-0554
A16A1CR12	1902-0554	4	2	DIODE-ZNR 10V 5% DO-15 PD=1W TC=+.06%	28480	1902-0554
A16A1CR13				DELETED		
A16A1CR14				DELETED		
A16A1CR15	1901-0040	1	4	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A16A1L2	9140-0154	2	1	COIL-MLD 53.8UH 1% Q=55 .156DX,375LG-NOM	28480	9140-0154
A16A1L3	9140-0029	0	1	COIL-MLD 100UH 10% Q=30 .25DX,313LG-NOM	28480	9140-0029
A16A1Q1	1854-0020	6	3	TRANSISTOR NPN SI TO-8 PD=25W	28480	1854-0020
A16A1Q2	1854-0020	6	3	TRANSISTOR NPN SI TO-8 PD=25W	28480	1854-0020
A16A1Q3	1853-0001	1	1	TRANSISTOR PNP SI TO-39 PD=600MW	28480	1853-0001
A16A1Q4	1854-0023	9	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A16A1Q5	1854-0020	6	3	TRANSISTOR NPN SI TO-8 PD=25W	28480	1854-0020
A16A1Q6	1854-0003	5	1	TRANSISTOR NPN SI TO-39 PD=800MW	28480	1854-0003
A16A1Q7	1854-0005	7	1	TRANSISTOR NPN 2N708 SI TO-18 PD=360MW	04713	2N708
A16A1Q8	1854-0547	2	1	TRANSISTOR NPN 2N3725 SI TO-5 PD=800MW	01295	2N3725
A16A1Q9	1854-0039	7	2	TRANSISTOR NPN 2N30538 SI TO-39 PD=1W	01928	2N30538
A16A1Q10	1854-0039	7	2	TRANSISTOR NPN 2N30538 SI TO-39 PD=1W	01928	2N30538
A16A1Q11				DELETED		
A16A1Q12				DELETED		
A16A1R1	0757-0942	4	1	RESISTOR 5.6K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5601-G
A16A1R2	0757-0900	4	6	RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A16A1R3	0757-0900	4	6	RESISTOR 100 2% .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A16A1R4	0757-0894	5	1	RESISTOR 56 1% .125W F TC=0+-100	24546	C4-1/8-T0-56R0-G
A16A1R5	0757-0929	7	1	RESISTOR 1.6K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1601-G

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-5. Options 001, 003 Only Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A16A1R6	0757-0914	0	2	RESISTOR 390 2X .125W F TC=0+-100	24546	C4-1/8-T0-391-G
A16A1R7	0757-0900	4		RESISTOR 100 2X .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A16A1R8	0757-0900	4		RESISTOR 100 2X .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A16A1R9	0757-0346	2	2	RESISTOR 10 1X .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A16A1R10	0757-0948	0	1	RESISTOR 10K 2X .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
A16A1R11	0757-0914	0		RESISTOR 390 2X .125W F TC=0+-100	24546	C4-1/8-T0-391-G
A16A1R12	0757-0900	4		RESISTOR 100 2X .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A16A1R13	2100-1773	2	1	RESISTOR-TRMR 1K 5% HW TOP=ADJ 1-TRN	28480	2100-1773
A16A1R14	0757-0346	2		RESISTOR 10 1X .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
A16A1R15	0757-0907	1	3	RESISTOR 200 2X .125W F TC=0+-100	24546	C4-1/8-T0-201-G
A16A1R16	0757-0920	8	2	RESISTOR 680 2X .125W F TC=0+-100	24546	C4-1/8-T0-681-G
A16A1R17	0757-0920	8		RESISTOR 680 2X .125W F TC=0+-100	24546	C4-1/8-T0-681-G
A16A1R18	0757-0900	4		RESISTOR 100 2X .125W F TC=0+-100	24546	C4-1/8-T0-101-G
A16A1R19	0757-0907	1		RESISTOR 200 2X .125W F TC=0+-100	24546	C4-1/8-T0-201-G
A16A1R20	0757-0907	1		RESISTOR 200 2X .125W F TC=0+-100	24546	C4-1/8-T0-201-G
A16A1T1	9100-2448	7	1	TRANSFORMER TRANSFORMER; EP=18VCT	28480	9100-2448
A16A1T2	05061-8010	2	1	TRANSFORMER	28480	05061-8010

See introduction to this section for ordering information  
 \*Indicates factory selected value

Table 6-5. Options 001, 003 Only Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A19	05061-6125	3	1	CLOCK DISPLAY ASSEMBLY (OPT 001 ONLY) (SERIES 1740)	28480	05061-6125
A19	05061-6136	6	1	CLOCK DISPLAY ASSEMBLY (OPT 003 ONLY) (SERIES 1740)	28480	05061-6136
	05061-6137	8	1	CABLE ASSEMBLY, CLOCK DISPLAY	28480	05061-6137
	1200-0063	2	2	CONNECTOR-SGL CONT SKT .04-IN-BSC-SZ RND	28480	1200-0063
	1250-0102	5	1	CONNECTOR-RF BNC FEM SGL-HOLE-FR 50-OMH	28480	1250-0102
A19A1	3101-0052	1	1	SWITCH-PB SPST-NO MOM .25A 30VAC BLK-BTN	82389	961
	5020-0176	0	2	INSULATOR FOR SNAP-ON PINS	28480	5020-0176
	05061-2118	4	1	PANEL, CENTER (OPT. 001 ONLY)	28480	05061-2118
	05061-2119	6	1	PANEL, CENTER (OPT. 003 ONLY)	28480	05061-2119
	05061-2120	9	1	PLATE, CENTER	28480	05061-2120
	05062-20162	7	1	WINDOW, DISPLAY	28480	05062-20162
A19A1	05061-6146	7	1	REGULATOR/DRIVE (SERIES 1740)	28480	05061-6146
A19A1C1	0160-2827	5	4	CAPACITOR-FXD 47UF+100-10% 40VDC AL	28480	0160-2827
A19A1C2	0160-2827	5	5	CAPACITOR-FXD 47UF+100-10% 40VDC AL	28480	0160-2827
A19A1C3	0160-0576	5	6	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A19A1C4	0160-0210	6	1	CAPACITOR-FXD 3.3UF+-20% 15VDC TA	56289	150D335X0015A2
A19A1C5	0160-3879	7	3	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A19A1C6	0160-0576	5	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A19A1C7	0160-0573	2	1	CAPACITOR-FXD 4700PF +-20% 100VDC CER	28480	0160-0573
A19A1C8	0160-0291	3	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A19A1C9	0160-0576	3	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A19A1C10	0160-2827	5	5	CAPACITOR-FXD 47UF+100-10% 40VDC AL	28480	0160-2827
A19A1C11	0160-0576	5	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A19A1C12	0160-3879	5	5	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A19A1C13	0160-0576	5	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A19A1C14	0160-2827	5	5	CAPACITOR-FXD 47UF+100-10% 40VDC AL	28480	0160-2827
A19A1C15	0160-0576	5	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A19A1CR1	1902-3234	3	1	DIODE-ZNR 19.6V 5% DO-7 PD=.4W TC=+.073X	28480	1902-3234
A19A1CR2	1901-0040	1	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A19A1CR3	1902-1286	1	1	DIODE-ZNR 1N5342B 6.8V 5% PD=5W TC=+200X	04713	1N5342B
A19A1CR4	1901-0040	0	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A19A1CR5	1901-0693	1	1	DIODE-PWR RECT 1N4934 100V 1A 200NS	04713	1N4934
A19A1F1	2110-0099	4	2	FUSE 1A 125V FAST-BLD .281X.093	28480	2110-0099
A19A1F2	2110-0099	4	2	FUSE 1A 125V FAST-BLD .281X.093	28480	2110-0099
A19A1L1	49140-0237	2	1	COIL 400UH 15X 1.12D-NOM 8RF=1MHZ	28480	49140-0237
A19A1L2	9100-0537	1	1	COIL 400UH 15X 1.12D-NOM 8RF=1MHZ	28480	9100-0537
A19A1Q1	1854-0215	1	2	TRANSISTOR NPN 8I PD=350MW FT=300MHZ	04713	2N3904
A19A1Q2	1854-0215	1	2	TRANSISTOR NPN 8I PD=350MW FT=300MHZ	04713	2N3904
A19A1Q3	1853-0314	9	1	TRANSISTOR PNP 2N2905A 8I TO-39 PD=600MW	04713	2N2905A
A19A1Q4	1853-0036	2	1	TRANSISTOR PNP 8I PD=310MW FT=250MHZ	28480	1853-0036
A19A1R1	0757-0442	9	10	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R2	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A19A1R3	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A19A1R4	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R5	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R6	0757-0427	0	1	RESISTOR 1.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1501-F
A19A1R7	0757-0465	6	6	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A19A1R8	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R9	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R10	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R11	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R12	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R13	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R14	0757-0442	9	9	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A19A1R15	0757-0338	2	1	RESISTOR 1K 1% .25W F TC=0+-100	24546	C5-1/4-T0-1001-F
A19A1R16	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A19A1R17	0757-0280	3	3	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A19A1R18	0698-8812	7	1	RESISTOR 1 1% .125W F TC=0+-100	28480	0698-8812
A19A181	3101-0878	9	1	SWITCH-TGL SUBMIN SPDT 2A 250VAC	28480	3101-0878
A19A182	3101-0557	1	2	SWITCH-PB SPST-NO MOM .5A 120VAC	28480	3101-0557
A19A183	3101-0557	1	1	SWITCH-PB SPST-NO MOM .5A 120VAC	28480	3101-0557
A19A1U1	1826-0180	0	1	IC TIMER TTL MONO/ASTBL	04713	MC1455P1
A19A1U2	1826-0428	9	1	IC 3524 MODULATOR 16-DIP-C	01295	863524J
				A19A1 MISCELLANEOUS PARTS		
	1251-3955	4	1		28480	1251-3955
	3050-0107	8	1	WASHER-FL MTLC NO. 6 .156-IN-ID	28480	3050-0107
	05061-0085	1	1	BRACKET, SWITCH	28480	05061-0085
	05061-2037	2	3	SPACER, RIVET-ON	28480	05061-2037

See introduction to this section for ordering information  
\*Indicates factory selected value



Table 6-5. Options 001, 003 Only Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A19A2	05061-6145	5	1	BOARD ASSEMBLY, DISPLAY (SERIES 1740)	28480	05061-6145
A19A2C1	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A19A2D81	1990-0452	6	6	DISPLAY-NUM-SEG 1-CHAR .3-H	28480	5082-7731, CAT C-E
A19A2D82	1990-0452	6		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	5082-7731, CAT C-E
A19A2D83	1990-0452	6		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	5082-7731, CAT C-E
A19A2D84	1990-0452	6		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	5082-7731, CAT C-E
A19A2D85	1990-0452	6		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	5082-7731, CAT C-E
A19A2D86	1990-0452	6		DISPLAY-NUM-SEG 1-CHAR .3-H	28480	5082-7731, CAT C-E
A19A2D1	1853-0058	8	6	TRANSISTOR PNP SI PD=300MH FT=200MHZ	07263	832248
A19A2D2	1853-0058	8		TRANSISTOR PNP SI PD=300MH FT=200MHZ	07263	832248
A19A2D3	1853-0058	8		TRANSISTOR PNP SI PD=300MH FT=200MHZ	07263	832248
A19A2D4	1853-0058	8		TRANSISTOR PNP SI PD=300MH FT=200MHZ	07263	832248
A19A2D5	1853-0058	8		TRANSISTOR PNP SI PD=300MH FT=200MHZ	07263	832248
A19A2D6	1853-0058	8		TRANSISTOR PNP SI PD=300MH FT=200MHZ	07263	832248
A19A2R1	0698-7244	5	1	RESISTOR 100K 1% .05W F TC=0+-100	24546	C3-1/8-T0-1003-G
A19A2R2	0698-7244	7	7	RESISTOR 2.15K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2151-G
A19A2R3	0698-7244	7		RESISTOR 2.15K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2151-G
A19A2R4	0698-7244	7		RESISTOR 2.15K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2151-G
A19A2R5	0698-7244	7		RESISTOR 2.15K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2151-G
A19A2R6	0698-7244	7		RESISTOR 2.15K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2151-G
A19A2R7	0698-7244	7		RESISTOR 2.15K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2151-G
A19A2R8	0698-7244	7		RESISTOR 2.15K 1% .05W F TC=0+-100	24546	C3-1/8-T0-2151-G
A19A2R9	0698-7202	7	7	RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T00-38R3-G
A19A2R10	0698-7202	7		RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T00-38R3-G
A19A2R11	0698-7202	7		RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T00-38R3-G
A19A2R12	0698-7202	7		RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T00-38R3-G
A19A2R13	0698-7202	7		RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T00-38R3-G
A19A2R14	0698-7202	7		RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T00-38R3-G
A19A2R15	0698-7202	7		RESISTOR 38.3 1% .05W F TC=0+-100	24546	C3-1/8-T00-38R3-G
A19A2RP1	1810-0055	5	1	NETWORK-RES 9-SIP10.0K OHM X 8	28480	1810-0055
A19A2RP2	1810-0191	2	1	NETWORK-RES 7-SIP10.0K OHM X 6	91637	CSP07C07-103J
A19A2U1	1820-2126	6	1	IC MISC PMOS	27014	MM5313N(76+)
A19A2U2	1858-0023	7	1	TRANSISTOR ARRAY	0192B	CA3081E
A19A2U3	1820-1146	8	1	IC BFR CMOS NON-INV HEX	0192B	C04050AF
	1200-0496	5	1	SOCKET, IC 14-PIN	28480	1200-0496

See introduction to this section for ordering information  
\*Indicates factory selected value

Table 6-6. Manufacturers Code List

Mfr No.	Manufacturer Name	Address	Zip Code
H9027	SCHURTER A G H	LUZERN, SW	
01002	GE CO INDUSTRIAL & POWER CAP DEPT	HUDSON FALLS, NY	12839
01221	ALLEN-BRADLEY CO	MILWAUKEE, WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS, TX	75222
0192B	RCA CORP SOLID STATE DIV	SOMERVILLE, NJ	08876
02660	AMPHENOL SALES DIV OF BUNKER-RAMO	BROADVIEW, IL	60153
03508	GE CO SEMICONDUCTOR PROD DEPT	SYRACUSE, NY	13201
03888	KDI PYROFILM CORP	WHIPPANY, NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX, AZ	85062
06001	GE CO ELEK CAP & BAT PROD DEPT	IRMO, SC	29063
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW, CA	94042
18324	SIGNETICS CORP	SUNNYVALE, CA	94086
19701	MEPCO/ELECTRA CORP	MINERAL WELLS, TX	76067
20940	MICRO-OHM CORP	EL MONTE, CA	91731
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD, PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA, CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO, CA	94304
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE, CA	92507
33095	SPECTRUM CONTROL INC	FAIRVIEW, PA	16415
52763	STETTNER-TRUSH INC	CAZENOVIA, NY	13035
53021	SANGAMO ELECTRIC CO	SPRINGFIELD, IL	62702
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS, MA	01247
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC, CT	06226
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA, PA	19108
82389	SWITCHCRAFT INC	CHICAGO, IL	60630
84411	TRW CAPACITOR DIV	OGALLALA, NE	69153
91637	DALE ELECTRONICS INC	COLUMBUS, NE	68601

**SECTION VII**  
**MANUAL CHANGES AND OPTIONS**

**7-1. MANUAL CHANGES**

7-2. This manual applies directly to Model 5065A Rubidium Vapor Frequency Standard having serial number prefix 1104.

**7-3. NEWER INSTRUMENTS**

7-4. As changes are made, newer instruments may have serial prefix numbers not listed in this manual. The manuals for these instruments will be supplied with an additional "manual changes" sheet containing the required information; contact the nearest Hewlett-Packard Sales and Service Office for information if this sheet is missing.

**7-5. OLDER INSTRUMENTS**

7-6. This manual with changes listed in Table 7-1 applies to Model 5065A Rubidium Vapor Frequency Standard having serial number prefix 968 and below.

**7-7. OPTIONS**

7-8. There is one option available; Option 001 Time Standard. Some instruments were Option 002 or Option 003.

a. Option 002: (Standby Power Supply) Add Figure 7-1 and Table 7-2 to manual. Perform manual changes listed in Paragraph 7-5. Applicable to instrument serial prefix 916 and below.

b. Option 003: (Combines Option 001, 002) Add Figure 7-1, and Table 7-2 to manual. Perform manual changes listed in Paragraph 7-5.

**7-9. Option 001 Time Standard**

7-10. For Option 001, see Figures 8-13 to 8-15.

7-11. Three changes that alter a particular assembly series number but not the instrument series number are located at the end of this section. They are:

- Change A: (Option 001 A16 Series 1532 Only)
- Change B: (Option 001 A5 Series 1840 Only)
- Change C: (Option 001 A5 Series 723 Only)

**CHANGE 1 (820-):**

Figure 8-18, A8 Phase Detector Assembly:  
Delete R50 10K resistor. Make appropriate changes to Section VI tables

Table 7-1. Manual Changes

Serial Prefix No.	Make Manual Changes
820	1 through 24
836	2 through 24
840	3 through 24
848	4 through 24
852	5 through 24
902	6 through 24
916	7 through 24
928	8 through 24
940	9 through 24
956	10 through 24
956	11 through 24
964	12 through 24
968	13 through 24
1104	14 through 24
1220	15 through 24
1320	16 through 24
1340	17 through 24
1416	18 through 24
1420	19 through 24
1532A00631 and Below	20 through 24
1532A00632 through	
1532A00790	21 through 24
1736	22 through 24
1820	23 through 24
1840	24 only.

Figure 8-16, A6 1 MHz Divider Assembly:  
Change L2 to 17  $\mu$ h 9140-0107. Make appropriate changes to Section VI tables

Figure 8-25, A13 Buffer Amplifier Assembly:  
Change A13A1R12 to 910 ohm 0757-0923.  
Change A13A1Q1, Q2, Q3 to 1854-0092 (2N3563). Make appropriate changes to Section VI tables.

Figure 7-2, A2 Battery Charger Assembly (Option 002):  
Change CR7 to 31.6 V 1902-3290. Make appropriate changes to Section VII tables.

Figure 8-27, A15 Voltage Regulator Assembly:  
Change R16 to 100 ohms 0757-0900. Make appropriate changes to Section VI tables.

Figure 8-6, (Wiring Diagram 2 of 3):  
Delete R7 from A17(6) and ground  
Make appropriate changes to Section VI tables.  
Delete R4. Make appropriate changes to Section VI tables.

Figure 8-11, A3 Multiplier Assembly:  
Delete L1, 2, 4, 3 from J1, J2, J3, J5 BNC's.  
Add jumper wires in place of deleted coils.  
Make appropriate changes to Section VI tables.

Figure 7-2, A2 Battery Charger (Option 002):  
Change BT1 to 24.0 V, 1420-0009.  
Make appropriate changes to Section VII tables.

**CHANGES 2 (836-):**

Figure 8-17, A7 AC Amplifier Assembly:  
Change A7A1C9 to 1.0 mf 0160-0127.  
Change A7A1R17 to 11K-0757-0949.  
Change A7A1R18 to 10K-0757-0948.  
Make appropriate changes to Section VI tables.

Figure 8-8, A1 Synthesizer Assembly:  
Delete C47, CR41.  
Add R96, 1K-0757-0924 in place of CR41.  
Change Q17, Q19 to 1854-0005 (2N708).  
Make appropriate changes to Section VI tables.

**CHANGE 3 (840-):**

Table 6-2, A3 60 MHz Multiplier Assembly:  
Change A3A1T1 to 00105-8003.

Table 6-2, A13 Buffer Amplifier Assembly:  
Change A13A1T1 to 00105-8003.

Figure 7-1, A2 Battery Charger Assembly (Option 002):  
Change Q5, Q6 to 1854-0003.  
Change CR11 to 1902-3224 (17.8 V).  
Change CR15 to 1902-3104 (5.62 V).  
Add CR14 between CR15-R27 junction and Q11 base (anode to A11).  
Make appropriate changes to Table 7-2.

**CHANGE 4 (848-):**

Figure 8-11, A3 Multiplier Assembly:  
Change Q1 to 1854-0092.  
Change Q2, Q5, Q6, Q8 to 1855-0081.  
Change Q4 to 1854-0060.  
Change Q7 to 1853-0015.  
Change C3 to 91 pf.  
Make appropriate changes to Section VI tables.

Figure 8-25, A13 Buffer Amplifier:  
Change C7 to 100 pf. Make appropriate changes to Section VI tables.

Figure 8-9, A1 Synthesizer Assembly:  
Delete R97, 98, 99. Make appropriate changes to Section VI tables.

**CHANGE 5 (852-):**

Figure 8-27, A15 Voltage Regulator Assembly:  
Delete C12.  
Make appropriate changes to Section VI tables.

**CHANGE 6 (902-):**

Figure 8-9, A1 Synthesizer Assembly:  
Change R19 to R:Fixed:2K. Make appropriate changes to Section VI tables.

Table 6-2, A14 Logic Assembly:  
Change CR13 to 1884-0003.

Table 7-2, A2 Battery Charger Assembly (Option 002):  
Change CR8 to 1884-0003.

**CHANGE 7 (916-):**

Page 6-7, 6-8, Table 6-2, A4:  
Replace A4 portion of Table 6-1 with Table 7-3.

Page 8-18, 8-19, Figure 8-12:  
Replace A4 related text, Component locator and Figure 8-12 with A4, 100 kHz text in Section VII and with Figures 7-3, 7-4, and 7-5.

Page 7-4, Table 7-2:  
Change for A2 Battery Charger, Option 002 Board Assembly only (Series No. 916 to 904).

Page 7-4, Table 7-2:  
Change A2R12 to 0811-2586, R:Fxd w.w. 910 OHMS, 3%, 2W.  
Change A2R13 to 0811-2587, R:Fxd w.w. 4.1 OHMS, 3%, 2W.  
Change A2R18 to 0757-0948, R:Fxd met film, 10K OHM, 2%, 1/4W.

Page 6-23, Table 6-3, A12:  
Change 05065-6074 to 5065-6030.

Page 6-9, Table 6-2, A7:  
Change A7J1 to 1250-0258.

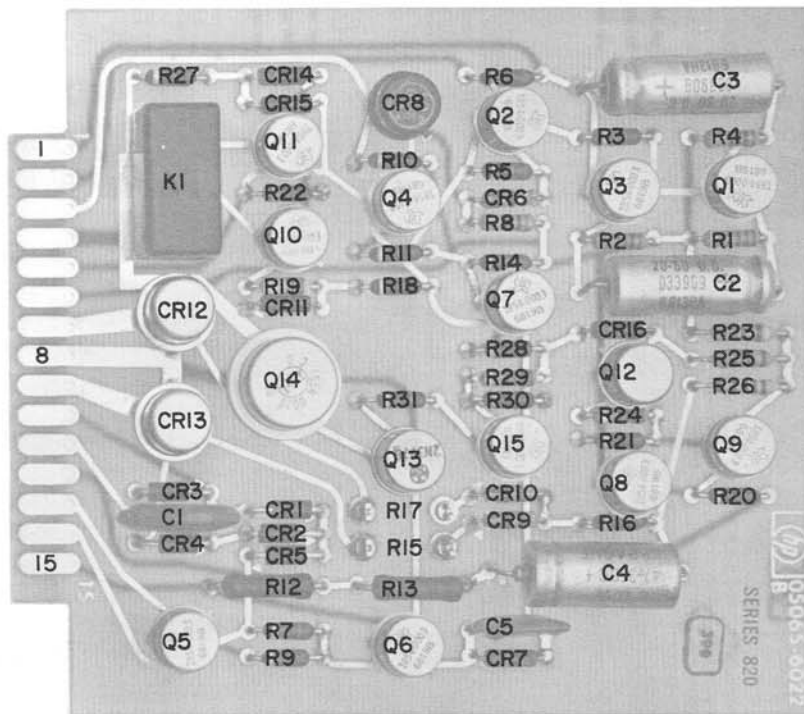
Page 6-5, Table 6-2, A3:  
Change A3, 0565-6078 to 05065-6008.  
Change A3J4 to 1250-0258.  
Change A3J7 to 1250-0258.  
Change A3J8 to 1250-0258.

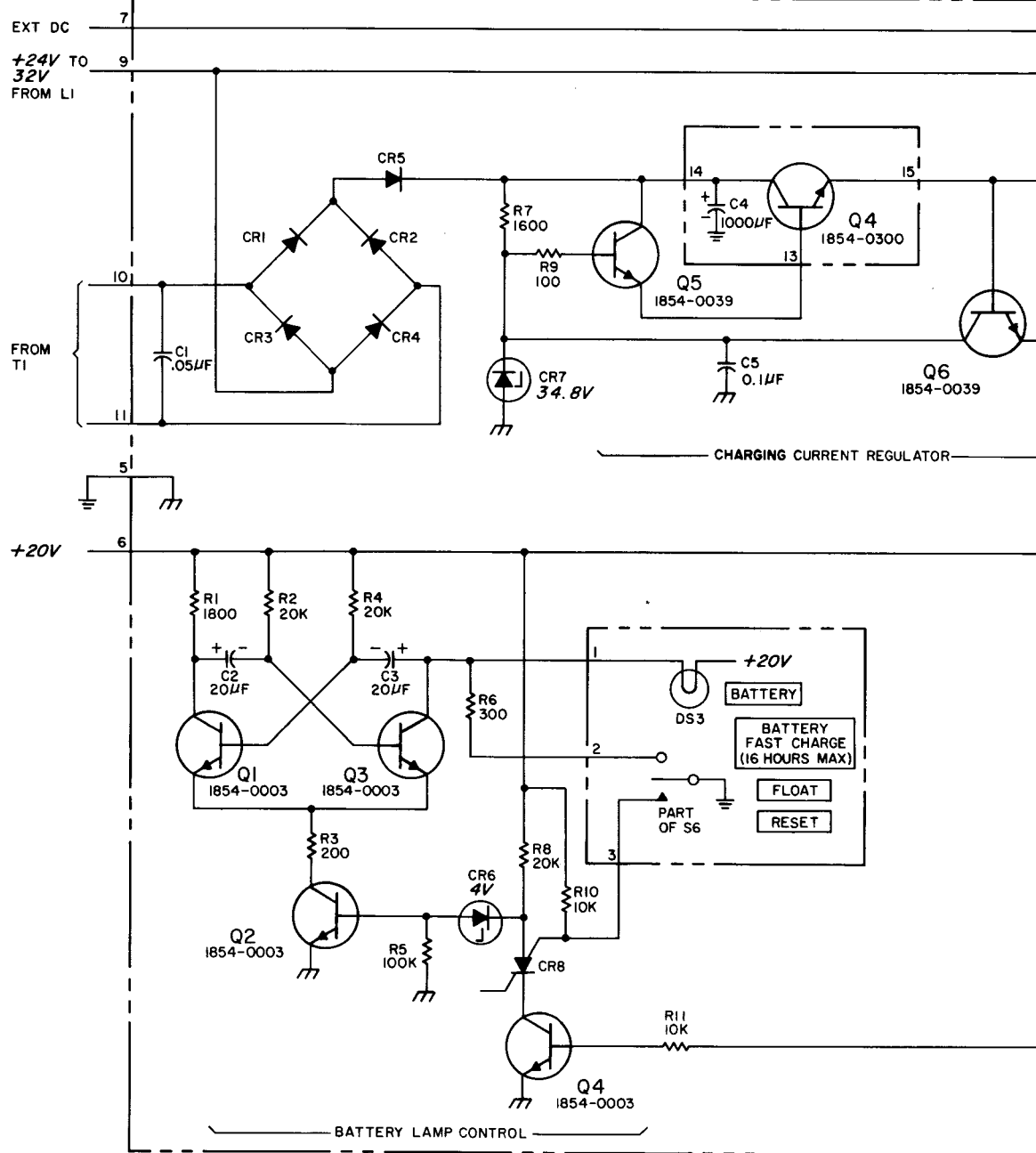
Page 6-16, Table 6-2:  
Change W4 to 05065-6035.

Figure 7-2  
**A2 BATTERY CHARGER ASSEMBLY**

(See Page 7-3)

Figure 7-1. Battery Charger Assy A2 Option 002

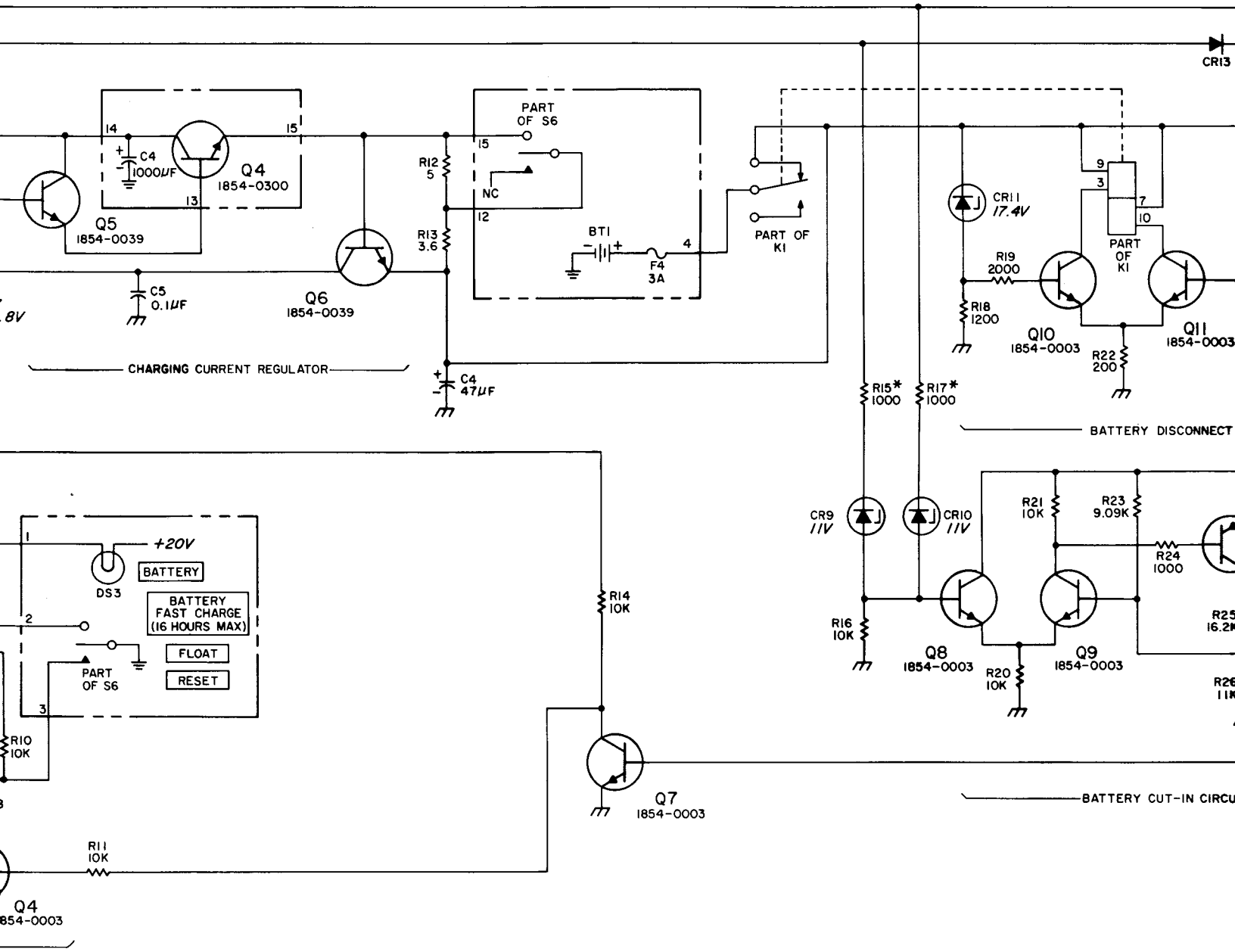




NOTES

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. ASTERISK(\*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN

A2 BATTERY CHARGER ASSEMBLY (05065-6022) (NOTE 1) SERIES 964



REFERENCE DESIGNATIONS

NO PREFIX	A2
BT1	
C4	C1-5 CR1-16
DS3	
F4	K1 Q1-15 R1-31 S1

DELETED:  
CR12, 14

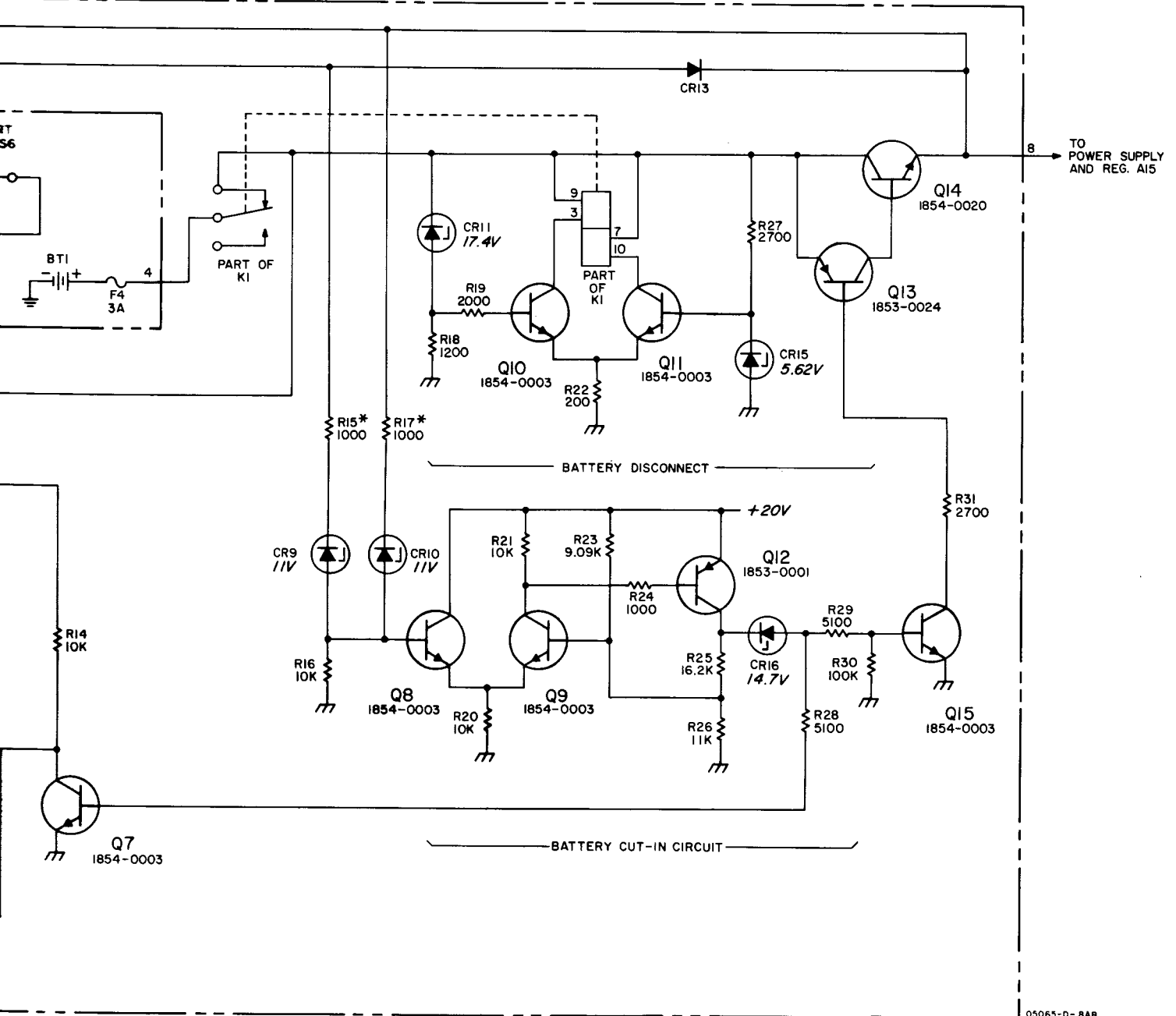
WITHIN THIS  
ADD  
VIATION

ED:

ED  
SHOWN



R ASSEMBLY (05065-6022) (NOTE 1) SERIES 964



05065-D-8AB

REFERENCE DESIGNATIONS

NO PREFIX	A2
BT1	
C4	C1-5 CR1-16
DS3	
F4	
Q4	K1 Q1-15 R1-31 S1

DELETED:  
CR12, 14

Figure 7-2. A2 Battery Charger Assembly

**CHANGE 8 (928-):**

- Page 8-5, Figure 8-4:  
Delete T.E.D device and P17/J17 of A12 and connections going to Q1, A15(5).
- Page 8-7, Figure 8-6:  
Delete CR3, P17/J17 and T.E.D. device.  
Connect Q1 emitter directly to A15(5) and label wire WHT-BLK-BLU.
- Page 8-10, UNIT THEORY OF OPERATION:  
Replace "PRESET DIVIDER TEXT" and "POWER SUPPLY" text with Paragraph 7-11 through 7-16, and Synthesizer Timing Diagram and Thumbwheel Switch Section.
- Page 8-11, Figure 8-8:  
Replace Figure 8-8 with Figure 7-6.
- Page 8-13, Figure 8-9:  
Replace Figure 8-9, component locator and waveforms with Figures 7-7, 7-8, and 7-9.
- Page 8-15, Figure 8-10:  
Replace Figure 8-10 and component locator with Figure 7-10 and 7-11.
- Page 8-43, Figure 8-14:  
Delete T.E.D device and P17/J17 information from A12 R.V.F.R.
- Pages 6-3, 6-4, 6-5, Table 6-2:  
Replace A1 portion of Table 6-2 with Table 7-4.
- Page 5-15:  
Add Tables 7-5, 7-6, 7-7, and 7-8.
- Page 6-15, Table 6-2:  
Delete CR3, J17.

**CHANGE 9 (940):**

- Page 8-45, Figure 8-25, A12 RVFR Assembly:  
Change A12A1C3 to 10 pf.  
Change A12A1C4 to 5.6 pf.
- Page 6-23, Table 6-3, A12 Parts List:  
Change A12A1C3 to 0160-2199, C:Fxd Mica 10 pf 5%.  
Change A12A1C4 to 0160-2251, C:Fxd Cer. 5.6 -.25 pf Vdc w.

**CHANGE 10 (956):**

- Page 8-29, Figure 8-17, A7 Assembly:  
Replace Figure 8-17 with Figure 7-13, Page 7-31.  
Replace A7 text on Page 8-28 with Page 7-27.  
Replace text and component locator on Page 8-29 with Page 7-29 (includes Figure 7-12).
- Pages 6-9, 6-10, Table 6-2, A7 Parts List:  
Replace A7 parts list on those pages with contents of Table 7-9, Pages 7-33 and 7-35.

**CHANGE 11 (960):**

- Page 1-2, Table 1-1:  
Change AC POWER CABLE to HP Part No. 05061-6091.
- Page 1-2, Table 1-2:  
Change Standby Power Supply description test line to 115/230 Vac  $\pm 10\%$  50-400 Hz.
- Page 2-2, Table 2-2:  
Add CLOCK, 4 pin male (J7); Connector HP Part 1251-0128; Mating Connector HP Part No. 1251-0127; Mating Connector Description 4-pin Male plug.  
Change AC LINE, 3-pin make jack (J8) Connector HP Part No. to 1251-0146 and Mating Connector HP Part No. to 1251-0257.
- Page 6-15, Table 6-2:  
Change C5A, B to 0160-3043, C:FxD CER 2 x .005 UF 250V  
Add J6, 1250-0140, Connector BNC.  
Add J7, 1251-0128, Connector female 4 contact.  
Change J8 to 1251-0146, Connector 3-pin male.  
Add F3, Fuse 2110-0001, Fuse: 1A, 250V.  
F3, Fuseholder 1400-0084, Extractor Post-type.  
Change F1 to 2110-0001.  
Change DS1 to 1450-0113, Lampholder: Red Lens.  
Change S1 to 3101-0033.
- Page 6-16, Table 6-2:  
Add W8 05065-6039, Cable Assy: Rear Panel to A4.  
Add W8 1250-0050, Nut:Clamp.  
Add W8 1250-0051, Pin: Connector.  
Add W8 8120-0229, Cable:Coax 50-OHM, RG-188A/U.  
Change ac power cable (under misc.) to 114B-16A.

- Page 7-5, Table 7-2:  
Change A3DS3 to 1450-0113, Lampholder: Red Lens.
- Page 8-3, Figure 8-2, Block Diagram:  
Change DS1, Integrator Limit color to Red.  
Change DS3, Battery Lamp color to Red.  
Change DS2, Continuous Operation Lamp color to Amber.  
Add Following J6 Figure to A4 Block:

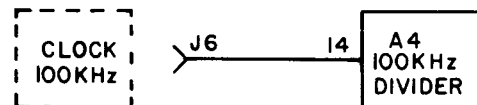


Table 7-2. Battery Charger Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2	05065-6068	1	STANDBY POWER SUPPLY FOR OPTION 02 ONLY	28480	05065-6068
A2	05065-0026	1	HOLDER: BATTERY	28480	05065-0026
A2	05065-6062	1	CABLE ASSY: BATTERY	28480	05065-6062
A2	05065-6022	1	BOARD ASSY: CHARGER	28480	05065-6022
A2	05065-2034	1	BOARD: BLANK PC	28480	05065-2034
A2BT1	1420-0066	1	BATTERY: RECHARGEABLE 25.2VOLTS	28480	1420-0066
A2C1	0150-0052	3	C:FXD CER 0.05 UF 20% 400VDCW	56289	33C17A
A2C2	0180-0049	2	C:FXD ELECT 20 UF +75-10% 50VDCW	56289	30D206G050CC2-DSM
A2C3	0180-0049	1	C:FXD ELECT 20 UF +75-10% 50VDCW	56289	30D206G050CC2-DSM
A2C4	0180-0097	1	C:FXD TANT. 47 UF 10% 35VDCW	56289	150D476X9035S2-DYS
A2C5	0150-0121	1	C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50B1S-CML
A2CR1	1901-0026	5	DIODE: SILICON 0.75A 200PIV	04713	SR1358-8
A2CR2	1901-0026	1	DIODE: SILICON 0.75A 200PIV	04713	SR1358-8
A2CR3	1901-0026	1	DIODE: SILICON 0.75A 200PIV	04713	SR1358-8
A2CR4	1901-0026	1	DIODE: SILICON 0.75A 200PIV	04713	SR1358-8
A2CR5	1901-0026	1	DIODE: SILICON 0.75A 200PIV	04713	SR1358-8
A2CR6	1902-3070	1	DIODE: BREAKDOWN 4.22V 5%	04713	SZ10939-74
A2CR7	1902-3290	1	DIODE BREAKDOWN: SILICON 31.6V 5%	28480	1902-3290
A2CR8	1884-0003	1	SWITCH: SILICON CONTROLLED	03508	3N58
A2CR9	1902-3172	2	DIODE BREAKDOWN: 11.0V 2%	28480	1902-3172
A2CR10	1902-3172	1	DIODE BREAKDOWN: 11.0V 2%	28480	1902-3172
A2CR11	1902-3224	1	DIODE: BREAKDOWN 17.8V 5% 400MH	28480	1902-3224
A2CR12	1901-0200	2	DIODE: SILICON 100 PIV 3A	02735	1N4998
A2CR13	1901-0200	1	DIODE: SILICON 100 PIV 3A	02735	1N4998
A2CR14	1901-0025	1	DIODE: SILICON 100MA/1V	07263	FD 2387
A2CR15	1902-3104	1	DIODE: BREAKDOWN 5.62V 5%	04713	SZ10939-110
A2CR16	1902-3203	1	DIODE BREAKDOWN: SILICON 14.7V 5%	28480	1902-3203
A2DS3	2140-0025	1	LAMP: INCANDESCENT 28.0V 0.04 AMPS	08806	327
A2DS3	1450-0114	1	LAMPHOLDER: AMBER LENS	07137	RDL-83-F3-000
A2K1	0490-0475	1	RELAY: DPDT 28V 2A	99928	LSA-2C-24B
A2Q1	1854-0003	12	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q2	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q3	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q4	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q5	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q6	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q7	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q8	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q9	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q10	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q11	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2Q12	1853-0001	1	TSTR: SI PNP (SELECTED FROM 2N1132)	28480	1853-0001
A2Q13	1853-0024	1	TSTR: SI PNP	80131	2N3778
A2Q14	1854-0020	1	TSTR: SI NPN	28480	1854-0020
A2Q15	1854-0003	1	TSTR: SI NPN (SELECTED FROM 2N1711)	28480	1854-0003
A2R1	0757-0930	1	R:FXD FLM 1.8K OHM 2% 1/8W	28480	0757-0930
A2R2	0757-0955	3	R:FXD FLM 20K OHM 2% 1/8W	28480	0757-0955
A2R3	0757-0907	2	R:FXD FLM 200 OHM 2% 1/8W	28480	0757-0907
A2R4	0757-0955	1	R:FXD FLM 20K OHM 2% 1/8W	28480	0757-0955
A2R5	0757-0972	2	R:FXD FLM 100K OHM 2% 1/8W	28480	0757-0972
A2R6	0757-0911	1	R:FXD FLM 300 OHM 2% 1/8W	28480	0757-0911
A2R7	0757-0929	1	R:FXD FLM 1.6K OHM 2% 1/8W	28480	0757-0929
A2R8	0757-0955	1	R:FXD FLM 20K OHM 2% 1/8W	28480	0757-0955
A2R9	0757-0900	1	R:FXD MET FLM 100 OHM 2% 1/8W	28480	0757-0900
A2R10	0757-0948	7	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A2R11	0757-0948	1	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A2R12	0727-0004	1	R:FXD DEPC 5 OHM 1% 1/2W	28480	0727-0004
A2R13	0683-0365	1	R:FXD COMP 3.6 OHM 5% 1/4W	01121	CB-36G5
A2R14	0757-0948	1	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A2R15	0757-0924	3	R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924
A2R16	0757-0948	1	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A2R17	0757-0924	1	R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924
A2R18	0757-0926	1	R:FXD FLM 1.2K OHM 2% 1/8W	28480	0757-0926
A2R19	0757-0931	1	R:FXD FLM 2K OHM 2% 1/8W	28480	0757-0931
A2R20	0757-0948	1	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A2R21	0757-0948	1	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A2R22	0757-0907	1	R:FXD FLM 200 OHM 2% 1/8W	28480	0757-0907
A2R23	0757-0288	1	R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A2R24	0757-0924	1	R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924
A2R25	0757-0447	1	R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
A2R26	0757-0443	1	R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A2R27	0757-0948	1	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A2R28	0757-0941	2	R:FXD FLM 5.1K OHM 2% 1/8W	28480	0757-0941
A2R29	0757-0941	1	R:FXD FLM 5.1K OHM 2% 1/8W	28480	0757-0941

See introduction to this section for ordering information

Table 7-2. Battery Charger Replaceable Parts (Continued)

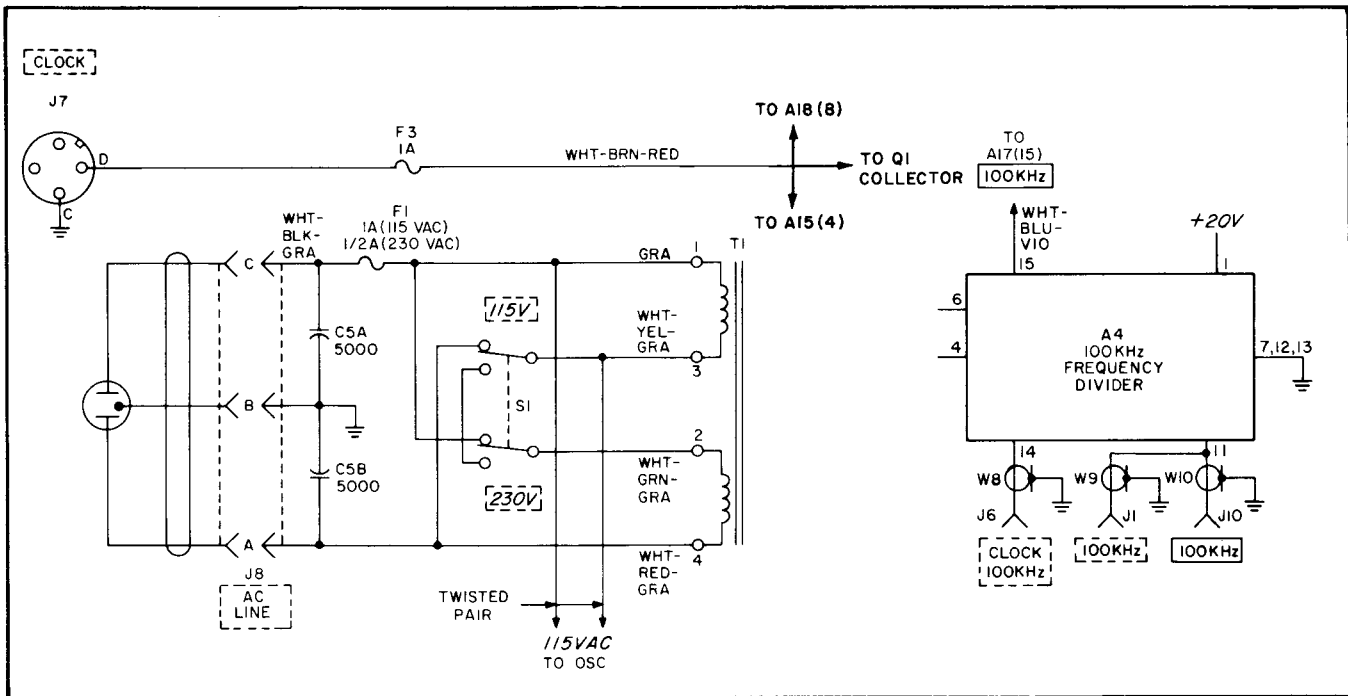
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2R30 A2R31 A2S6	0757-0972 0757-0934 3101-1164	1 1	R:FXD FLM 100K OHM 2% 1/8W R:FXD FLM 2.7K OHM 2% 1/8W SWITCH:TODGGLE DPDT 5A 115V AC	28480 28480 28480	0757-0972 0757-0934 3101-1164

See introduction to this section for ordering information

Page 8-7, Figure 8-6:

Figure A

Figure B



Change input ac wiring, C5A,B values as shown in Figure A.  
Add J7, F3 and wire as shown in Figure A.  
Add J6, W8 to A4(14) as shown in Figure B.

Page 8-9, Figure 8-7:  
Change input ac wiring, C5A,B values as shown in Figure A.  
Add J7, F3 and wire as shown in Figure A.  
Add J6, W8 to A4(14) as shown in Figure B.

Page 6-3, Table 6-2:  
Change A1A1C1 to 0140-0221, F:FXD MICA 220 PF 1% Factory select.

Page 6-4, Table 6-2:  
Change A1A1R71 to 0757-0968, R:FXD Met Flm OHM 2%, 1/8W Factory Select.

Page 6-5, Table 6-2:  
Change A1A1R85 to 0757-0943, R:Fxd Flm 6.2 Ohm, 2% 1/8W, Factory Select.

Page 8-13, Figure 8-9, A1 Assembly:  
Change A1A1C2 to 220 pf.

Page 8-15, Figure 8-10, A1 Assembly:  
Change A1A1R71 to 68K.  
Change A1A1R85 to 6200.

Page 7-4, Table 7-2, Battery Charger Parts List:  
Change A2R18 to 0757-0929, R:Fxd Met Flm 1600 Ohm 2% 1/8W.

Page 7-6, Figure 7-2, A2 Battery Charger:  
Change A2R18 to 1600 Ohm.  
Delete Series 964 reference at top of Schematic Diagram.

Page 6-10, Table 6-2, A7 Assembly:  
Change A7A1C6 to 0160-0166.  
Change A7A1C7, C8 to 0160-0163.  
Change A7A1C18, to 0160-0166.  
Change A7A1C19, 20 to 0161-0163.

**CHANGE 12 (964):**

Page 8-15, Figure 8-10, A1 Synthesizer Assembly:  
Change R87 to 12K Ohm.  
Change A1 Series to 964.

Page 6-5, Table 6-2:  
Change A1R87 to 0757-0950 R:MET FLM 6200 Ohm 2% 1/8W.

Page 6-7, Table 6-2:  
Change A4C3 to -160-2225.  
Change A4C10 to 0160-2218.  
Change A4C12 to 0140-0182.  
Change A4C19 to 0140-0184.  
Change A4C21 to 0140-0184.

Page 6-15, Table 6-2:  
Change S5 to 3100-2402.

**CHANGE 13 (968):**

Page 8-31, Figure 8-18, A8 PHASE DETECTOR Assembly:

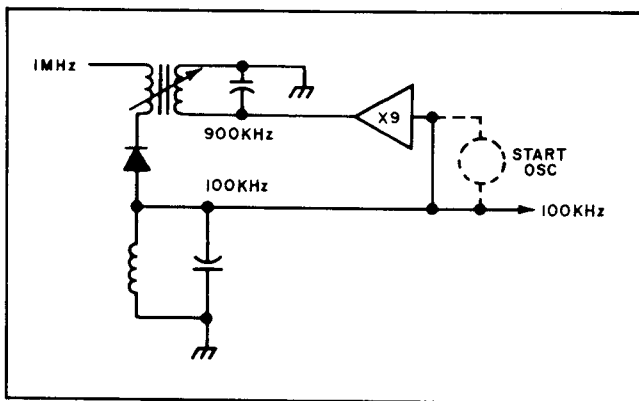
Change A1 to Q3, Q8 to Q11 to 1854-0003.

Page 6-11, Table 6-2:

Change A8Q1 to A8Q3 and A8Q8 to A8Q11 to 1854-0003.

The A4 Module uses regenerative division to divide 1 MHz to 100 kHz as shown. Operation is similar to that of A7 1 MHz Frequency Divider.

Figure 7-3. 100 kHz Regenerative Divider



The 100 kHz divider is a regenerative divide-by-ten circuit followed by an amplifier stage. This assembly includes signal-sensing logic to control the divider-start circuit in response to both the 100 kHz output and the dc start signal that comes from A7 1 MHz Frequency Divider. Assume the 1 MHz signal is present at the divider circuit input, but the 100 kHz output has not started. Divider operation requires 100 kHz at the base of Q3, the X9 multiplier. This 100 kHz signal is derived from the output signal once the divider starts. During divider start, the required 100 kHz signal is obtained by converting tuned amplifier A6 into a 100 kHz oscillator by feeding a signal from its output back to its input through FET switch Q5.

The 1 MHz signal input to A4 is amplified by Q1. The input is also coupled through Q2 whose output connects through A4(2) to A5 Digital Divider. The start signal connects from A6 1 MHz Frequency Divider through A4(4) to Q4; Q4 biases Q5 "on" to complete the feedback path for Q7 which then oscillates at 100 kHz.

When the regenerative division process starts, the start circuit is no longer required. A small sample of the 100 kHz output connects to CR3 and CR5 to produce a negative bias to cut off Q7. The resulting increased voltage at Q4 emitter cuts this stage off, which in turn positively biases FET switch "off" to open the start oscillator path. The regenerative dividing process is maintained as long as there is continuity in the 1 MHz input.

Multiplier stage Q3 converts 100 kHz at its base to 900 kHz in its tuned collector circuit. The resulting 900 kHz mixes with the input 1 MHz from T1 in mixing diode CR2. The parallel resonance of L3 and C8, tuned to 100 kHz, traps all undesired frequencies in the mixing product. 100 kHz couples to Q7 to complete the regenerative path.

Q9 and Q10 feed the 100 kHz front and rear panel output jacks. Adjustable T3 tunes Q10 for optimum power out. A second 100 kHz output is supplied by clock amplifier Q8 through A4(14). Diode CR5 and C29 in T3 output provide a rectified and filtered dc output for the 100 kHz position of the CIRCUIT CHECK meter.

#### A4 MAINTENANCE

##### NORMAL OPERATION

The A4 circuits process the A6 1 MHz output by means of regenerative division to produce 100 kHz. The A4 Assembly starts dividing when both 1 MHz and the dc start signal from A6 are present at A4 inputs. A4 outputs are as follows:

- 100 kHz to front and rear-panel jacks from A4(11).
- A buffer amplifier 1 MHz output to A5 Digital Divider Assembly from A4(2).
- Rectified 100 kHz output to CIRCUIT CHECK meter from A4(15).
- A separate rear panel CLOCK 100 kHz output from A4(14).

##### OPERATIONAL CHECK

- A simple check of A4 operation can be made by observing the CIRCUIT CHECK 100 kHz indication and comparing it with the reference meter readings on the front-panel door. In addition, the rear-panel CLOCK 100 kHz output should be 1 volt rms into 1000 ohms; also, the 1 MHz buffer amplifier output at A4(2) should be .5 volts rms into 1000 ohms.

b. To check operation of the START AUTO-START switch, set this switch to the center position and momentarily disconnect J4 of A10 Oscillator. Note that with the top cover removed, A10J4 is accessible. Without a 5 MHz input to A6, there is no A6 1 MHz output and consequently no 100 kHz output. With A10J4 reconnected, there should be no 100 kHz output until the START AUTO-START switch is placed at either START or AUTO-START.

c. To check that the 1 MHz output (J1 and J10) outputs are within specifications, proceed as follows:

- 1) Using the 5065A 5 MHz output as an external time base input to a counter connect the 100 kHz front-panel jack to the counter input and check for 100 kHz  $\pm$  one count. Disconnect the counter.
- 2) Connect the front panel 100 kHz jack through a 50-ohm feedthrough to an RF voltmeter. Check for 1.0 to 1.5 volts rms. Disconnect the voltmeter and connect an oscilloscope in its place. Check that the 100 kHz output is a clean undistorted sinewave. Disconnect the oscilloscope.
- 3) If a distortion check of the 100 kHz output is desired, refer to steps 4 and 5 of Table 5-2, In-Cabinet Performance Check.

## TROUBLESHOOTING

### NOTE

For troubleshooting or tuning it will be necessary to mount the A4 circuit card on a HP 05065-6064 circuit board extender. Power should be disconnect before this assembly is removed and re-installed.

## a. Signal Checks

- 1) To check Q1, monitor 1 MHz at CR2.
- 2) To check Q3, short the 1 MHz input at A4(6) and then inject 100 kHz at R15 and R16 (1.0 V rms). Check for 900 kHz (X9) at CR2. If this checks out, leave the 100 kHz connected, remove the short at A4(6), and check for 100 kHz at R17 and R18 junction. If there is no regenerative division, check start circuit of Q4 and Q5. In case the dc start circuits is not working, the start oscillator can be turned on by grounding TP1 to close Q5 switch.

## b. Tuning Adjustments

- 1) Connect a 50-ohm termination to the rear panel 100 kHz output jack.
- 2) Connect a BNC tee to the front panel 100 kHz output jack. Then connect an electronic counter and RMS voltmeter to the VNC tee. Connect the 5065A 5 MHz output to counter EXT STD INPUT and set counter for external standard operation.
- 3) Set front panel START-AUTO-START switch to AUTO-START. Tune A4T1, T2, L6, and T3 for maximum indication on the RMS voltmeter. Counter should indicate 1 MHz  $\pm$  one count.
- 4) Retune A4T1, T2, L6, and T3 for maximum output. Output level should be between 1.0 and 1.5 volts. This complete the 100 kHz divider tuning.

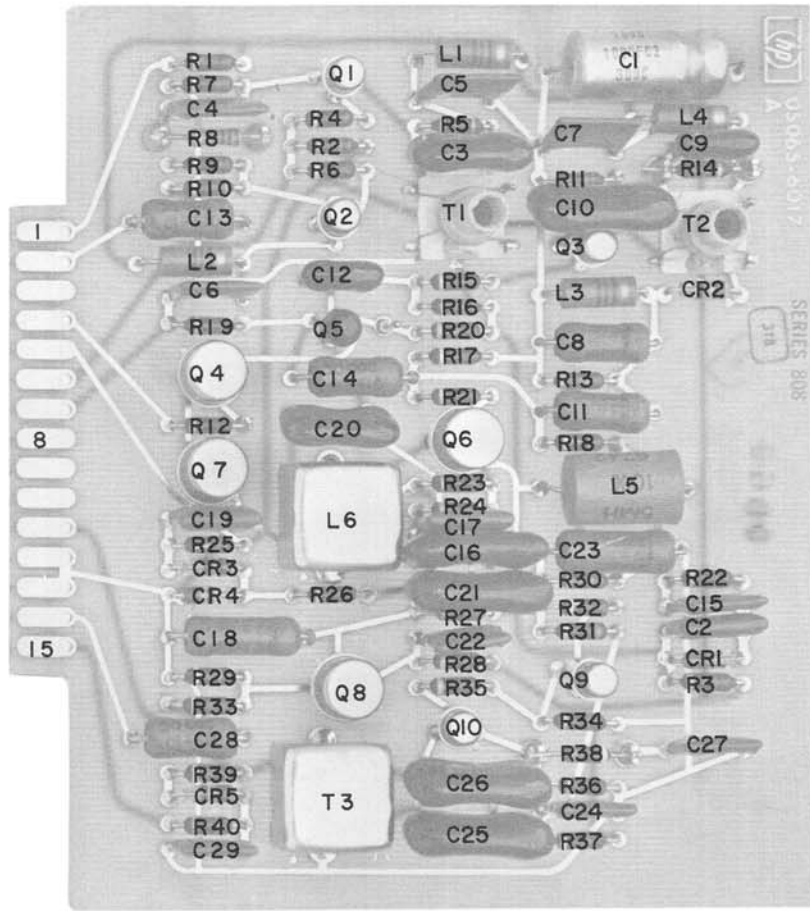
## MODULE REPLACEMENT

When replacing the A4 Assembly after repair or when a new A4 Assembly is installed, the circuit should be completely realigned per the preceeding paragraphs.

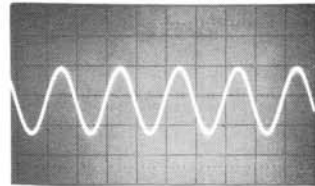
Figure 7-5  
**A4 100 kHz FREQUENCY DIVIDER ASSEMBLY**  
(See Page 7-11)



Figure 7-4. A4 100 kHz Divider



1 .2 V/cm, 1  $\mu$ s/cm

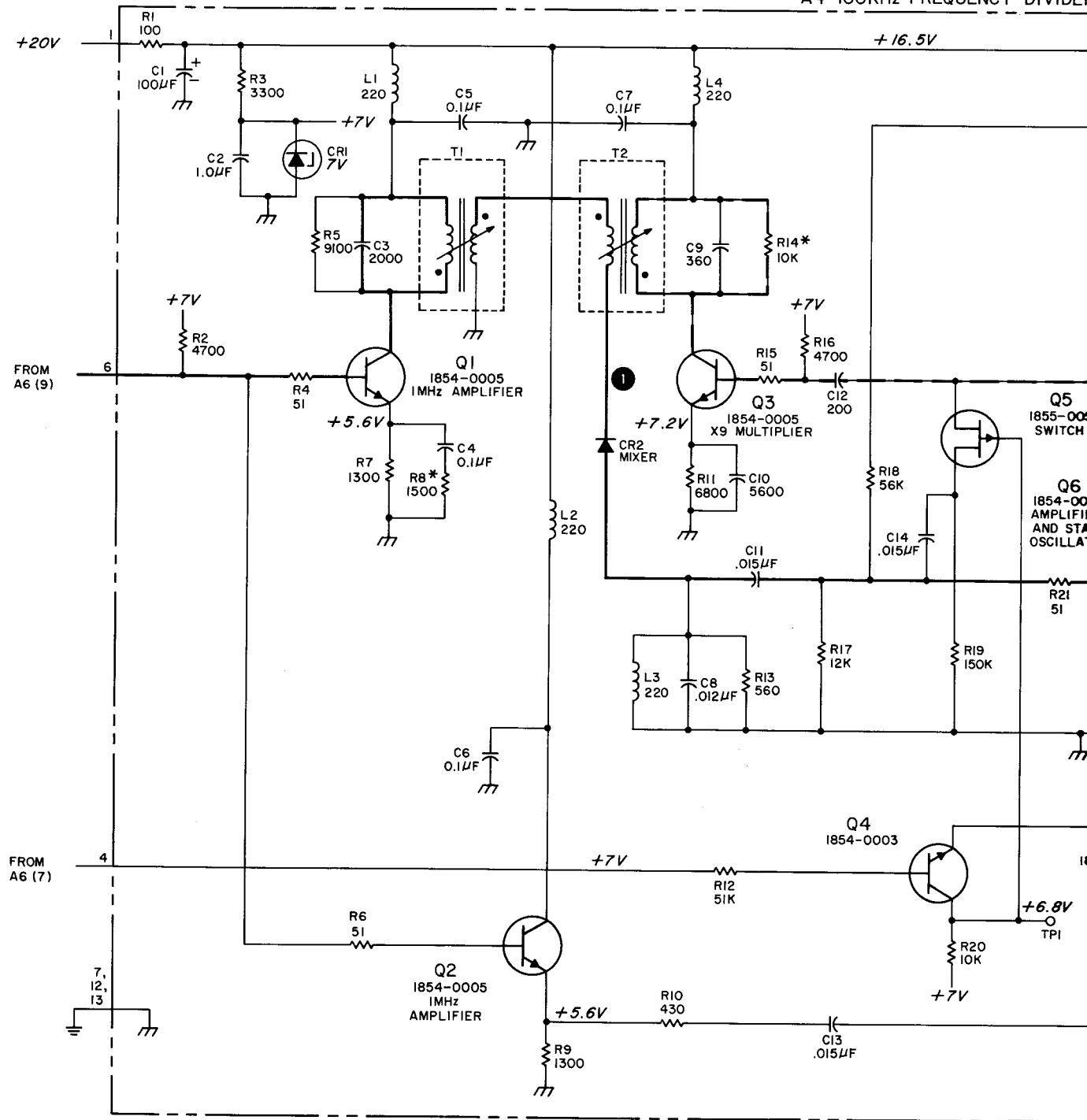


2 .1 V/cm, 10  $\mu$ s/cm

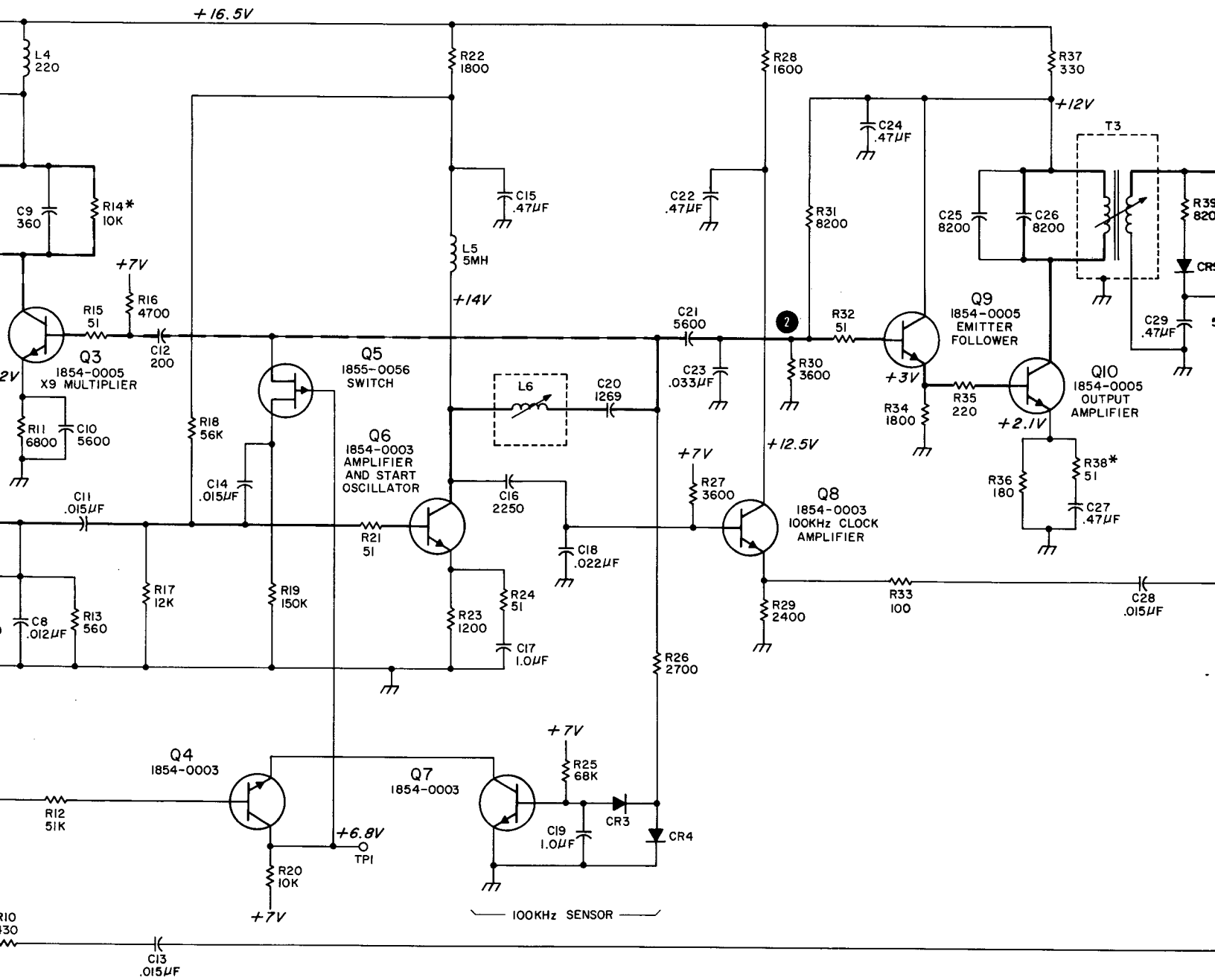
5065A: Normal operation unless noted.

Oscilloscope: DC coupled.

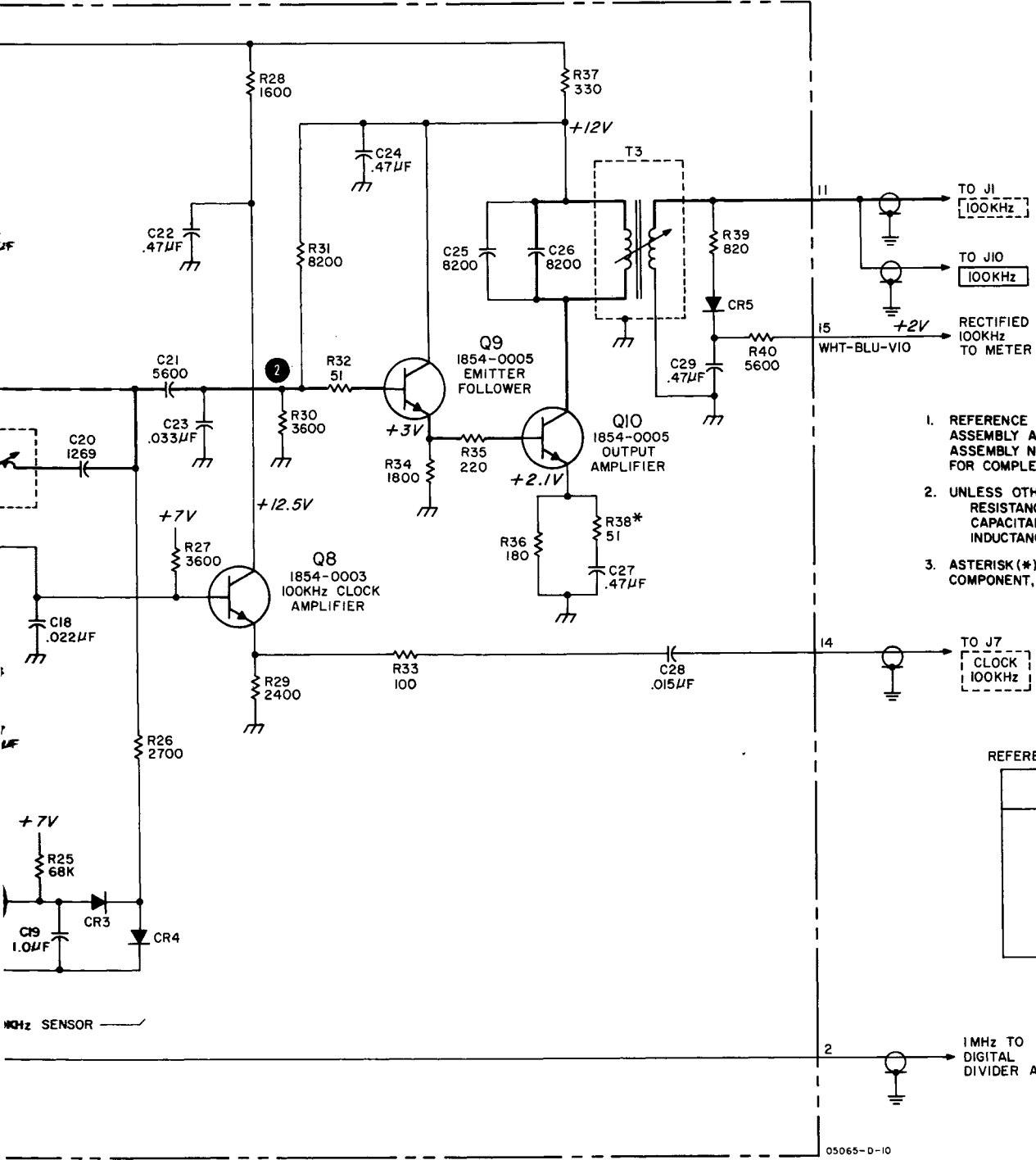
A4 100KHz FREQUENCY DIVIDER



A4 100KHz FREQUENCY DIVIDER ASSEMBLY (05065-6017)(NOTE 1)



65-6017)(NOTE 1)



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. ASTERISK (\*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN.

REFERENCE DESIGNATIONS

A4
C1-29 CR1-5 L1-6 Q1-10 R1-40 T1-3 TP1

Figure 7-5. A4 100 kHz Frequency Divider Assembly

Table 7-3. A4 100 kHz Divider Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4	05065-6017	1	BOARD ASSY:100KHZ DIVIDER	28480	05065-6017
A4	05065-2031	1	BOARD:BLANK PC	28480	05065-2031
A4C1	0180-0113	1	C:FXD ELECT TA 100UF +20-15% 30VDCW	56289	109D107C2030T2
A4C2	0160-0127	3	C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13CS-CML
A4C3	0140-0180	1	C:FXD MICA 2000 PF 2%	28480	0140-0180
A4C4	0150-0121	4	C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50B1S-CML
A4C5	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50B1S-CML
A4C6	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50B1S-CML
A4C7	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50B1S-CML
A4C8	0160-0301	1	C:FXD MY 0.012 UF 10% 200VDCW	56289	192P12392-PTS
A4C9	0140-0228	1	C:FXD MICA 360 PF 1% 300VDCW	28480	0140-0228
A4C10	0140-0170	2	C:FXD MICA 5600 PF 5% 300VDCW	28480	0140-0170
A4C11	0160-0194	4	C:FXD MY 0.015 UF 10%	56289	192P15392-PTS
A4C12	0140-0220	1	C:FXD MICA 200 PF 1% 300VDCW	28480	0140-0220
A4C13	0160-0194		C:FXD MY 0.015 UF 10%	56289	192P15392-PTS
A4C14	0160-0194		C:FXD MY 0.015 UF 10%	56289	192P15392-PTS
A4C15	0160-0174	5	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A4C16	0140-0235	1	C:FXD MICA 2250PF 1% 300VDCW	14655	RDM20F(22500F3C
A4C17	0160-0127		C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13CS-CML
A4C18	0160-0162	1	C:FXD MY 0.022 UF 10% 200VDCW	56289	192P22392-PTS
A4C19	0160-0127		C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13CS-CML
A4C20	0160-0954	1	C:FXD MICA 1269 PF 1%	28480	0160-0954
A4C21	0140-0170		C:FXD MICA 5600 PF 5% 300VDCW	28480	0140-0170
A4C22	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A4C23	0160-0163	1	C:FXD MY 0.033 UF 10% 200VDCW	56289	192P33392-PTS
A4C24	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A4C25	0140-0184	2	C:FXD MICA 8200 PF 1% 100VDCW	28480	0140-0184
A4C26	0140-0184		C:FXD MICA 8200 PF 1% 100VDCW	28480	0140-0184
A4C27	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A4C28	0160-0194		C:FXD MY 0.015 UF 10%	56289	192P15392-PTS
A4C29	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A4CR1	1902-3125	1	DIODE:BREAKDOWN 6.98V 2% 400MW	28480	1902-3125
A4CR2	1901-0040	4	DIODE:SILICON 30MA 30WV	07263	FDG1088
A4CR3	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A4CR4	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A4CR5	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A4L2	9140-0129		COIL:FXD RF 220 UH	28480	9140-0129
A4L3	9140-0129		COIL:FXD RF 220 UH	28480	9140-0129
A4L4	9140-0129		COIL:FXD RF 220 UH	28480	9140-0129
A4L6	107A-9F	1	COIL ASSY	28480	107A-9F
A4Q1	1854-0005	5	TSTR:SI NPN	80131	2N708
A4Q2	1854-0005		TSTR:SI NPN	80131	2N708
A4Q3	1854-0005		TSTR:SI NPN	80131	2N708
A4Q4	1854-0003	4	TSTR:SI NPN(SELECTED FROM 2N1711)	28480	1854-0003
A4Q5	1855-0056	1	TSTR:SI FET	80131	2N4342
A4Q6	1854-0003		TSTR:SI NPN(SELECTED FROM 2N1711)	28480	1854-0003
A4Q7	1854-0003		TSTR:SI NPN(SELECTED FROM 2N1711)	28480	1854-0003
A4Q8	1854-0003		TSTR:SI NPN(SELECTED FROM 2N1711)	28480	1854-0003
A4Q9	1854-0005		TSTR:SI NPN	80131	2N708
A4Q10	1854-0005		TSTR:SI NPN	80131	2N708
A4R1	0757-0900	2	R:FXD MET FLM 100 OHM 2% 1/8W	28480	0757-0900
A4R2	0757-0940	2	R:FXD FLM 4700 OHM 2% 1/8W	28480	0757-0940
A4R3	0757-0936	1	R:FXD FLM 3.3K OHM 2% 1/8W	28480	0757-0936
A4R4	0757-0893	7	R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893
A4R5	0757-0947	1	R:FXD FLM 9.1K OHM 2% 1/8W	28480	0757-0947
A4R6	0757-0893		R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893
A4R7	0757-0927	4	R:FXD FLM 1.3K OHM 2% 1/8W	28480	0757-0927
A4R8	0757-0927		R:FXD FLM 1.3K OHM 2% 1/8W	28480	0757-0927
A4R9	0757-0927		R:FXD FLM 1.3K OHM 2% 1/8W	28480	0757-0927
A4R10	0757-0915	1	R:FXD FLM 430 OHM 2% 1/8W	28480	0757-0915
A4R11	0757-0944	1	R:FXD FLM 6.8K OHM 2% 1/8W	28480	0757-0944
A4R12	0757-0965	1	R:FXD FLM 51K OHM 2% 1/8W	28480	0757-0965
A4R13	0757-0918	1	R:FXD FLM 560 OHM 2% 1/8W	28480	0757-0918
A4R14	0757-0948	2	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A4R15	0757-0893		R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893
A4R16	0757-0940		R:FXD FLM 4700 OHM 2% 1/8W	28480	0757-0940
A4R17	0757-0950	1	R:FXD FLM 12K OHM 2% 1/8W	28480	0757-0950
A4R18	0757-0966	1	R:FXD FLM 56K OHM 2% 1/8W	28480	0757-0966
A4R19	0757-0976	1	R:FXD FLM 150K OHM 2% 1/8W	28480	0757-0976
A4R20	0757-0948		R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A4R21	0757-0893		R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893
A4R22	0757-0930	3	R:FXD FLM 1.8K OHM 2% 1/8W	28480	0757-0930
A4R23	0757-0926	1	R:FXD FLM 1.2K OHM 2% 1/8W	28480	0757-0926
A4R24	0757-0893		R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893
A4R25	0757-0968	1	R:FXD MET FLM 68K OHM 2% 1/8W	28480	0757-0968

See introduction to this section for ordering information

Table 7-3. A4 100 kHz Divider Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4R26	0757-0934	1	R:FXD FLM 2.7K OHM 2% 1/8W	28480	0757-0934
A4R27	0757-0937	2	R:FXD FLM 3.6K OHM 2% 1/8W	28480	0757-0937
A4R28	0757-0929	1	R:FXD FLM 1.6K OHM 2% 1/8W	28480	0757-0929
A4R29	0757-0933	1	R:FXD FLM 2.4K OHM 2% 1/8W	28480	0757-0933
A4R30	0757-0937	1	R:FXD FLM 3.6K OHM 2% 1/8W	28480	0757-0937
A4R31	0757-0946	1	R:FXD FLM 8.2K OHM 2% 1/8W	28480	0757-0946
A4R32	0757-0893	1	R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893
A4R33	0757-0900	1	R:FXD MET FLM 100 OHM 2% 1/8W	28480	0757-0900
A4R34	0757-0930	1	R:FXD FLM 1.8K OHM 2% 1/8W	28480	0757-0930
A4R35	0757-0908	1	R:FXD FLM 220 OHM 2% 1/8W	28480	0757-0908
A4R36	0757-0906	1	R:FXD MET FLM 180 OHM 2% 1/8W	28480	0757-0906
A4R37	0757-0912	1	R:FXD MET FLM 330 OHM 2% 1/8W	28480	0757-0912
A4R38	0757-0893	1	R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893
A4R39	0757-0922	1	R:FXD FLM 820 OHM 2% 1/8W	28480	0757-0922
A4R40	0757-0942	1	R:FXD FLM 5.6K OHM 2% 1/8W	28480	0757-0942
A4R41	0757-0927	1	R:FXD FLM 1.3K OHM 2% 1/8W	28480	0757-0927
A4R42	0757-0930	1	R:FXD FLM 1.8K OHM 2% 1/8W	28480	0757-0930
A4T1	05061-8005	1	TRANSFORMER:1MHZ-4MHZ	28480	05061-8005
A4T2	05061-8008	1	TRANSFORMER:.9MHZ MULTIPLIER	28480	05061-8008
A4T3	107A-9C	1	TRANSFORMER ASSY:100KHZ	28480	107A-9C

See introduction to this section for ordering information

## THE PRESET DIVIDER

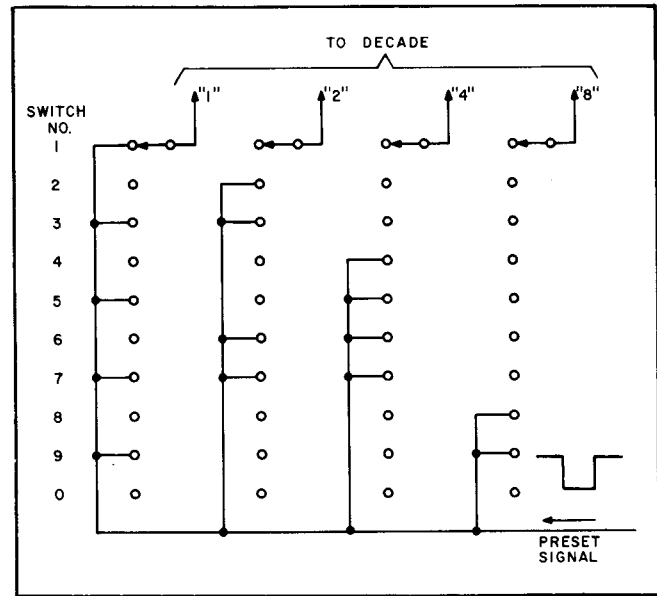
The preset divider is made up of four decades giving a total dividing capability of 10,000. With each 10,000 counts applied to the divider input, there will be one output pulse. With the addition of the preset capability this divider can be set to divide by any integer (except 1 through 12, due to reset and preset time). Since the divider can be set to divide by any predetermined integer, the system is considered a divide-by-n preset divider. For example: if the divider were to divide-by-2, and 8 would be preset into the decade before the counting sequence starts, and since an 8 count is already in the decade from the preset, it will take only 2 inputs to get 1 output. Conversely, to divide-by-8, 2 counts are preset into the decade prior to counting.

The preset divider delivers an "H" output to the sample circuit at the 9988 count (the sum of the input 5 MHz pulses and the preset information of the four decades). Output stage IC5 remains "on" with an "H" output during count 9989. Count 9990 turns off IC5 and starts a 1.5  $\mu$ sec reset period. Inhibit gate Q1 and Q2 closes to prevent 5 MHz pulses from entering the decades during the reset and preset period. During reset, the decades are restored to "0" count. Following the reset period is a 0.5  $\mu$ sec preset period. At this time, the thumbwheel switch preset information is fed to the four decades. At the end of the preset period, inhibit gate Q1 and Q2 opens and counting resumes. The counting cycle re-occurs at the 5 MHz/n rate determined by the thumbwheel setting.

The 5 MHz input signal is shaped by the negative-clamping action of Q1, the first half of inhibit gate Q1 and Q2. The 5 MHz pulse is then applied to first decade IC2(5) which responds to the positive-going transition of the input pulse. The four decades are series connected through inverting amplifiers in IC1, IC3, and IC6, and also through inverting amplifiers Q4 and Q9 as shown in the Synthesizer Timing Diagram on page 7-16. Each decade responds to the positive-going transition of the input pulse at pin 5. Connecting to the "1", "2", "4", and "8" inputs of each decade are the thumbwheel-switch connections through which the decades are preset as required for the desired Synthesizer frequency as derived from Table 3-9. The thumbwheel switch puts in binary information for the desired preset count as can be seen by the wiring diagram for one thumbwheel-switch section shown below. The decade count will therefore be the total of the preset information plus the number of input 5 MHz pulses.

When the count reaches 9000 (preset information plus the number of 5 MHz pulses), final decade IC10 delivers an "8" pulse from IC10(1) to IC9(3) and a "1" pulse from IC10(6) to IC9(5). These inputs activate a NOR

Table 3-9. Typical Thumbwheel Switch Section



gate which delivers a coincidence "9" output (H) pulse at IC9(6). This "H" pulse is inverted by Q11 for the first "1" input to IC5(1).

When the count reaches 9900, third decade IC7 delivers an "8" pulse from IC7(1) to IC6(5) and a "1" pulse from IC7(6) to IC6(3). These items activate a NOR gate in IC6 which delivers a coincidence "9" output (H) at IC6(6), which is then inverted by Q8 for the second "L" input to IC5(2).

When the count reaches 9980, second decade IC4 delivers an "8" pulse from IC4(1) through an inverting amplifier in IC3 (IC3-5 to IC3-6) to Q6. Q6 inverts this pulse for the third "L" pulse at IC5(3).

When the count reaches 9988, first decade IC2 delivers an "8" pulse from IC2(1) to IC5(5) for the final "L" pulse which activates IC5. Since IC2 output remains unchanged during count 9989, IC5 remains activated until count 9990. At this count, IC2(1) output goes "H" and turns off NOR gate IC5. Thus, IC5 output pulse is two input counts wide or 0.4  $\mu$ sec.

Reset one-shot multivibrator IC11 is triggered when NOR gate IC5 closes and provides a 1.5  $\mu$ sec pulse to Q16, Q7, and preset one-shot multivibrator IC8(9). The signal through Q16 is amplified, inverted, sent to NOR gate (Q13, Q14) and then applied to amplifier Q3. When Q3 collector goes "H", the input gate closes for the 1.5  $\mu$ sec reset period. The reset signal through Q7 is amplified, inverted, and applied to decade IC4(2).

Decade IC2 count is "0" but IC4, IC7, and IC10 are at the count of "999". The reset pulse into IC4(2) cycles





Table 7-4. A1 Synthesizer Assembly Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	05065-6018	1	MODULE ASSY:SYNTHESIZER	28480	05065-6018
A1S1			CONSISTS OF S1A THRU S1D		
A1S1	3100-2063	1	SWITCH:THUMBWHEEL	28480	3100-2063
A1S2	3101-0033	1	SWITCH:SLIDE DPDT 0.5A 125AC/DC	82389	11A-1009A
A1	0340-0119	1	INSULATED FEED THRU:TEFLON	98291	FT-SM-023-P20
A1	0510-0207	1	NUT:CAPTIVE 4-40 X 0.188 LG	28480	0510-0207
A1	1250-0901	1	CONNECTOR:RF BULKHEAD	15558	1104/D
A1	05060-0007	1	BRACKET:END	28480	05060-0007
A1	05065-0035	1	COVER:SYNTHESIZER	28480	05065-0035
A1	05065-0036	1	CHASSIS:SYNTHESIZER	28480	05065-0036
A1	05065-2032	1	PLATE:END	28480	05065-2032
A1	05065-2043	1	PLATE:END	28480	05065-2043
A1A1	05065-6019	1	BOARD ASSY:SYNTHESIZER	28480	05065-6019
A1A1	05065-2033	1	BOARD:BLANK PC	28480	05065-2033
A1A1C1	0180-0291	4	C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A1A1C2	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A1A1C3	0150-0121	10	C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C4	0150-0093	10	C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C5	0180-0116	4	C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A1A1C6	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C7	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C8	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C9	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A1A1C10	0140-0192	1	C:FXD MICA 68 PF 5%	28480	0140-0192
A1A1C11	0160-0127	5	C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13CS-CML
A1A1C12	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C13	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A1A1C14	0140-0221	1	C:FXD MICA 220 PF 1%	28480	0140-0221
A1A1C15	0160-0127		C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13CS-CML
A1A1C16	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C17	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C18	0140-0160	1	C:FXD MICA 3400 PF 5% 500VDCW	28480	0140-0160
A1A1C19	0140-0196	1	C:FXD MICA 150 PF 5%	72136	RDM15F151J3C
A1A1C20	0140-0225	1	C:FXD MICA 300 PF 1%	28480	0140-0225
A1A1C21	0160-0174	3	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A1A1C22	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A1A1C23	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C24	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A1A1C25	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A1A1C26	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C27	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C28	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A1A1C29	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C30	0160-0127		C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13CS-CML
A1A1C31	0160-0127		C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13CS-CML
A1A1C32	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C33	0140-0234	3	C:FXD MICA 500 PF 1%	28480	0140-0234
A1A1C34	0140-0234		C:FXD MICA 500 PF 1%	28480	0140-0234
A1A1C35	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C36	0150-0093		C:FXD CER 1.0 UF +80-20% 100VDCW	72982	801-K800011
A1A1C37	0160-0127		C:FXD CER 1.0 UF 20% 25VDCW	56289	5C13CS-CML
A1A1C38	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C39	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C40	0180-0106	1	C:FXD ELECT 60 UF 20% 6VDCW	28480	0180-0106
A1A1C41	0180-0155	1	C:FXD ELECT 2.2 UF 20% 20VDCW	56289	150D225X0020A2-DYS
A1A1C42	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C43	0140-0234		C:FXD MICA 500 PF 1%	28480	0140-0234
A1A1C44	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A1A1C45	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A1A1C46	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C508IS-CML
A1A1C47	0160-0340	1	C:FXD MICA 600 PF 1%	28480	0160-0340
A1A1CR1	1902-3104	1	DIODE:BREAKDOWN 5.62V 5%	04713	SZ10939-110
A1A1CR2	1902-3070	1	DIODE:BREAKDOWN 4.22V 5%	04713	SZ10939-74
A1A1CR3	1910-0016	16	DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR4	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR5	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR6	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR7	1902-3149	1	DIODE BREAKDOWN:9.09V 5%	28480	1902-3149
A1A1CR8	1902-0048	1	DIODE:BREAKDOWN 6.81V 5%	04713	SZ10939-134
A1A1CR9	1901-0040	13	DIODE:SILICON 30MA 30MV	07263	FDG1088
A1A1CR10	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR11	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR12	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR13	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR14	1902-3139	1	DIODE:BREAKDOWN 8.25V 5%	04713	SZ10939-158

See introduction to this section for ordering information

Table 7-4. A1 Synthesizer Assembly Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A1CR15	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR16	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR17	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR18	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR19	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR20	1902-0025	1	DIODE: BREAKDOWN:10.0V 5% 400 MW	28480	1902-0025
A1A1CR21	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR22	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR23	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR24	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A1A1CR25	1902-3203	1	DIODE BREAKDOWN:SILICON 14.7V 5%	28480	1902-3203
A1A1CR26	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR27	0122-0013	5	C:VOLTAGE VAR 39 PF 30VDCW	28480	0122-0013
A1A1CR28	1902-3024	1	DIODE: BREAKDOWN 2.87V 5%	04713	SZ10939-26
A1A1CR29	1902-3125	1	DIODE: BREAKDOWN 6.98V 2% 400MW	28480	1902-3125
A1A1CR30	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR31	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR32	1901-0050	2	DIODE:SI 200 MA AT 1V	07263	FDA 6308
A1A1CR33	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A1A1CR34	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR35	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR36	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR37	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR38	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR39	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR40	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1CR41	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A1A1IC1	1820-0080	4	IC:RTL GATE QUAD 2-INPT	28480	1820-0080
A1A1IC2	1820-0079	1	INTEGRATED CIRCUIT:DECADE COUNTER(5MHZ)	28480	1820-0079
A1A1IC3	1820-0080		IC:RTL GATE QUAD 2-INPT	28480	1820-0080
A1A1IC4	1820-0329	3	IC:TTL DECADE COUNTER 5 MHZ MIN.	28480	1820-0329
A1A1IC5	1820-0081	1	INTEGRATED CIRCUIT:DIGITAL 4-INPUT	07263	U58991129X
A1A1IC6	1820-0080		IC:RTL GATE QUAD 2-INPT	28480	1820-0080
A1A1IC7	1820-0329		IC:TTL DECADE COUNTER 5 MHZ MIN.	28480	1820-0329
A1A1IC8	1820-0315	2	INTEGRATED CIRCUIT	28480	1820-0315
A1A1IC9	1820-0080		IC:RTL GATE QUAD 2-INPT	28480	1820-0080
A1A1IC10	1820-0329		IC:TTL DECADE COUNTER 5 MHZ MIN.	28480	1820-0329
A1A1IC11	1820-0315		INTEGRATED CIRCUIT	28480	1820-0315
A1A1L1	9100-1618	1	COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A1A1L2	9140-0112	1	COIL:FXD RF 4.7 UH	28480	9140-0112
A1A1L3	9140-0029	1	COIL/CHOKE:FXD 100 UH	99848	3100-15-101
A1A1L4	9140-0114	1	COIL:FXD RF 10 UH	28480	9140-0114
A1A1L5	9140-0237	1	COIL:FXD 200 UH 5%	28480	9140-0237
A1A1L6	9140-0137	1	COIL:FXD RF 1000 UH 5%	28480	9140-0137
A1A1L7	9140-0096	1	COIL/CHOKE 1.00 UH 10%	99800	1537-12
A1A1Q1	1854-0009	16	TSTR:SI NPN	80131	2N709
A1A1Q2	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q3	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q4	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q5	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q6	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q7	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q8	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q9	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q10	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q11	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q12	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q13	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q14	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q15	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q16	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q17	1854-0013	2	TSTR:SI NPN	80131	2N2218A
A1A1Q18	1854-0092	4	TSTR:SI NPN	80131	2N3563
A1A1Q19	1854-0013		TSTR:SI NPN	80131	2N2218A
A1A1Q20	1854-0035	1	TSTR:SI NPN	28480	1854-0035
A1A1Q21	1854-0092		TSTR:SI NPN	80131	2N3563
A1A1Q22	1854-0092		TSTR:SI NPN	80131	2N3563
A1A1Q23	1854-0023	2	TSTR:SI NPN(SELECTED FROM 2N2484)	28480	1854-0023
A1A1Q24	1854-0003	2	TSTR:SI NPN(SELECTED FROM 2N1711)	28480	1854-0003
A1A1Q25	1854-0003		TSTR:SI NPN(SELECTED FROM 2N1711)	28480	1854-0003
A1A1Q26	1854-0092		TSTR:SI NPN	80131	2N3563
A1A1Q27	1854-0023		TSTR:SI NPN(SELECTED FROM 2N2484)	28480	1854-0023
A1A1R1	0757-0900	3	R:FXD MET FLM 100 OHM 2% 1/8W	28480	0757-0900
A1A1R2	0698-3633	1	R:FXD MET OX 390 OHM 5% 2W	28480	0698-3633
A1A1R3	0757-0924	23	R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924

See introduction to this section for ordering information

Table 7-4. A1 Synthesizer Assembly Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number	
A1A1R4	0757-0924	8	R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R5	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R6	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R7	0757-0928		R:FXD FLM 1.5K OHM 2% 1/8W	28480	0757-0928	
A1A1R8	0757-0928		R:FXD FLM 1.5K OHM 2% 1/8W	28480	0757-0928	
A1A1R9	0757-0935	6	R:FXD FLM 3K OHM 2% 1/8W	28480	0757-0935	
A1A1R10	0757-0938	6	R:FXD FLM 3.9K OHM 2% 1/8W	28480	0757-0938	
A1A1R11	0757-0972	4	R:FXD FLM 100K OHM 2% 1/8W	28480	0757-0972	
A1A1R12	0757-0935	4	R:FXD FLM 3K OHM 2% 1/8W	28480	0757-0935	
A1A1R13	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R14	0757-0928	6	R:FXD FLM 1.5K OHM 2% 1/8W	28480	0757-0928	
A1A1R15	0757-0935		R:FXD FLM 3K OHM 2% 1/8W	28480	0757-0935	
A1A1R16	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R17	0757-0928		R:FXD FLM 1.5K OHM 2% 1/8W	28480	0757-0928	
A1A1R18	0757-0938		R:FXD FLM 3.9K OHM 2% 1/8W	28480	0757-0938	
A1A1R19	0757-0931	6	R:FXD FLM 2K OHM 2% 1/8W	28480	0757-0931	
A1A1R20	0757-0931		R:FXD FLM 2K OHM 2% 1/8W	28480	0757-0931	
A1A1R21	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R22	0757-0938		R:FXD FLM 3.9K OHM 2% 1/8W	28480	0757-0938	
A1A1R23	0757-0938		R:FXD FLM 3.9K OHM 2% 1/8W	28480	0757-0938	
A1A1R24	0757-0972	1	R:FXD FLM 100K OHM 2% 1/8W	28480	0757-0972	
A1A1R25	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R26	0757-0935		R:FXD FLM 3K OHM 2% 1/8W	28480	0757-0935	
A1A1R27	0757-0941		R:FXD FLM 5.1K OHM 2% 1/8W	28480	0757-0941	
A1A1R28	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R29	0757-0948	6	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948	
A1A1R30	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R31	0757-0928		R:FXD FLM 1.5K OHM 2% 1/8W	28480	0757-0928	
A1A1R32	0757-0928		R:FXD FLM 1.5K OHM 2% 1/8W	28480	0757-0928	
A1A1R33	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R34	0757-0931	6	R:FXD FLM 2K OHM 2% 1/8W	28480	0757-0931	
A1A1R35	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R36	0757-0938		R:FXD FLM 3.9K OHM 2% 1/8W	28480	0757-0938	
A1A1R37	0757-0938		R:FXD FLM 3.9K OHM 2% 1/8W	28480	0757-0938	
A1A1R38	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R39	0757-0972	6	R:FXD FLM 100K OHM 2% 1/8W	28480	0757-0972	
A1A1R40	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R41	0757-0935		R:FXD FLM 3K OHM 2% 1/8W	28480	0757-0935	
A1A1R42	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R43	0757-0948		R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948	
A1A1R44	0757-0900	6	R:FXD MET FLM 100 OHM 2% 1/8W	28480	0757-0900	
A1A1R45	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R46	0757-0928		R:FXD FLM 1.5K OHM 2% 1/8W	28480	0757-0928	
A1A1R47	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R48	0757-0928		R:FXD FLM 1.5K OHM 2% 1/8W	28480	0757-0928	
A1A1R49	0757-0931	6	R:FXD FLM 2K OHM 2% 1/8W	28480	0757-0931	
A1A1R50	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R51	0757-0948		R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948	
A1A1R52	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R53	0757-0931		R:FXD FLM 2K OHM 2% 1/8W	28480	0757-0931	
A1A1R54	0757-0967	1	R:FXD FLM 62K OHM 2% 1/8W	28480	0757-0967	
A1A1R55	0757-0962	2	R:FXD FLM 39K OHM 2% 1/8W	28480	0757-0962	
A1A1R56	0757-0948	4	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948	
A1A1R57	0757-0893		R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893	
A1A1R58	0757-0916	1	R:FXD MET FLM 470 OHM 2% 1/8W	28480	0757-0916	
A1A1R59	0757-0948	1	R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948	
A1A1R60	0757-0933		R:FXD FLM 2.4K OHM 2% 1/8W	28480	0757-0933	
A1A1R61	0757-0907		R:FXD FLM 200 OHM 2% 1/8W	28480	0757-0907	
A1A1R62	0721-0011		2	R:FXD DEPC 500K OHM 1% 1/8W	28480	0721-0011
A1A1R63	0757-0910		1	R:FXD MET FLM 270 OHM 2% 1/8W	28480	0757-0910
A1A1R64	0757-0931	1	R:FXD FLM 2K OHM 2% 1/8W	28480	0757-0931	
A1A1R65	0757-0969		R:FXD FLM 75K OHM 2% 1/8W	28480	0757-0969	
A1A1R66	0757-0957		R:FXD FLM 24K OHM 2% 1/8W	28480	0757-0957	
A1A1R67	0757-0893		R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893	
A1A1R68	0757-0893		R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893	
A1A1R69	0757-0929	3	R:FXD FLM 1.6K OHM 2% 1/8W	28480	0757-0929	
A1A1R70	0757-0936	1	R:FXD FLM 3.3K OHM 2% 1/8W	28480	0757-0936	
A1A1R71	0757-0965	1	R:FXD FLM 51K OHM 2% 1/8W	28480	0757-0965	
A1A1R72	0757-0972	3	R:FXD FLM 100K OHM 2% 1/8W	28480	0757-0972	
A1A1R73	0698-3130		R:FXD MET FLM 2.70 MEGOHM 1% 1/8W	28480	0698-3130	
A1A1R74	0698-3130	1	R:FXD MET FLM 2.70 MEGOHM 1% 1/8W	28480	0698-3130	
A1A1R75	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924	
A1A1R76	0757-0929		R:FXD FLM 1.6K OHM 2% 1/8W	28480	0757-0929	
A1A1R77	0757-0902		R:FXD MET FLM 120 OHM 2% 1/8W	28480	0757-0902	
A1A1R78	0757-0935		R:FXD FLM 3K OHM 2% 1/8W	28480	0757-0935	

See introduction to this section for ordering information

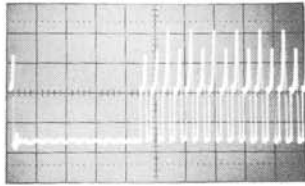
Table 7-4. A1 Synthesizer Assembly Replaceable Parts (Continued)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A1R79	0698-3129	1	R:FXD DEPC 1.00 MEGOHM 1% 1/8W	28480	0698-3129
A1A1R80	0721-0011		R:FXD DEPC 500K OHM 1% 1/8W	28480	0721-0011
A1A1R81	0757-0960	1	R:FXD FLM 33K OHM 2% 1/8W	28480	0757-0960
A1A1R82	0698-3126	1	R:FXD DEPC 2.21 MEGOHM 1% 1/8W	28480	0698-3126
A1A1R83	0698-3127	1	R:FXD DEPC 4.75 MEGOHM 2% 1/8W	28480	0698-3127
A1A1R84	0757-0948		R:FXD FLM 10K OHM 2% 1/8W	28480	0757-0948
A1A1R85	0757-0943	1	R:FXD FLM 6.2K OHM 2% 1/8W	28480	0757-0943
A1A1R86	0698-3130		R:FXD MET FLM 2.70 MEGOHM 1% 1/8W	28480	0698-3130
A1A1R87	0757-0950	1	R:FXD FLM 12K OHM 2% 1/8W	28480	0757-0950
A1A1R88	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924
A1A1R89	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924
A1A1R90	0757-0942	1	R:FXD FLM 5.6K OHM 2% 1/8W	28480	0757-0942
A1A1R91	0757-0929		R:FXD FLM 1.6K OHM 2% 1/8W	28480	0757-0929
A1A1R92	0757-0893		R:FXD FLM 51 OHM 2% 1/8W	28480	0757-0893
A1A1R93	0757-0934	1	R:FXD FLM 2.7K OHM 2% 1/8W	28480	0757-0934
A1A1R94	0757-0962		R:FXD FLM 39K OHM 2% 1/8W	28480	0757-0962
A1A1R95	0757-0900		R:FXD MET FLM 100 OHM 2% 1/8W	28480	0757-0900
A1A1R96	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924
A1A1T1	05065-8012	1	TRANSFORMER:BLOCKING OSCILLATOR	28480	05065-8012
A1A1T2	05065-8011	2	TRANSFORMER:5.3MHZ	28480	05065-8011
A1A1T3	05065-8011		TRANSFORMER:5.3MHZ	28480	05065-8011
A1A1XY1	1200-0159	1	CRYSTAL HOLDER	28480	1200-0159
A1A1Y1	0410-0162	1	CRYSTAL:5.315MHZ	28480	0410-0162

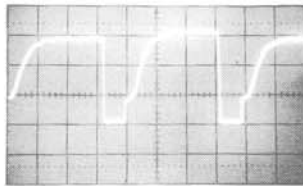
See introduction to this section for ordering information

**SYNTHESIZER ASSEMBLY A1 BLOCK DIAGRAM**

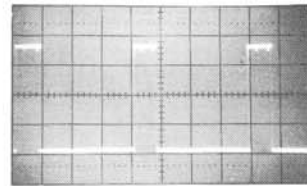
Figure 7-6. A1 Waveforms



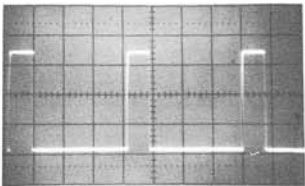
1 .5/cm, .5 s/cm



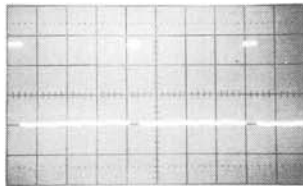
2 1 V/cm, .5 s/cm



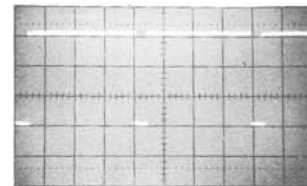
3 Q3 Col & Q7 Col Grd.  
.5 V/cm, 5 s/cm



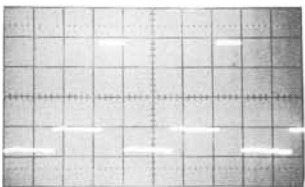
4 1 V/cm, 5 s/cm



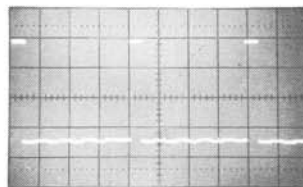
5 .5 V/cm, 50 s/cm



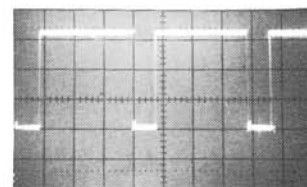
6 .5 V/cm, 50 s/cm



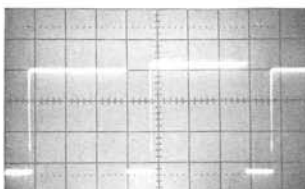
7 Time Scale 0000  
.5 V/cm, .5 ms/cm



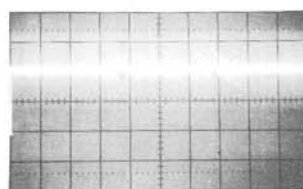
8 Q3 Col & Q7 Col Grd.  
1 V/cm, .5 ms/cm



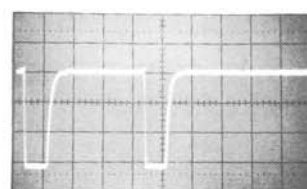
9 Q11, Q3, & Q7 Col,  
Shorted to Grd.  
.5 V/cm, .5 s/cm



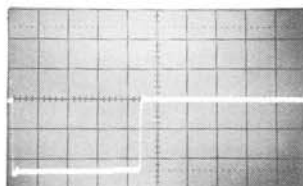
10 1 V/cm, .5 s/cm\*



11 Time Scale 0000  
2 V/cm, .2 ms/cm



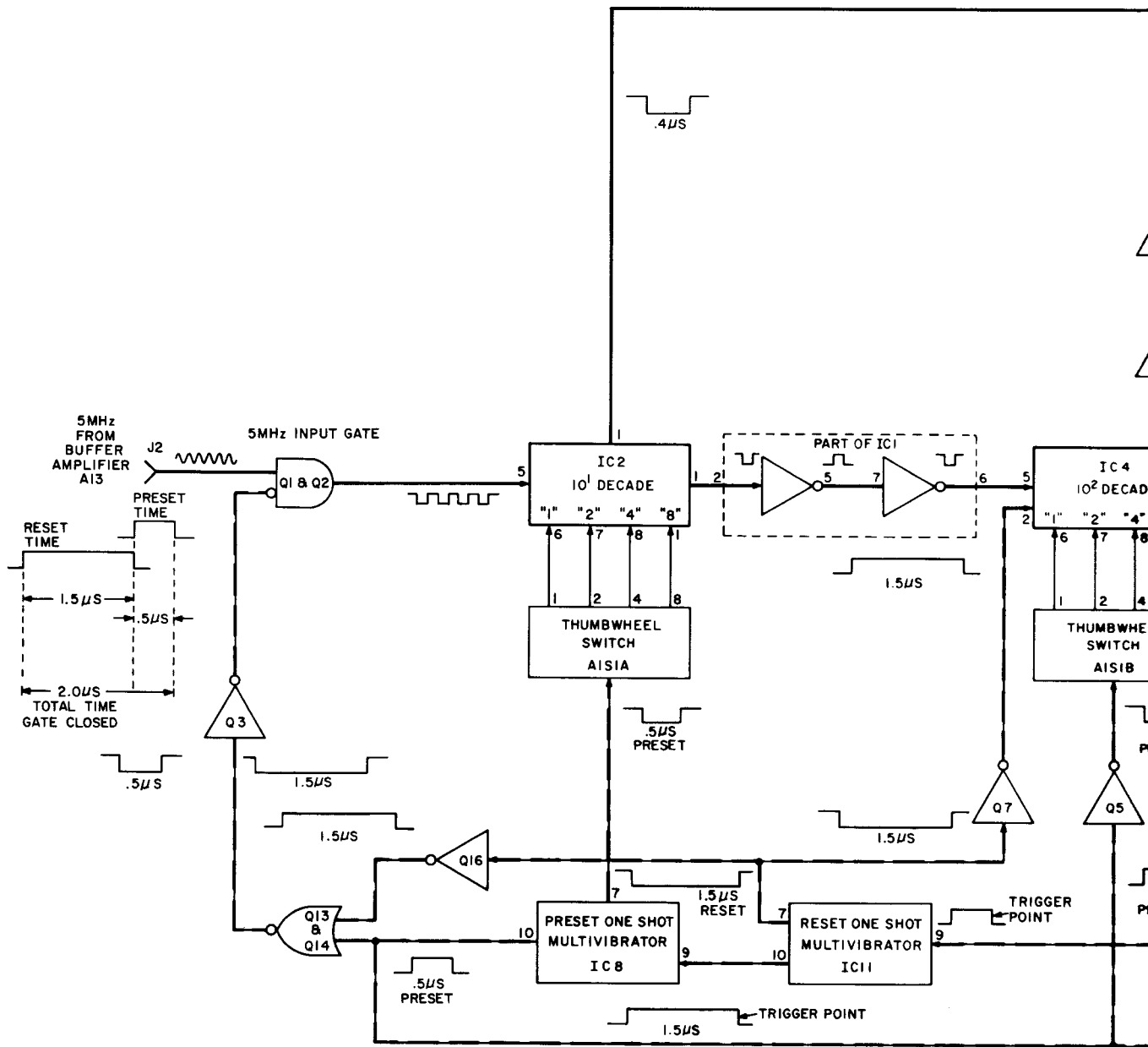
12 TPI - Q7 Col Grd.  
.5 V/cm, .5 s/cm

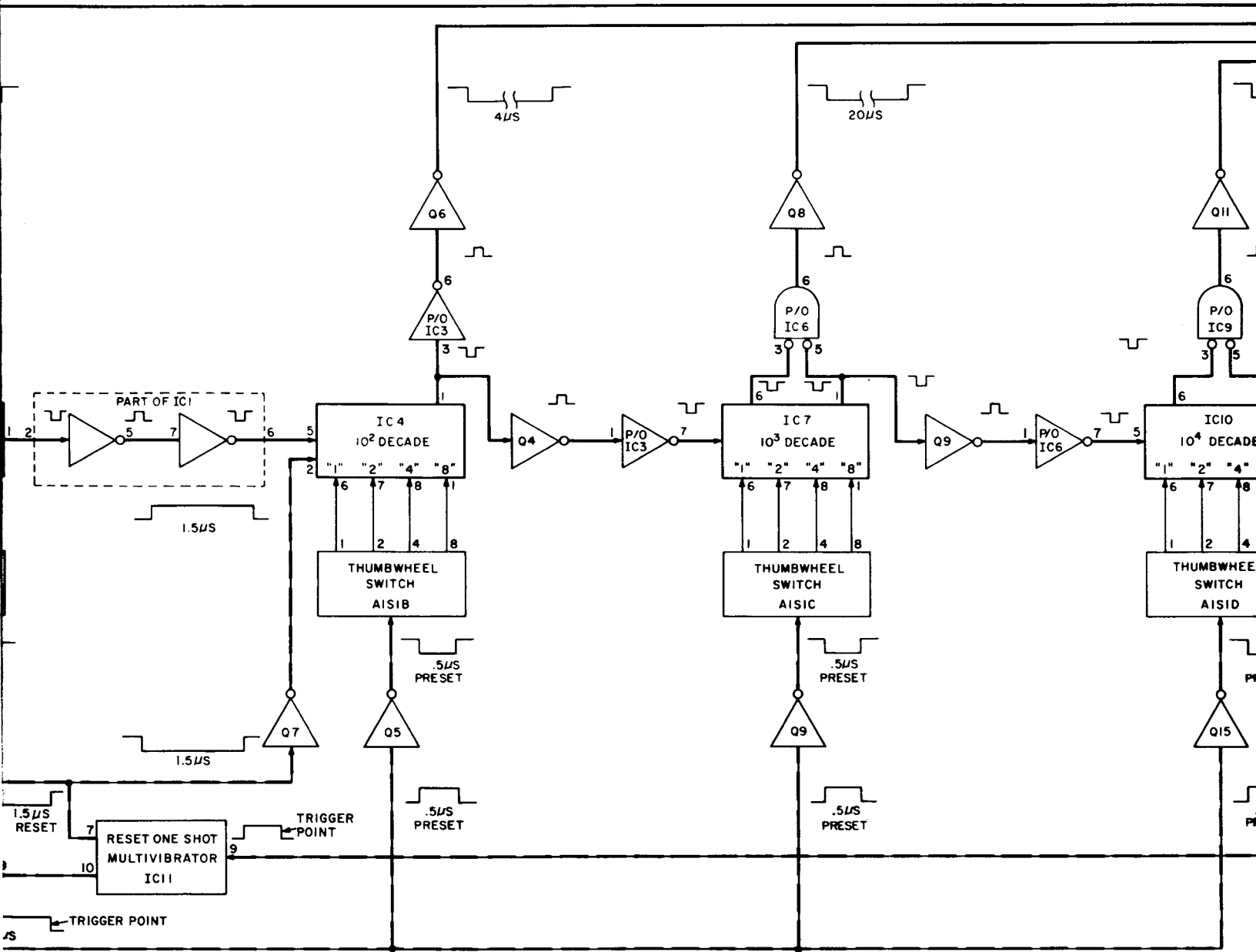


13 1 V/cm, .5 s/cm

5065A: Normal Operation unless noted.  
Oscilloscope: DC coupled

\*A1Q3(c) and A1Q7(c) connected to A1 chassis ground.







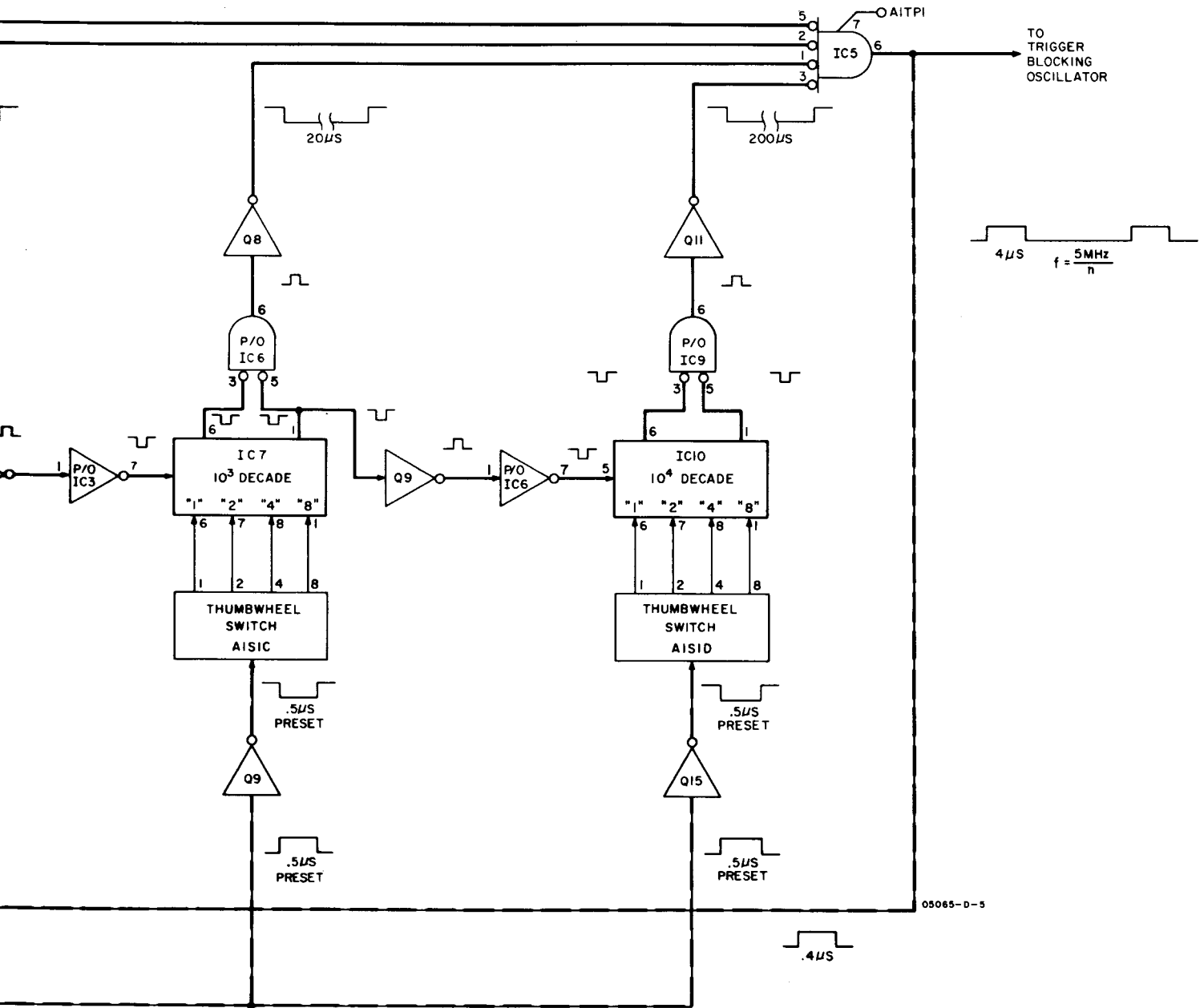
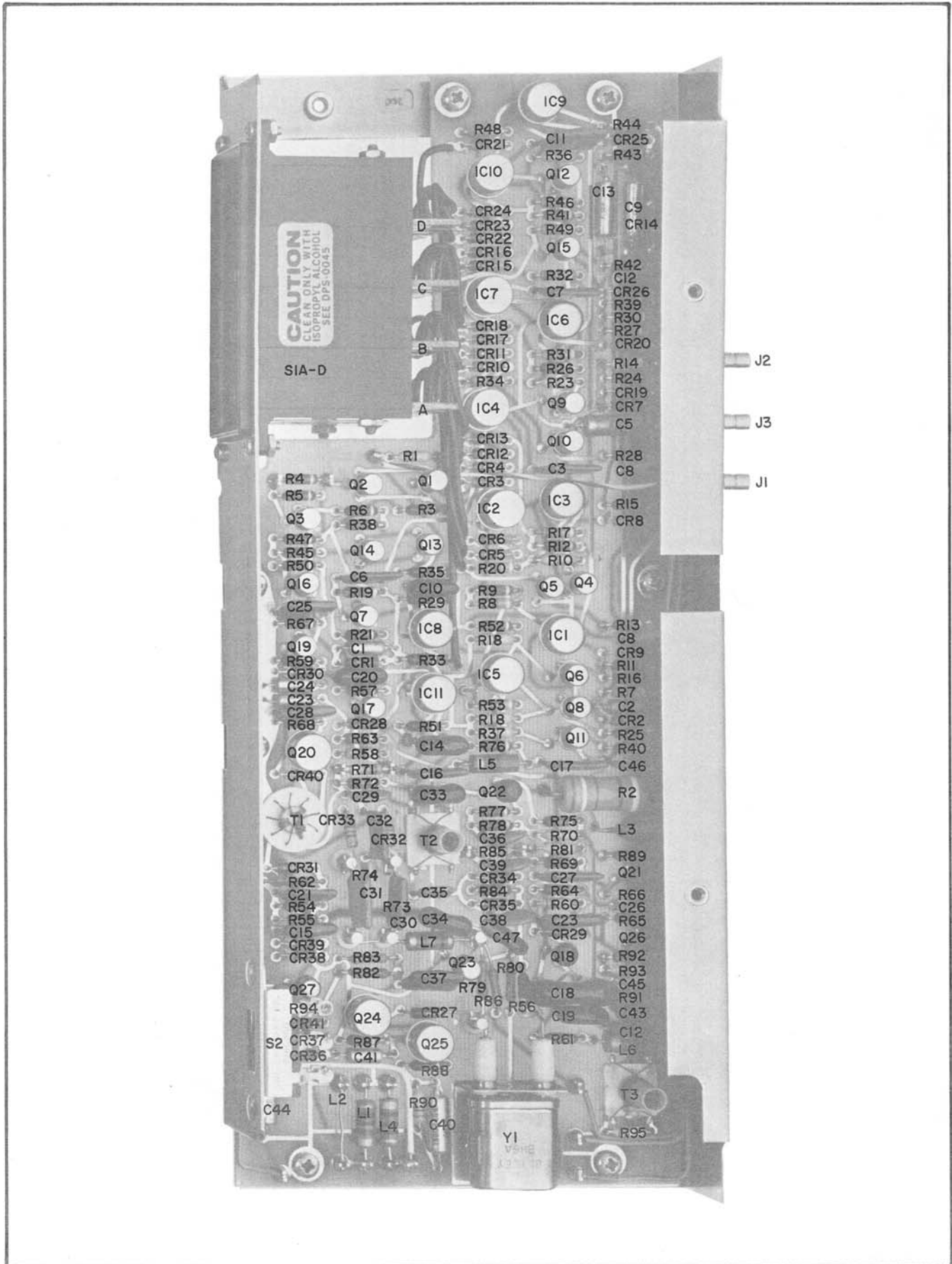
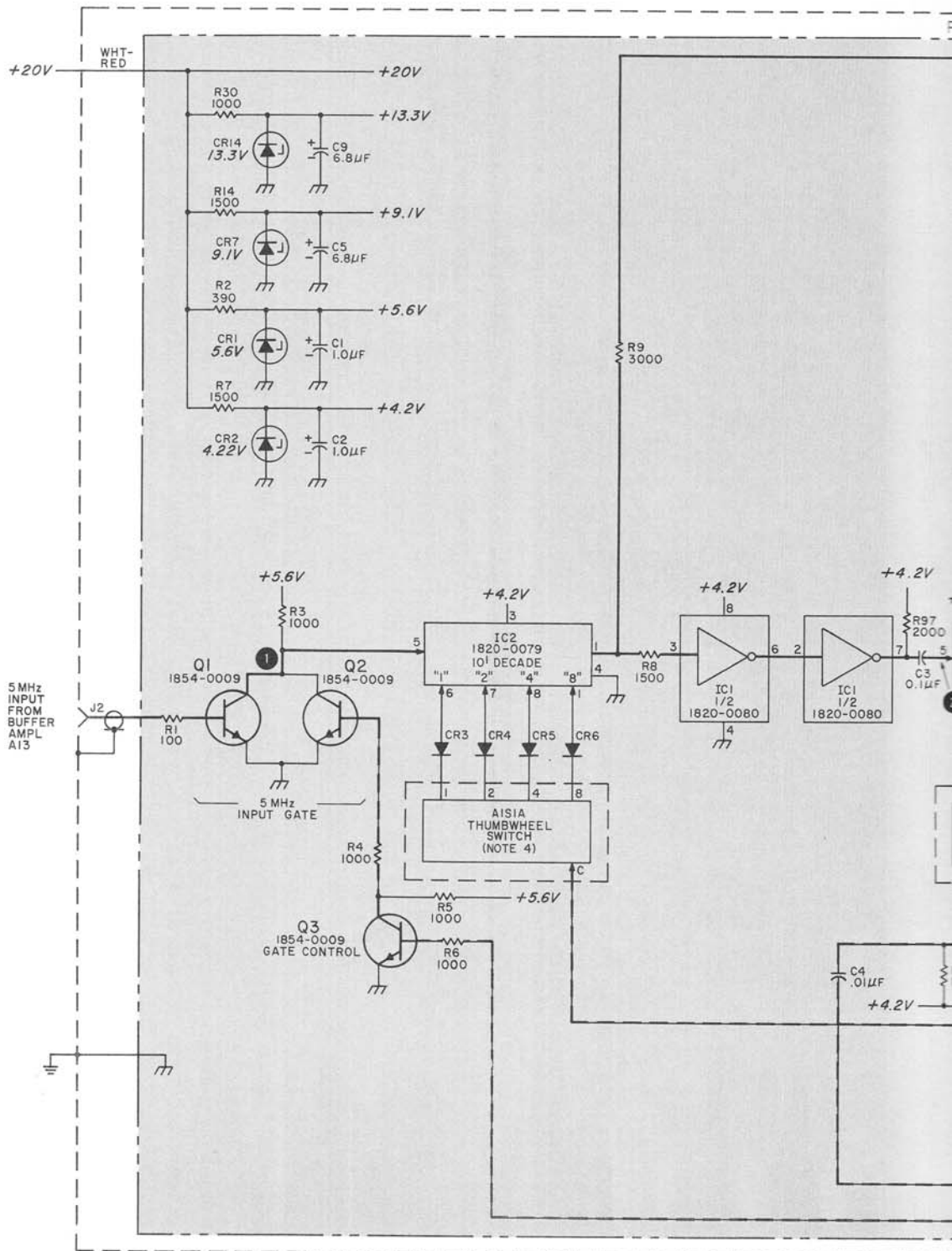


Figure 7-7. Synthesizer Assembly A1 Block Diagram

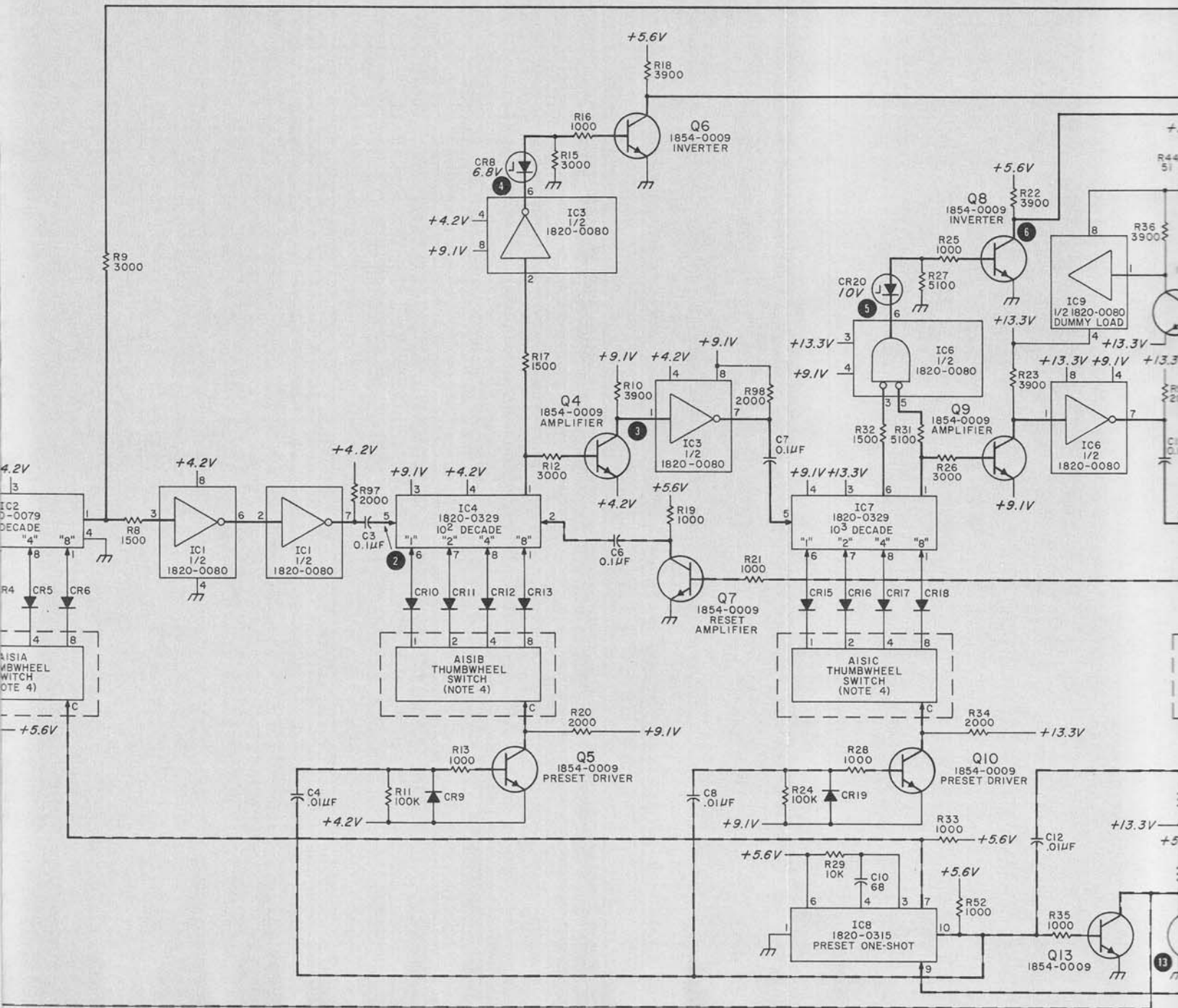
Figure 7-9  
**PART OF A1 SYNTHESIZER ASSEMBLY**  
(See Page 7-23)

Figure 7-8. A1 Synthesizer Assembly

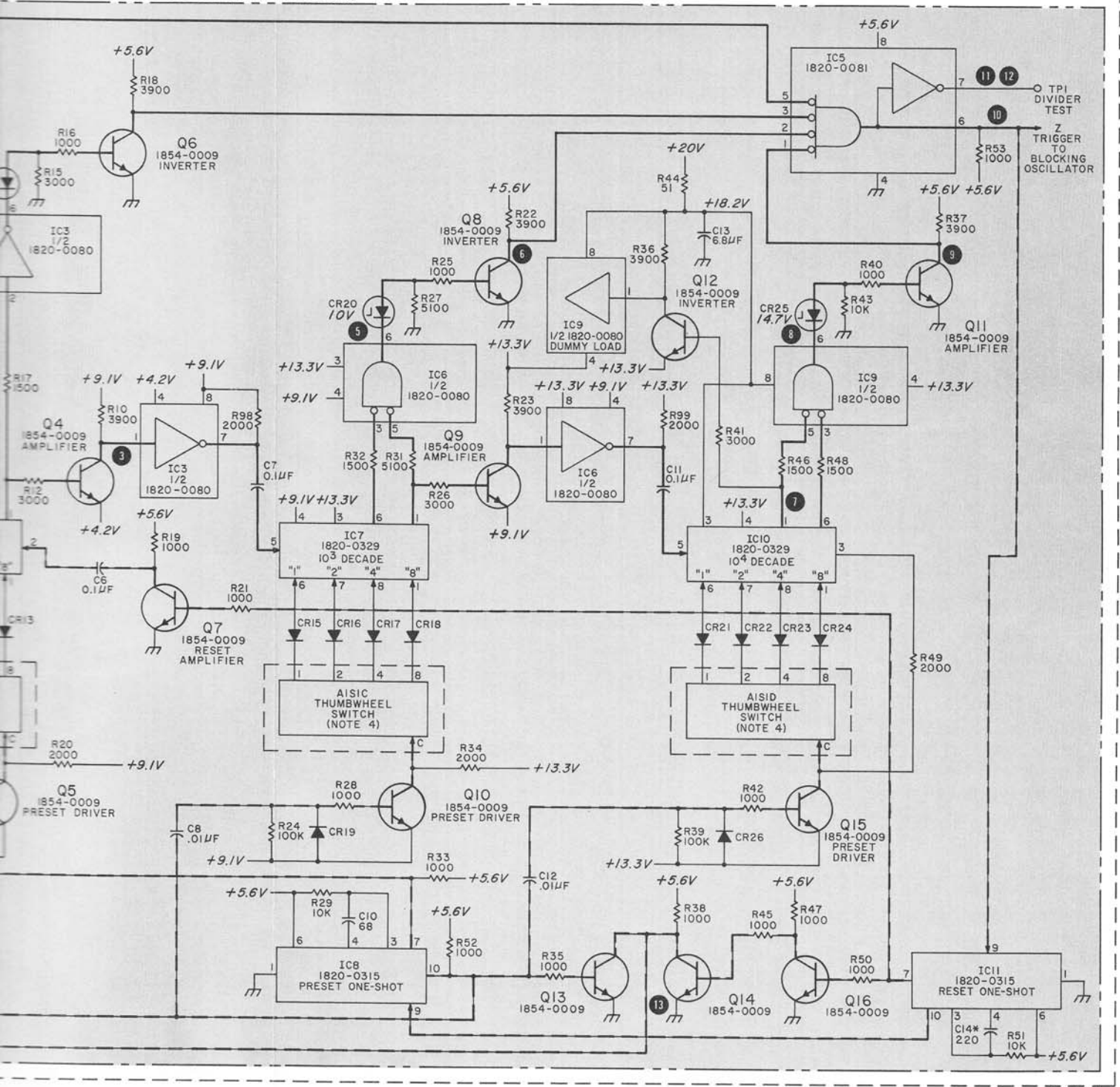




PART OF AI SYNTHESIZER ASSEMBLY (05065-6018) (NOTE 1)  
 PART OF AAI SYNTHESIZER P.C. BOARD ASSEMBLY (05065-6019)



SYNTHESIZER ASSEMBLY (05065-6018) (NOTE 1)  
SYNTHESIZER P.C. BOARD ASSEMBLY (05065-6019)



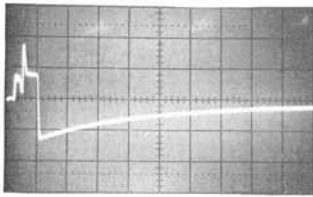
05065-D-6

Figure 7-9. Part of A1 Synthesizer Assembly

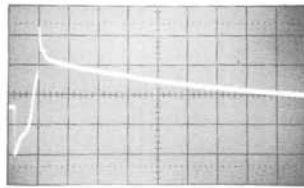
**SYNTHESIZER A1 PHASE-LOCKED OSCILLATOR SECTION**

Figure 7-11  
(See Page 7-25)

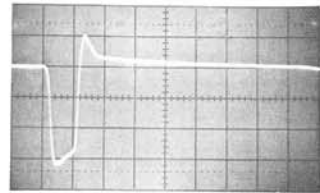
Figure 7-10. A1 Waveforms



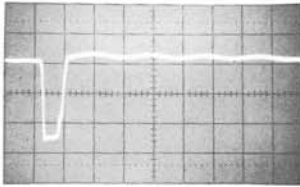
14 1 V/cm, .5 s/cm



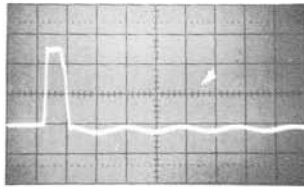
15 .5 V/cm, .5 s/cm



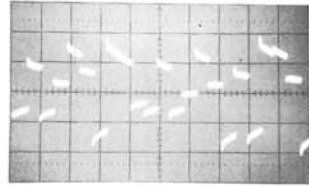
16 5 V/cm, .1 s/cm



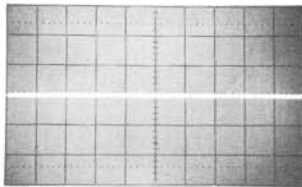
17 (Y1 OUT) 5 V/cm  
.1 s/cm



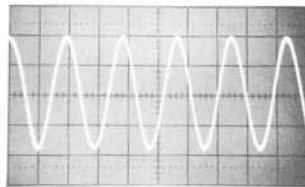
18 (Y1 OUT) 5 V/cm  
.1 s/cm



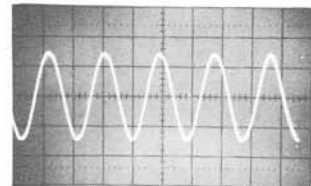
19 2 V/cm, 2 ms/cm



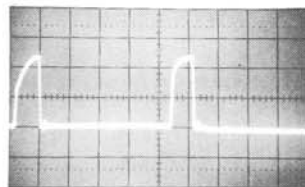
20 2 V/cm, 2 ms/cm



21 2 V/cm, .1 s/cm



22 1 V/cm, .1 s/cm



23 Q3 Col & Q7 Col Grd.  
1 V/cm, .5 s/cm

5065A: Normal operation unless noted.

Oscilloscope: DC coupled





PART OF AI SYNTHESIZER ASSEMBLY (05065-6018) (NOTE 1)

PART OF AAI SYNTHESIZER P.C. BOARD ASSEMBLY (05065-6019)

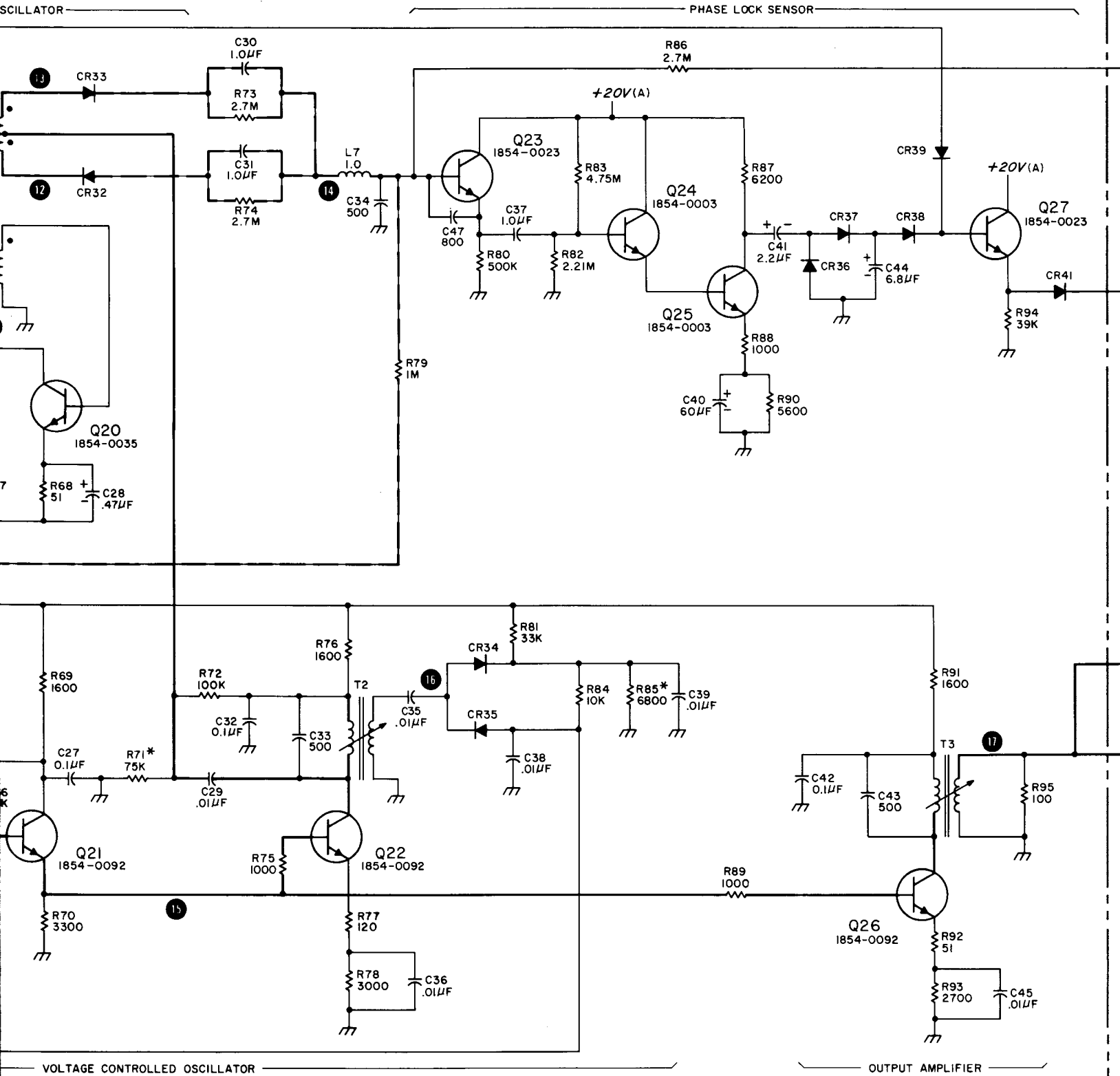
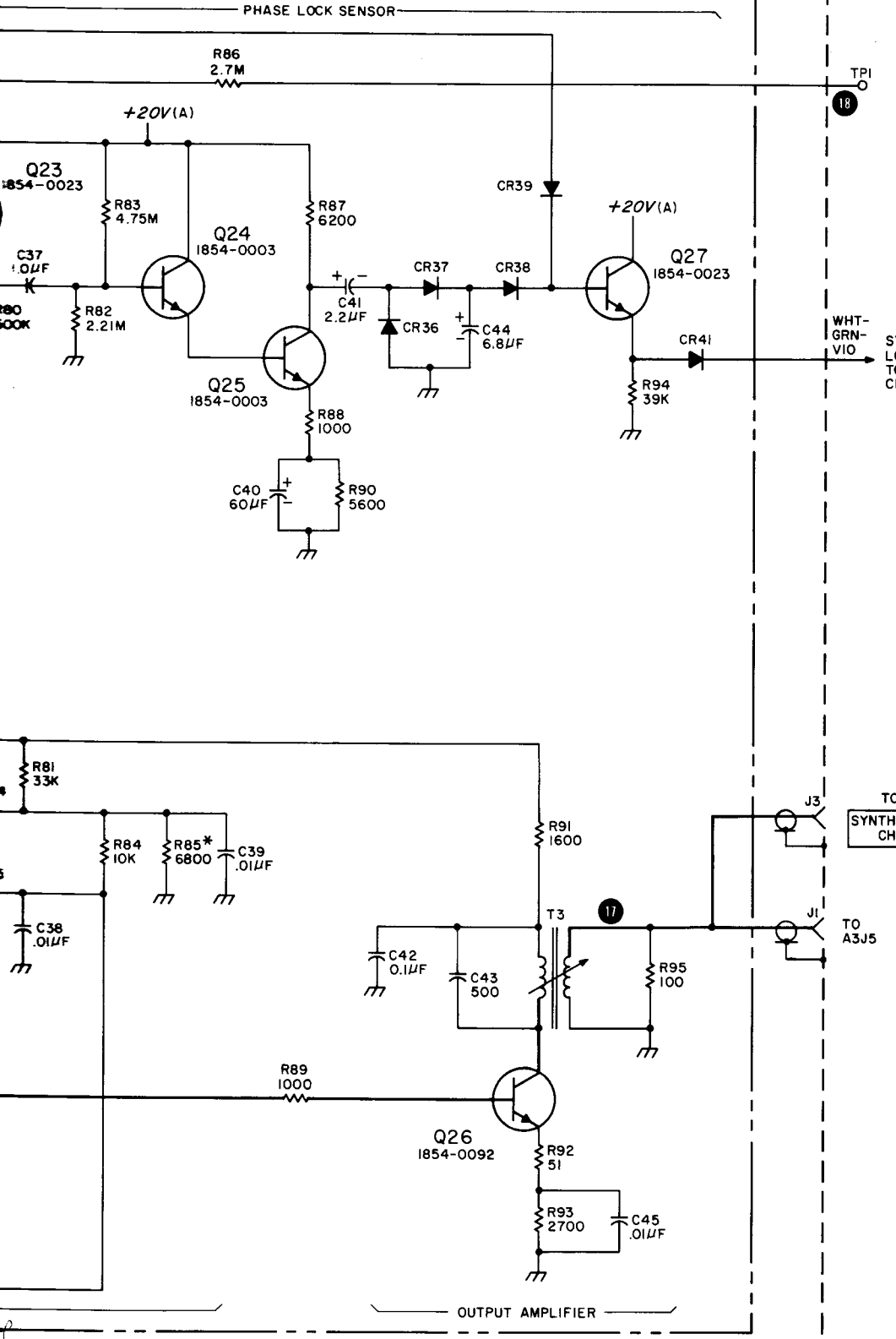


Figure 7-1

NOTE 1)

05065-6019)



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. ASTERISK(\*) INDICATES SELECTED COMPONENT, AVERAGE VALUES SHOWN.
4. SEE THUMBWHEEL SWITCH PAGE 8-10

REFERENCE DESIGNATIONS

NO PREFIX	A1	A1A1
		CI-3,15-45, 47-49 CR1,2,27, 29-39,41 IC1-6
	J1-3	LI-9 Q1-4,17-27 RI-26, 54-57, 59-95,100
TPI	SI,2	TI-3 TPI YI

05065-D-7AB

Figure 7-11. Synthesizer A1 Phase-Locked Oscillator Section

Table 7-5. A1 Troubleshooting

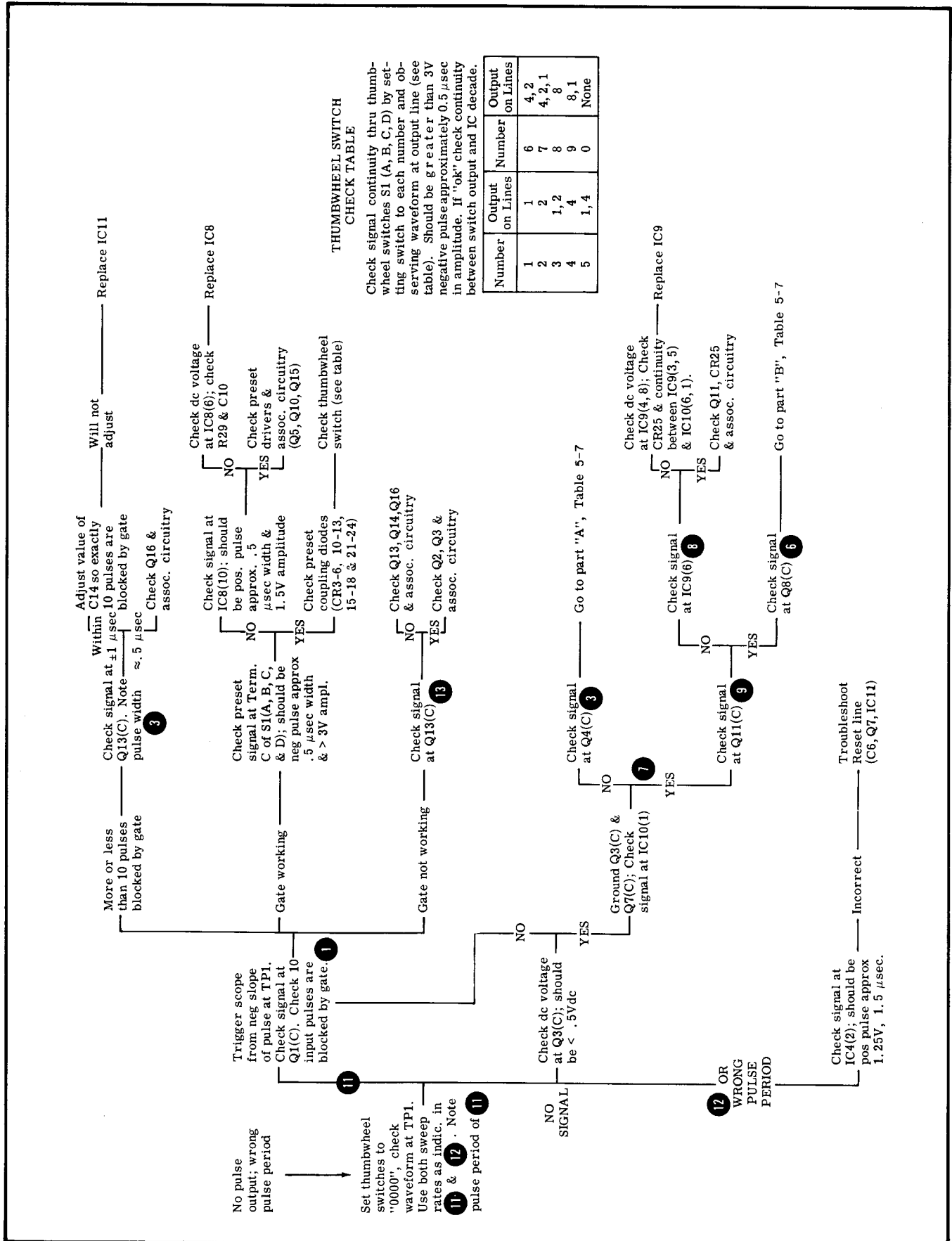


Table 7-6. A1 Troubleshooting

