Errata

Title & Document Type: **4204A Oscillator Operating and Service Manual**

Manual Part Number: **04204-90010**

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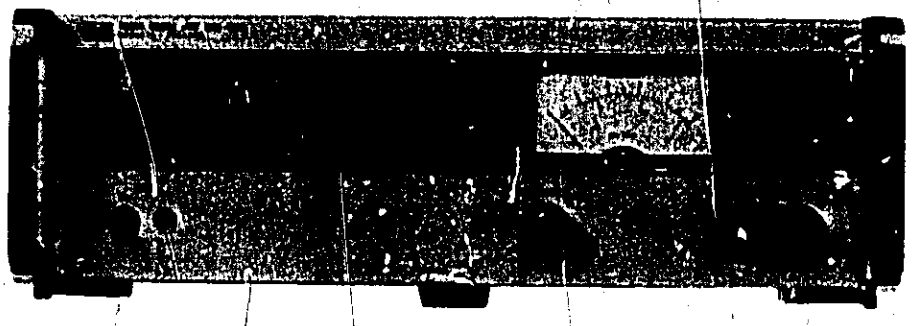
OPERATING AND SERVICE MANUAL

OSCILLATOR

4204A



HEWLETT PACKARD

4204A

CERTIFICATION

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

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OPERATING AND SERVICE MANUAL

MODEL 4204A
OSCILLATOR

SERIALS PREFIXED: 1523J

See Section VII for Other Serial Prefixes.

Manual Part No. 04204-90010
Microfiche Part No. 04204-90060

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HEWLETT PACKARD

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

Table 1-1. Specifications

Frequency Range: 10Hz to 999.9kHz, digitally set in 4 digits.

Frequency Accuracy: ±0.2% or ±0.1Hz, whichever is greater (at 25°C).

Frequency Stability:

±10% Line Voltage Variation: Less than ±0.01%.

Change of Frequency with Temperature: ±100 ppm/°C.

Drift: 10 ppm/minute

Frequency Response: Flat within ±3%, 9.999kHz reference (25°C ±5°C).

Output: 10 V (22 dBm) into 600 ohms (160 mW). 20V Open Circuit.

Output Attenuator: 80 dB in 10 dB steps; ±0.5 dB error.

Output Monitor: Voltmeter monitors level at input of attenuator in volts or dB.

Accuracy: ±2% of full scale.

Flatness: ±1% at full scale, 10 Hz to 500kHz.
±2% at full scale, 500kHz to 1MHz.

Distortion: Less than 0.3%, 30Hz to 100kHz.
Less than 1%, 10Hz to 600kHz.
Less than 1.2%, 10Hz to 1MHz.

Hum and Noise: Less than 0.05% of output.

Temperature Range: 0°C to +50°C.

Power: 115V/230V switch, ±10%, 10 watts, 50 to 60 Hz.

Weight: Net, 19 lbs. (8.5 kg). Shipping, 28 lbs. (11 kg).

Accessories Available:

HP 11004A Line Matching Transformer has a frequency response of 5kHz to 600kHz providing fully balanced outputs for 135 or 600 ohms.

HP 11005A Line Matching Transformer has a frequency response of 20 Hz to 45 kHz providing full balanced output into 600 ohms.

HP 16252A Matching Transformer has a frequency response of 10 kHz to 1 MHz providing unbalanced 75 ohm output, terminated in UG-657/U female BNC connector.

Frequency characteristics: ±0.1dB(typ), 10kHz to 1MHz.

HP 11000A Cable: Dual Banana Plug.

HP 11001A Cable: Banana Plug to BNC Male connector.

Option 01: 4204A Output Monitor top scale calibrated in dBm/600Ω. Bottom scale calibrated in volts.

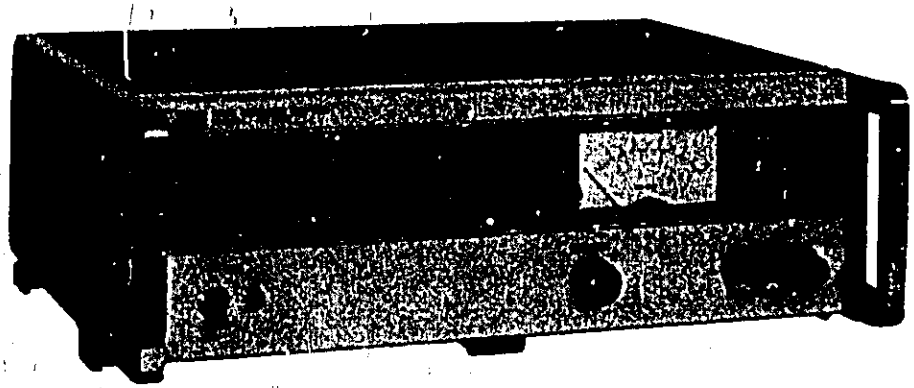


Figure 1-1. Model 4204A Oscillator

SECTION I
GENERAL INFORMATION

1-1. DESCRIPTION

1-2. The Hewlett-Packard Model 4204A Oscillator is a general-purpose digital oscillator that produces a sine wave output signal continuously adjustable in frequency from 10 Hz to 1 MHz and in amplitude from 0 to 10 volts rms into a 600-ohm load (-60 to +22 dBm). Frequency selection is by four, in-line, indicating switches, one for each digit and by a frequency control that provides continuous adjustment between digital settings. An output attenuator provides accurate attenuation in 10-dB steps and an amplitude control provides continuous adjustment between steps. The output signal level is measured by a front-panel meter calibrated in both rms volts and dBm. The 4204A Oscillator is isolated from power-line ground to permit connecting the output terminals to external circuits above and below ground potential with minimum shunting, and to avoid undesirable ground loops. The 4204A uses stabilized amplifiers and regulated power supplies to obtain the frequency stability needed for 4-place resetability.

1-3. CIRCUIT DESCRIPTION

1-4. The 4204A Oscillator consists of a Wien Bridge oscillator, an output amplifier followed by continuously adjustable amplitude control, a step adjustable attenuator feeding the output terminals, and an electronic voltmeter that measures the signal level applied to the output attenuator. Each step on the attenuator switch indicates the full-scale voltage to be read from the meter. The output attenuator presents a 600-ohm source resistance to the output terminals. In the 10 and 30-volt positions of the attenuator, the attenuator is out of the circuit, and the amplitude control and amplifier together present a 600-ohm internal impedance to the load. The output amplifier completely isolates the oscillator tuning circuits from the output terminals. The amplifier maintains good waveform purity with a wide range of load impedances; specified purity is obtained with any load above 600 ohms.

SECTION II
INSTALLATION

2-1. UNPACKING AND INSPECTION

2-2. When receiving a shipment from a carrier, inspect the shipping container with carrier present. If the shipping carton shows evidence of rough handling when received, take exception on the carrier delivery receipt before accepting the shipment. If no apparent damage is noted, but physical damage is discovered upon opening of the carton, preserve the carton and packing materials intact, notify the carrier immediately, and have them perform a written inspection of the condition of the carton and its contents.

2-3. STORAGE

2-4. When storing the oscillator, wrap in paper to prevent air circulation and accumulation of dust. Do not subject the oscillator to temperatures below -40° C or above +75° C (-53° F to +167° F).

2-5. SHIPMENT

2-6. If possible, use original shipping container and cushions for reshipment. Otherwise, wrap instrument in wrapping paper, completely surround it with a 1-1/2 inch thick urethane cushions (or equivalent), and pack firmly in a strong corrugated paper container. Seal with strong tape and mark box "FRAGILE". If loose fill dunnage such as "flakes" or "straws" is used, use at least three inches thickness all around and pack the dunnage very tightly. Loose fill compresses after a short time and allows the load to shift.

2-7. OPERATION ON 115 OR 230-VOLT LINES

2-8. The Model 4204A can be operated on either 115 or 230-volt (±10%), 50 to 60 Hz 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 slide the switch to expose "115" marking for 115-volt operation, or "230" marking for 230-volt operation. The oscillator is supplied with a 115-volt fuse; be sure to replace this fuse for 230-volt operation (see Table 2-1).

Table 2-1. 115/230 Volt Conversion

Line Voltage Conversion	115 Volt	230 Volt
Slide Switch	Up	Down
AC Line Fuse	200mAT (HP 2100-0235)	100mAT (HP 2100-0234)

CAUTION

Before plugging instrument into AC power line be sure LINE VOLTAGE switch is properly positioned.

2-9. GROUNDING THE OSCILLATOR CABINET

2-10. The 4204A is equipped with a detachable, 3-wire power cord, (HP part number 8120-1378). The round pin on the plug connects the instrument cabinet (but not the inner chassis) to the power-line ground. When connecting to a 2-blade outlet, use a connector adapter (HP part number 1251-0048), and connect the short lead on the adapter to ground. Do not disconnect this ground wire to obtain "ungrounded" operation; instead, disconnect the captive ground strap between the red and black OUTPUT terminals on the front panel.

2-11. RACK INSTALLATION

2-12. The Model 4204A is ready for bench operation as shipped from the factory. Additional parts necessary for rack mounting are packaged with the instrument. To convert for rack installation, proceed as follows:

a. Remove tilt stand from bottom.

b. Remove feet from bottom. (press the foot-release button, slide foot toward center of instrument, and lift off).

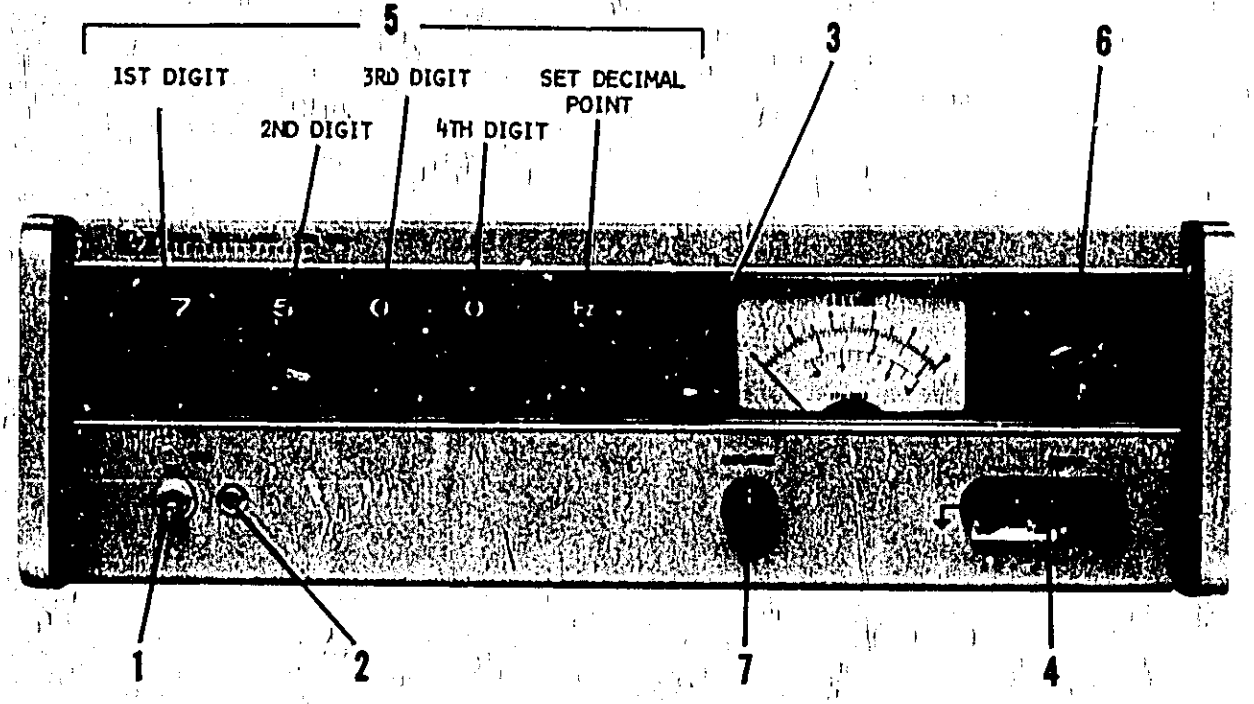
c. Remove adhesive-backed trim strips near front end of each side panel.

d. Attach rack filler strip along bottom edge of front panel.

e. Attach flanges to side panels where trim strips were removed. Instrument is now ready to mount in a standard rack.

2-13. OPERATOR'S MAINTENANCE

2-14. Operator's preventive maintenance consists of observing and reporting any sign of deterioration to repair facilities. Examples of deterioration are inaccurate frequency or amplitude indication, inadequate output level, difficult operation of controls or physical damage. Lubrication is used only on a sliding bar that carries the decimal point across the frequency indicators. A small amount of grease can be applied when needed, after wiping off old lubricant. The following check-out procedure is provided for an operator's quick test of oscillator performance. Perform this test after every shipment or prolonged storage, and after rough handling or use in severe climatic conditions.



1. Line switch: turns on the oscillator.

2. Pilot lamp: lights when the oscillator is turned on.

3. VERNIER control: adjusts output frequency within a frequency range of ±1 count at the least significant digit of Frequency Selector setting.

4. OUTPUT connector: provides output signal maximum 10 volts rms into 600Ω load. Shorting strap connects chassis ground and power line ground.

5. Output Frequency Selector switch: select the figure for each of the four digits and sets the decimal point with corresponding unit. The figure "0" in the 1st digit is usable only on Hz range.

6. OUTPUT ATTENUATOR: selects the meter voltage range.

7. AMPLITUDE control: adjust the output level as read on the meter.

Figure 3-1. Front Panel Controls, Connectors and Indicators

SECTION III
OPERATION

3-1. OPERATING PROCEDURE

3-2. The step-by-step procedure for operating the 4204A Oscillator is shown in the Figure 3-1.

3-3. FREQUENCY STABILITY AFTER TURN ON

3-4. The 4204A output frequency is within specified accuracy a few seconds after turn on; however, best frequency stability is obtained after a 5-minute warm-up. After the warm up, and with a stable ambient temperature, frequency drift is less than 10 PPM/minute. If the ambient temperature changes, the resulting change in frequency will be less than 100 PPM/°C. If the power-line voltage changes, the resulting change in frequency will be less than 100 PPM/10% line voltage change. Momentary turn-off causes a minor frequency shift and about three minutes are needed to return to original frequency.

3-5. FREQUENCY VERNIER

3-6. The 4204A output frequency is calibrated when the VERNIER control is centered. Adjusting the VERNIER clockwise increases frequency; maximum rotation gives about 0.1% frequency change.

3-7. OPERATING PRECAUTIONS

WARNING

When operating the oscillator ungrounded, the inner chassis assumes the electrical potential of the circuit to which the output terminals are connected. This potential exists on the control knob set screws.

3-8. Do not connect the OUTPUT terminals to circuits that are more than 600 volts from ground potential. Do not apply potentials across the OUTPUT terminals. Excessive current applied to the output attenuator can impair its accuracy. The first (left-hand) frequency selector should be set to "0" only on the Hz frequency range. When switching to the lowest frequencies, a few seconds are required for oscillation buildup. On 1V range and below, the OUTPUT terminals must be connected to a 600-ohm load for the meter to be accurate.

3-9. OUTPUT TERMINAL ISOLATION FROM GROUND

3-10. The entire oscillator circuit and red OUTPUT terminals are ungrounded; they are isolated from the power-line ground by over 15GΩ in parallel with approximately 500 picofarads. The oscillator cabinet is connected through a third wire in the power cord to the power line ground. The black binding post to the left of the OUTPUT terminals connects directly to the instrument cabinet and power line ground. The captive grounding strap on this binding post can be connected to the adjacent red OUTPUT terminal to ground the low-side of the oscillator output. If the load connected to the oscillator output is already grounded, it may be desirable to leave the oscillator output ungrounded to avoid having two ground points. This prevents unwanted ground currents from flowing through the signal leads, especially important when generating very low-level signals. Figure 3-2 shows an example of using the oscillator output ungrounded and connected to a circuit at high potential.

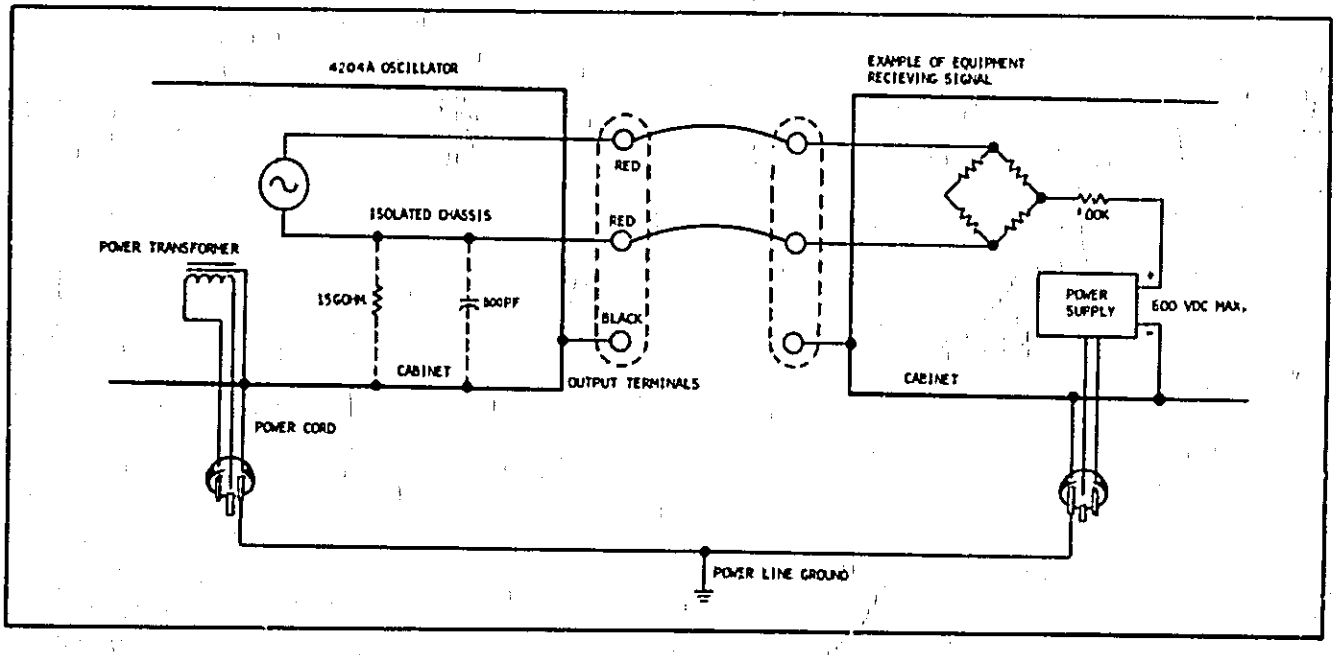


Figure 3-2. Example of Isolated Output Terminal

3-11. READING THE OUTPUT METER

3-12. The front-panel meter indicates the rms value of the voltage at the OUTPUT terminals, using the full-scale voltage indicated by the setting of the output attenuator. For the meter to be read accurately, the OUTPUT terminals must be connected to a 600-ohm load. Any other value of load resistance changes the actual output voltage from that read on the meter, except on the 10 and 30-volt ranges when all attenuator resistance is out of the circuit. The actual output voltage or dBm for other values of load resistance can be determined from the equations which follow. Equations for obtaining actual output voltage for external loads other than 600 ohms:

10V and 30 V ranges:

$$E_{output} = E_{meter}$$

3 V range:

$$E_{output} = \frac{2 \times E_{meter}}{1 + \frac{600}{R_{load}} + 0.1\left(1 - \frac{600}{R_{load}}\right)}$$

1V to 1 mV ranges:

$$E_{output} = \frac{2 \times E_{meter}}{1 + \frac{600}{R_{load}}}$$

3-13. ZERO SETTING THE METER

3-14. Set the meter pointer to the zero calibration mark with the oscillator turned off. Adjust the meter pointer by turning the black disk below the meter face. There is a small recess in the disk to receive a pointed tool.

3-15. LOADING THE OUTPUT TERMINALS

3-16. The 4204A output terminals may be connected to any load impedance above 600 ohms without impairing waveform purity. Load impedances very much lower than 600 ohms increase waveform distortion approximately as shown in the Figure 3-3.

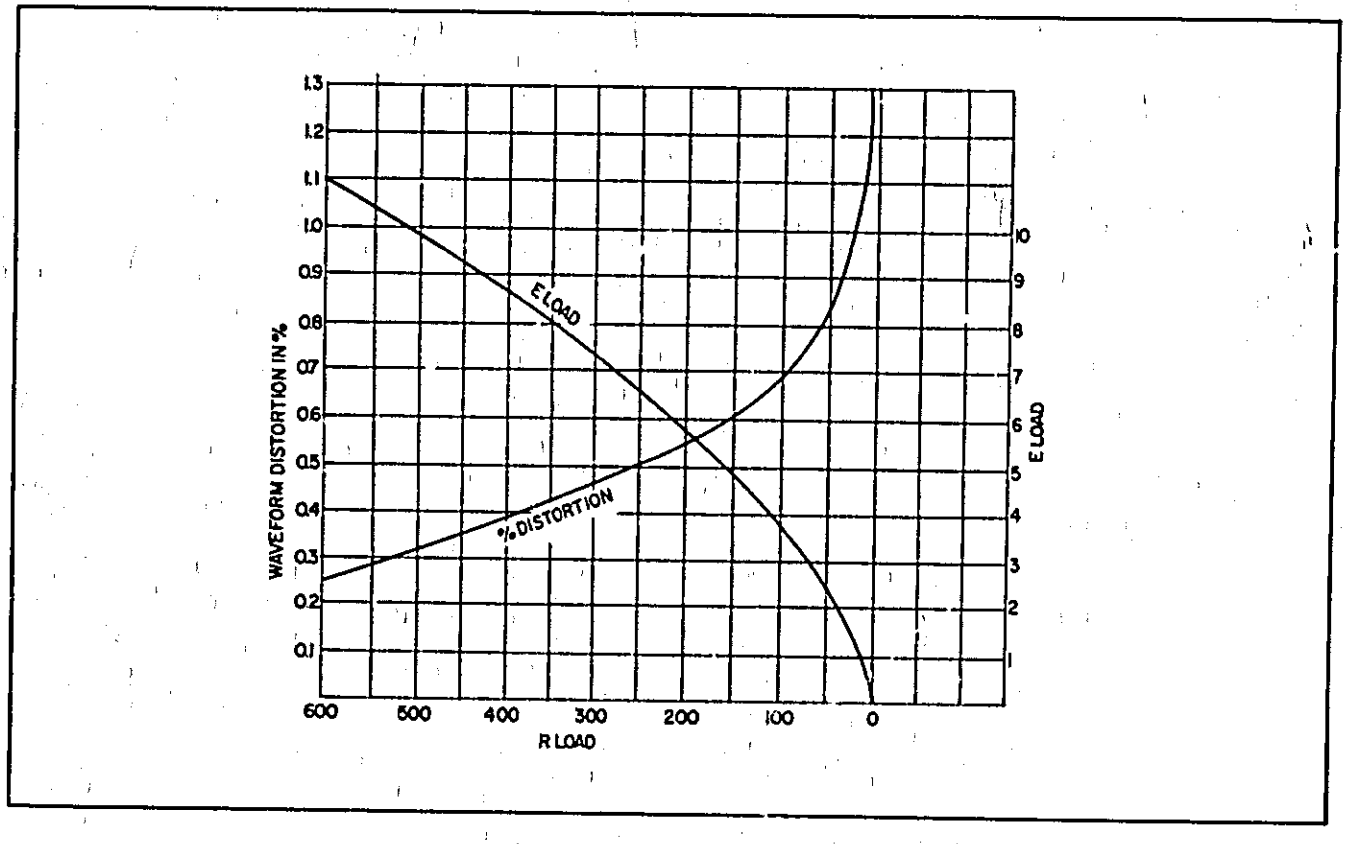


Figure 3-3. Load vs Distortion Curve

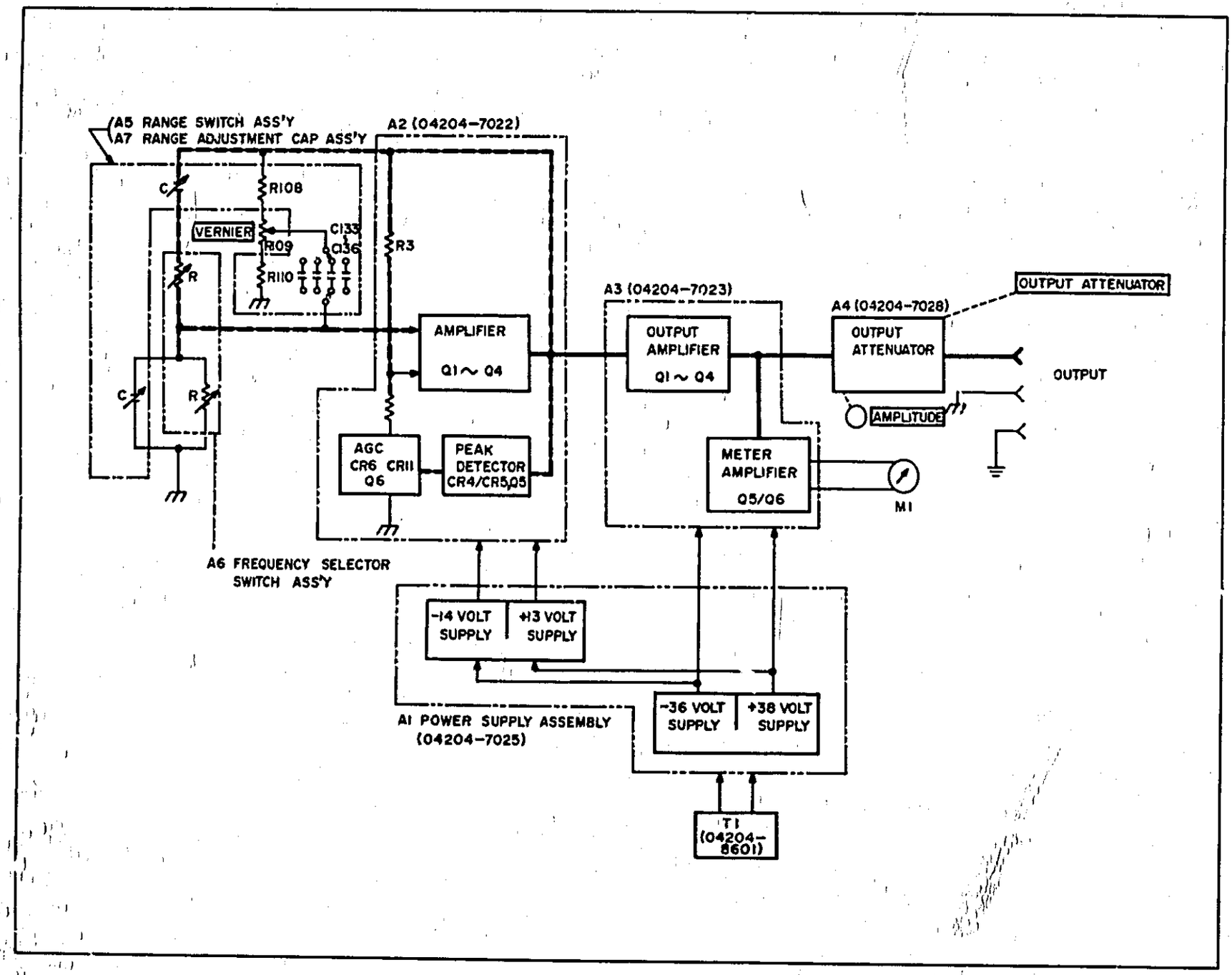


Figure 4-1. Model 4204A Block Diagram

SECTION IV
THEORY OF OPERATION

4-1. INTRODUCTION

4-2. This section discusses the basic principles of the HP Model 4204A digital oscillator. A general description of block diagram is given first, with details of various circuits following. The block diagram section discusses the functions of the major circuits within the instrument, using the overall block diagram. The circuit description provides a detailed description of all major circuits. It is suggested that the block diagram and schematics included in this manual be referred to while reading the circuit description.

4-3. The Model 4204A utilizes a Wien Bridge RC circuit and combines the functions of audio oscillator and AC voltmeter in application requiring an accurate frequency of known amplitude. A digital frequency indicator is provided and is ideal where repeatability of measurement is required. Any frequency between 10.0 Hz and 999.9 kHz can be digitally selected with an in-line rotary switch. As many as 36,900 discrete frequencies are available. A built-in high impedance voltmeter measures the output. The meter is calibrated to read in volts or dBm into a matched 600 ohm load. The output attenuator has an 80dB range adjustable in 10dB steps with a 20dB vernier control. Maximum output power can be increased to 10 volts (22 dBm) in 600 ohms.

4-4. BLOCK DIAGRAM DESCRIPTION

4-5. The HP Model 4204A Digital Oscillator provides accurate, stable test signals for both laboratory and production work. The following paragraphs contain a brief outline of the functions of the major circuit group in the instrument. Reference is made to the Overall Block Diagram in Page 4-0, Figure 4-1.

4-6. OSCILLATOR CIRCUIT (A2 A5 A6 A7)

4-7. The basic Wien bridge oscillator circuit, used in the Model 4204A Digital Oscillator consists of a two-stage amplifier (Q1, Q2) with both negative and positive feedback loops. A complementary symmetry impedance converter (Q3, Q4) is used at the output stage. Positive feedback for sustaining oscillations is applied through a frequency selective network of the Wien bridge. Oscillations are sustained at the frequency where the phase shift to the network is zero. The negative feedback loop involves the other pair of bridge arms. The amplitude is stabilized by the addition of a peak detector (CR4, CR5, Q5). When the amplitude of the amplifier changes, the peak detector sends an error signal to the AGC (Q6, CR6-CR11). The purpose of the AGC is to continuously control the oscillator gain to maintain unity loop gain. The resistance of the AGC can be varied slightly to change the divider ratio of the negative feedback network, thus bringing the output back to a constant level.

4-8. AMPLIFIER ASSEMBLY (A3)

4-9. The output amplifier circuit consists of the following circuits; a two-stage amplifier, a complementary symmetry impedance converter, a meter amplifier circuit, an output coupling and negative feedback. The amplifier (Q1, Q2) has high open loop gain. The total gain of the stage is determined by the negative feedback loop (around 5). The impedance converter (Q3, Q4) provides the appropriate match to the output attenuator circuit. The meter amplifier is provided with a meter calibration circuit and DC negative feedback to stabilize the DC operating levels. AC negative feedback stabilizes the amplifier gain and also compensates for non linearities of the diodes in the meter bridge. The meter bridge supplies the current to drive the meter.

4-10. OUTPUT ATTENUATOR (A4)

4-11. The output of the Amplifier Assembly is connected to the Output Attenuator via AMPLITUDE control network. The output Attenuator reduces the output signal level in 10dB steps from +20 dBm to -60 dBm. The AMPLITUDE control provides a continuous attenuation over 20 dB and a 600 ohm source resistance to the Output Attenuator.

4-12. CIRCUIT DETAILS

4-13. OSCILLATOR CIRCUIT (A2)

4-14. Transistors Q1 through Q4 provide a high open loop gain. CR1 provides DCV shift for Q2 base C3 couples signal around CR1. C4 and R5 prevent unwanted oscillation. Q3 and Q4 are forward biased to conduct equally. As equal base signals go in positive direction, internal resistance of Q3 increased as Q4 decreases. Signal and DC level at R9, R10 junction are about equal to those at CR2, CR3 junction. CR2, CR3 provide DC voltage shift for proper operating levels of Q3 and Q4.

4-15. PEAK DETECTOR

4-16. Resistor R11 isolates the peak detector from the oscillator output. C7 prevents DC bias of CR4. CR4 passes negative half of output waveform to Q5. Q5 drives breakdown diode CR5. CR5 passes only the peaks above about 6 volts to Q6.

4-17. AGC CIRCUIT

4-18. Resistors R3, R4, R19 and the diode network comprise the divider. C1 and C6 compensate the feedback at high frequencies. C2 permits calibrating adjustments of the oscillator frequency at 900 kHz. C5 blocks the dc operating voltage from the diode network. The value of R21 is selected to set oscillator output level between 4.1 and 4.5 volts rms. R20 permits minor adjustment of waveshape to minimize

distortion. The value of R6 is selected to obtain between -0.5 and -1.0 Vdc at XA2(12). The impedance of the diode network between R20 and ground is controlled automatically to hold oscillator output amplitude constant as follows.

4-19. An increase in output level increases Q6 conduction and decreases CR6, 7, 8, 9 conduction, which in turn increases impedance of the diodes. The higher the impedance of the diodes, the greater the degenerative feedback to Q1 and the lower the oscillator output. Resistors R14, R16 set dc operating voltages for Q6.

4-20. VERNIER FREQUENCY CONTROL

4-21. VERNIER control capacitors C133 through 136 and resistors R108 through R110 give a small amount of phase shift in oscillator feedback to adjust the output frequency about ±0.1%.

4-22. RANGE SWITCH ASS'Y (A5)

4-23. Each position of A5 selects two groups of capacitors of about equal total capacity. The group in upper part of A5 is connected in series with resistors in upper part of A6. The group in the lower part of A5 is connected in parallel with resistors in the lower part of A6. On the two lower frequency ranges, calibration is by capacitor selection. On the two upper ranges, calibration is by adjustable capacitors. After serial prefix -631, R111 was moved from connector XA7 to etched circuit A7. The later issue A7 may be used in the earlier issue chassis by replacing R111 on the connector with a wire jumper.

4-24. FREQUENCY SELECTOR SWITCH ASS'Y (A6)

4-25. Each frequency digit on the front panel selects a pair of equal resistors, one from the upper bank, one from the lower bank. The resistors selected by each digit from the lower bank are connected in parallel with each other and in parallel with tuning capacitors on A5, A7. Resistors in the upper bank are connected in parallel with each other and in series with the tuning capacitors. The upper and lower R-C sets are connected in series across the amplifier output, with the midpoint connected to the amplifier input. At one frequency the signal at the amplifier input is in phase with the signal at the amplifier output and oscillation occurs.

4-26. OUTPUT AMPLIFIER (P/O A3)

4-27. Transistors Q1 and Q2 form a high gain amplifier. C1 blocks dc voltage from A2. R3 developes degenerative feedback voltage for Q1. C2 provides signal ground for R3. R2 provides dc operating level for Q1. DC voltage division between R4, R5 and CR1 establishes ic operating voltages for Q2, Q3 and Q4. The value of R27 is selected to equalize the dc voltage across Q3 and Q4 (as indicated by +1 to +2V at L1). CR1 provides the dc voltage shift between Q1 and Q2. C3 couples signal around CR1.

4-28. Complementary symmetry impedance converter, transistors Q3 and Q4 are forward biased to conduct equally. As equal base signals go in positive direction, internal resistance of Q3 increases as Q4 decreases. Signal and dc level at R8, R9 junction are about equal to those at CR2, CR3 junction. CR2 and CR3 provide a dc voltage shift for proper operating levels of Q3 and Q4. L2 compensates load on Q2 at high frequency.

4-29. Resistor R11 establishes source impedance of output amplifier. C6 prevents shunting the dc volts at L1. L1 equalizes load impedance at high frequencies. R10 couples degenerative signal to Q1. The ratio R10 to R3 determines the closed loop gain around 5. The value of R28 is selected to set the maximum output signal level to between 20 and 20.12V rms.

4-30. METER AMPLIFIER (P/O A3)

4-31. Meter calibration circuit consists of the voltage divider R14 through R16, C7 and C8. R15 adjusts full-scale meter reading on the 10 volt range at 400Hz with 600-ohm load connected to the output terminals. C7 equalizes meter reading on the 10-volt range at 1MHz.

4-32. Transistors Q5 and Q6 form a stabilized amplifier. DC degenerative feedback to Q5 base stabilizes dc operating levels. AC degenerative feedback to Q5 emitter stabilizes amplifier gain. Resultant gain of Q5 is about 0.43; gain of Q6 is about 63. (Shorting R23 does not effect Q6 gain).

4-33. Diodes CR4 and CR5 conduct current through the meter and charge C13. C13 maintains continuous meter current. C11 and C12 couple Q6 output signal to R19, across which degenerative feedback is developed. Waveform across R19 is sine. When the output attenuator is switched to the 30-volt range, a contact on S3 connects meter shunt R25, R26 to permit the meter to read the 20-volt maximum, open-circuit output level. R26 adjusts meter sensitivity for the 30-volt range only.

4-34. OUTPUT ATTENUATOR (A3)

4-35. AMPLITUDE control R2A/B adjusts output signal level from minimum to maximum. Provides 600-ohm source resistance to output attenuator to maintain meter calibration at all output levels. Output attenuator reduces output signal level in 10-dB steps from +20 dBm to -60 dBm. The attenuator presents a shunt resistance of 600 ohms to both the output amplifier and output terminals at all settings.

4-36. POWER SUPPLY (A1)

4-37. In the primary circuit of the power transformer, capacitor C1 bypasses noise on line to ground. S2 connects the two primary windings in parallel for 115-volt operation or in series for 230-volt operation.

4-38. -36V SUPPLY

4-39. Diodes CR1 and CR2 give full-wave rectification for the -36V regulator. The series regulator Q1 supplies current to -36V and -14V loads. Feedback voltage fed to Q1 base regulates the emitter voltag-

and attenuates ac ripple. The regulator amplifier (Q3/Q4) amplifies any ripple or drift on the -36V output and applies it out-of-phase to the series regulator base to hold the -36V constant. CR5 supplies a stable emitter voltage for Q3. Resistors R3, R4 and R5 set the dc operating levels for Q1, Q3 and Q4. R3 adjusts the -36V output. C2 feeds ripple and noise directly to Q3 base to avoid attenuation in R3 and R4.

4-40. -14V SUPPLY

4-41. Resistor R6 supplies current to voltage regulator CR6 and to load. C4 attenuates ripple and provides low-impedance source.

4-42. +38V AND +13V SUPPLY

4-43. For the positive supply, operation is identical to the above mentioned negative supply but with reversed polarities.

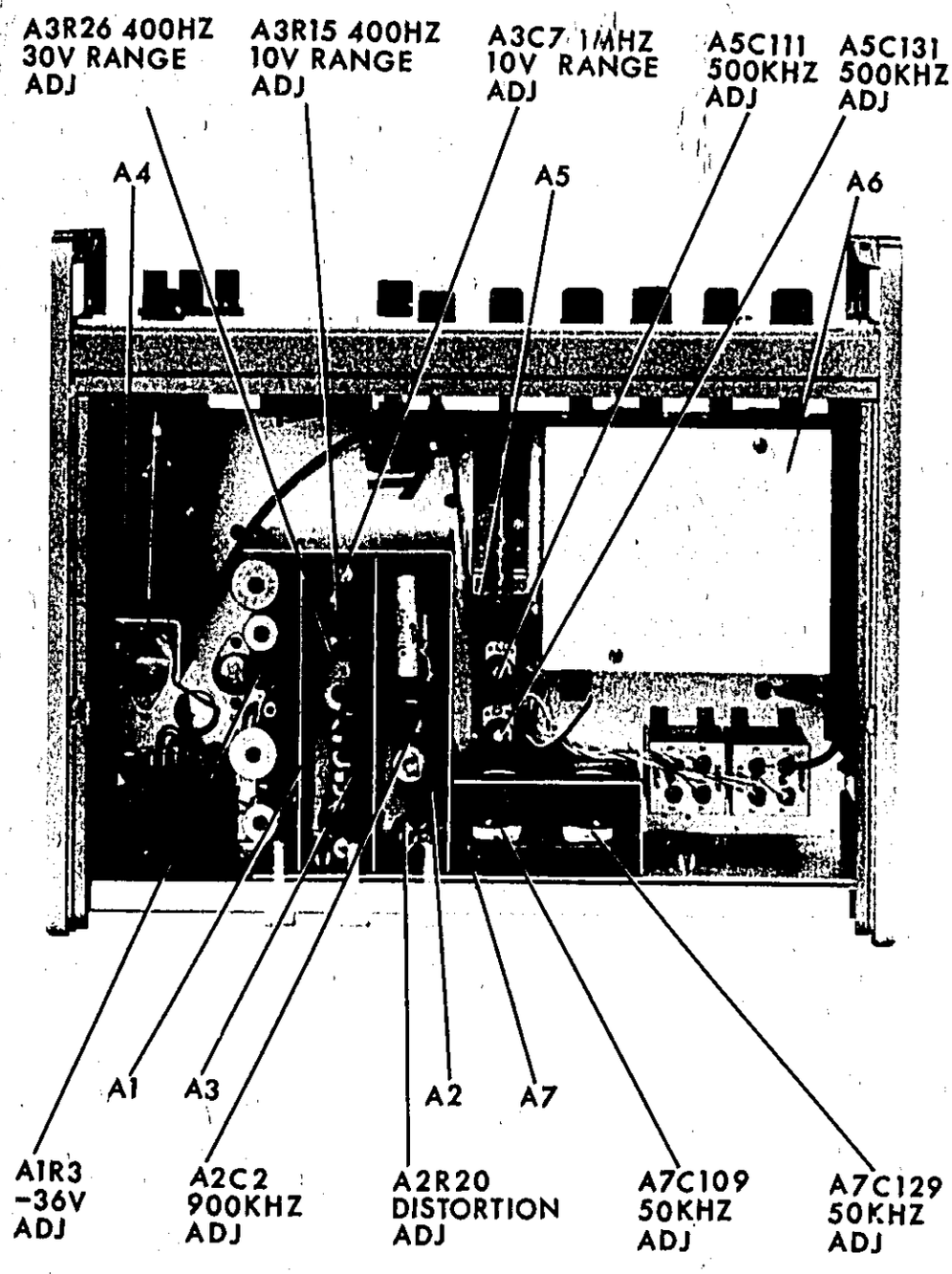


Figure 5-1. Assembly and Adjustment Location

SECTION V
MAINTENANCE

5-1. INTRODUCTION

5-2. This section contains information necessary to maintain the Model 4204A. The following paragraphs describe the Performance Checks, the Calibration Procedures, and the Troubleshooting Procedures.

5-3. REQUIRED EQUIPMENT

5-4. Table 5-1 is a list of the equipment needed to properly maintain the Model 4204A. If the recommended model is not available, use any substitute that meets the required characteristics.

5-5. PERFORMANCE CHECKS

5-6. The Performance Checks are "in cabinet" tests that compare the Model 4204A with its specifications. These procedures can be used both for incoming inspection and periodic inspection. A Performance Check Test Card is provided at the end of this section for recording the performance of the Model 4204A during the performance checks. The card can be removed from the manual and used as a permanent record of the incoming inspection or of a routine performance check. If the Model 4204A does not meet its specifications, refer to the Adjustment and Calibration Procedures, Paragraph 5-19.

5-7. PRELIMINARY OPERATIONS

5-8. Verify that all power switches are turned off, then connect all applicable auxiliary equipment to the appropriate power source.

a. Adjust the autotransformer for minimum output voltage.

b. Connect the Test Instrument power cord to the autotransformer.

c. Connect the 600Ω resistor across the red output terminals on the Test Instrument. Unless otherwise specified, the load will be used during calibration. Disconnect the output terminal ground strap.

Table 5-1. Required Equipment

Item	Minimum Use Specifications	Suggested Mfg. & Model
Load Resistor	600 Ω ±1% 1/4 Watt, non-inductive resistor	HP Part No. 0698-6261
Autotransformer	115/230Vac input; 100/200 to 130/260Vac output	
Oscilloscope	10 MHz bandwidth 5mV/div sensitivity	HP Model 180A/1801A
Electronic RMS Voltmeter	0.001Vrms to 30Vrms full scale; ±1% of full scale; 10 Hz to 1 MHz.	HP Model 3400A or 400E
Frequency Counter	6 Place; frequency and 1, 10, 100 period-average time interval measurements; 1μsec timing units ±0.001% accuracy; 1 volt input sensitivity.	HP Model 5326A HP Model 5300A/5302A HP Model 5246L/5251A
Distortion Analyzer	10 Hz to 1 MHz ±1 dB accuracy in distortion measurement; 10 volt input sensitivity.	HP Model 333A
Test Leads	Low-capacity coax, terminated in dual-banana plugs.	HP Model 11000A
Test Leads unshielded pair	Terminated in dual-banana plugs.	
Adapter, BNC-to dual banana		

d. Set the Test Instrument controls as follows:

OUTPUT ATTENUATOR .... 10 V
AMPLITUDE..... 10
Frequency switches..... 400.0 Hz
Vernier ..... center line

e. The 4204A Digital Oscillator is factory calibrated at 115Vac in an ambient temperature of 25° C.

f. Turn on power switches for all auxiliary equipment and the Test Instrument. Set the autotransformer for 115/230 volts output.

g. Verify that each piece of equipment is operating and allow to warm up and stabilize. The required warm-up time for the Test Instrument is five minutes.

NOTE

Unless otherwise specified, verify the results of each test and take corrective action.

5-9. OUTPUT LEVEL AND FLATNESS CHECK

5-10. Complete steps a. through e. before taking corrective action. This is to determine if more than one range is out of tolerance.

a. Set the EVM to the 10 volt range.

b. Connect the EVM to the Test Instrument output. Use unshielded EVM input cable.

c. Set the Test Instrument controls as follows:

Frequency switches..... 9.999 kHz
OUTPUT ATTENUATOR .. 10V
AMPLITUDE..... 9.7 volts on EVM

d. Set the Test Instrument frequency selectors for the following frequencies and record the EVM reading at each frequency. The EVM must read between 9.4V and 10V at each frequency.

010.0 Hz and 999.9 Hz
1.000 kHz and 9.999 kHz
10.00 kHz and 99.99 kHz
100.0 kHz and 999.9 kHz

NOTE

If a substitute EVM is used, consider that most EVM's are designed for use above 20 Hz and may read as much as 10% low at 10 Hz.

e. At the frequency giving the lowest reading in step d. turn the AMPLITUDE control maximum clockwise and record the EVM reading, this reading must be between 10.0Vrms and 10.6 Vrms.

5-11. METER ACCURACY CHECK

5-12. Set the EVM to the 10 volt range. Connect the Test Instrument Output through the unshielded test leads to the EVM.

a. Set the Test Instrument controls as follows:

Frequency switches ..... 010.0 Hz
OUTPUT ATTENUATOR... 10V
AMPLITUDE ..... 9.8 volts on the Test Instrument Voltmeter

b. Record the EVM reading; this reading must be between 9.6 and 10.

c. Set the Test Instrument controls as follows:

Frequency switches ..... 1.000 kHz
AMPLITUDE ..... 9.8 volts on the Test Instrument Voltmeter

d. Record the EVM reading; the EVM reading must be between 9.6 and 10.

e. Set the Test Instrument controls as follows:

Frequency switches ..... 100.0 kHz
AMPLITUDE ..... 9.8 volts on the Test Instrument Voltmeter

f. Record the EVM reading; the EVM reading must be between 9.6 and 10.

g. Set the Test Instrument controls as follows:

Frequency switches ..... 500.0 kHz
AMPLITUDE ..... 9.8 volts on the Test Instrument Voltmeter

h. Record the EVM reading; the EVM reading must be between 9.6 and 10.

i. Set the Test Instrument controls as follows:

Frequency switches ..... 999.9 kHz
AMPLITUDE ..... 9.8 volts on the Test Instrument Voltmeter

j. Record the EVM reading; the EVM reading must be between 9.6 and 10.

k. Record the difference between maximum reading and minimum reading among those obtained in steps b, d, f and h. The difference should be less than 0.2V.

l. Record the difference between maximum reading and minimum reading among those obtained in steps h and j. The difference should be less than 0.4V.

m. Set the EVM to the 30 volt range.

n. Disconnect 600Ω load from Test Instrument.

o. Set the Test Instrument controls as follows:

Frequency switches.....	1,000 kHz
OUTPUT ATTENUATOR ...	30 V
AMPLITUDE.....	20 volts on the EVM

p. Record the Test Instrument Voltmeter reading; the Test Instrument voltmeter must read between 19.4 and 20.6.

q. Disconnect Test Instrument output terminal ground strap. Connect 600Ω load to output terminals and connect coaxial test leads between output terminals and EVM.

r. Set the Test Instrument controls as follows:

Frequency switches.....	400.0 Hz
OUTPUT ATTENUATOR ...	+20 dBm
AMPLITUDE.....	0 dBm on the EVM

s. Set the Test Instrument Output Attenuator and the EVM to the following ranges and record the dBm reading on the EVM for each output level; the EVM must read between -0.5 and +0.5 dB at each setting:

+10 dBm	-10 dBm	-40 dBm
0 dBm	-20 dBm	-50 dBm
	-30 dBm	-60 dBm

t. Disconnect the EVM from the Test Instrument.

5-13. DISTORTION CHECK

5-14. Set the distortion analyzer for measurement of distortion on a 10-volt signal at 10 Hz. Connect the distortion analyzer input to the Test Instrument output.

a. Set the Test Instrument controls as follows:

OUTPUT ATTENUATOR ...	10V
AMPLITUDE.....	10 volts on the Test Instrument Voltmeter

b. Set the Test Instrument frequency switches for the following frequencies and record the output distortion for each frequency; the distortion analyzer reading must not exceed the percentage given after each frequency setting:

010.0 Hz (1.0%)
030.0 Hz (0.3%)
99.99 kHz (0.3%)
600.0 kHz (1.0%)

c. Disconnect the distortion analyzer from the Test Instrument.

5-15. FREQUENCY RANGE AND ACCURACY CHECK

5-16. Complete steps d. through j. before taking corrective action. This is to determine if more than one range, or more than one digit is out of tolerance.

a. Connect the frequency counter input to the Test Instrument output.

b. Set the Test Instrument controls as follows:

OUTPUT ATTENUATOR ...	3V
AMPLITUDE.....	10 on the Output Voltmeter
Vernier	center line

c. Set the counter for frequency measurements with five significant figures for frequencies in step d.

d. Set the Test Instrument frequency switches as follows and record the counter reading for each setting; the counter must read between the figures given after each frequency setting:

100.0 kHz (99.80 to 100.2 kHz)
999.9 kHz (998.0 to 1002. kHz)

e. Set the counter for frequency measurement with five significant figures for frequencies in step f.

f. Set the Test Instrument frequency switches as follows and record the counter reading for each setting; the counter must read between the figures given after each frequency setting:

10.00 kHz (9.980 to 10.02 kHz)
99.99 kHz (99.80 to 100.2 kHz)

g. Set the counter for readings having five significant figures for frequencies in step h.

h. Set the Test Instrument frequency switches as follows and record the counter reading for each setting; the counter must read between the figures given after each frequency setting:

1.100 kHz (1.098 to 1.102)
2.200 kHz (2.196 to 2.204)
3.300 kHz (3.293 to 3.307)
4.400 kHz (4.391 to 4.409)
5.500 kHz (5.489 to 5.511)
6.600 kHz (6.587 to 6.613)
7.700 kHz (7.685 to 7.715)
8.800 kHz (8.782 to 8.818)
9.900 kHz (9.880 to 9.919)
990.0 Hz (988.0 to 991.9)

i. Set the counter for period measurement having five significant figures for frequencies in step j.

j. Set the frequency switches as follows and record the period of the output frequency for each setting; the counter must read between the figures given after each frequency setting:

19.9 Hz	(50000 to 50505 μsec)
18.8 Hz	(52910 to 53475 μsec)
17.7 Hz	(56180 to 56818 μsec)
16.6 Hz	(59881 to 60606 μsec)
15.5 Hz	(64103 to 64935 μsec)
14.4 Hz	(68966 to 69930 μsec)
13.3 Hz	(74627 to 75757 μsec)
12.2 Hz	(81301 to 82644 μsec)
11.1 Hz	(89286 to 90909 μsec)
10.0 Hz	(99010 to 101010 μsec)

5-17. FREQUENCY STABILITY CHECK

5-18. Set the frequency counter for frequency measurement using a 1 second gate time. Connect the counter input to the Test Instrument Output.

a. Connect an autotransformer between ac power line and 4204A LINE input receptacle. Set autotransformer for an output voltage of 115 Vac (+0 - 10V).

b. Set 4204A controls as follows:

Frequency control switch ... nearly 990kHz
OUTPUT ATTENUATOR 3V
AMPLITUDE ..... 10 volts on output voltmeter outer scale.

c. Adjust Frequency control so as to indicate 990.000kHz on frequency counter.

d. Change autotransformer output from 105 Vac to 125 Vac and read frequency counter display. The frequency counter readout should be from 989.900kHz to 990.100kHz.

5-19. ADJUSTMENT AND CALIBRATION PROCEDURES

5-20. The following is a complete adjustment and calibration procedure for the Model 4204A. These procedures should be performed only when it is determined that any performance check does not meet 4204A specifications. Assembly and adjustment location is shown in Figure 5-1.

5-21. POWER SUPPLY ADJUSTMENT

5-22. There is only one adjustment in the power supplies, A1R3 accessible on the top of A1. Set A1R3 to obtain -37 VDC at XA1(7). Adjusting A1R3 also has a small effect on the +40 VDC at XA1 (10).

5-23. DISTORTION ADJUSTMENT

5-24. The distortion level of the signal generated by the 4204A Oscillator is typically several dB less than the signal at the output terminals. The oscillator circuit can generate excessive distortion if A2R20 (DIST ADJ) is not correctly adjusted and/or if the dc operating voltage in the oscillator amplifier are not correctly set. Set R20 by observing or measuring distortion on a 19kHz signal at the output terminals and adjusting R20 to minimize distortion. Set the dc operating voltages by selecting the value of *R6 to obtain between -0.5 and -1.0 volts at XA2(12). If the dc voltmeter used is affected by the presence of the 10Hz signal, disable the oscillator by shorting XA2(7) to chassis. The dc operating voltages may need resetting following replacement of any component in the oscillator amplifier.

5-25. FREQUENCY AND FLATNESS ADJUSTMENTS

5-26 Oscillator frequency is adjusted by a different procedure for each frequency range, and the adjustment for each range is independent of the adjustments of all other ranges. On each range, frequency and amplitude flatness across the range are interdependent. If a tuning capacitor or pad fail, both frequency and amplitude are affected and, correspondingly, the adjustments called for simultaneously correct both frequency and amplitude flatness.

5-27. 010.0 TO 999.9 Hz FREQUENCY RANGE ADJUSTMENT

5-28. There are no "screwdriver" adjustments for calibrating the 10 to 999.9 Hz range. Frequency and amplitude flatness are adjusted by adding or removing capacitor pads as follows:

a. Turn on the 4204A and allow at least five minutes to stabilize at room temperature.

b. After warm-up, remove 4204A to cover for access to A2 and A7.

c. Connect a frequency counter to the 4204A output and set the counter for period measurement of 10 Hz 4 significant figures.

d. Connect an AC voltmeter to R19, R20 junction. After noting setting of R20, adjust R20 to center position.

e. Set the 4204A controls as follows:

Frequency switches..... 500.0 Hz
VERNIER ..... center
OUTPUT ATTENUATOR ... 3V
AMPLITUDE..... 3

f. The voltmeter must read between 100 and 110 millivolts and the counter must read between 1999.6 and 2000.4 microseconds. If they do not, adjustment is needed as follows:

g. If the voltmeter and/or counter reading is out of tolerance, refer to Table 5-2. In the first column of Table 5-2 find the number of microseconds closest to the counter reading; and above the column heads find the millivolts nearest that obtained on the voltmeter. If either error is greater than that listed in the table, locate the defective capacitor (s) by measuring individual capacitors.

h. Read down the selected millivolts column until opposite the selected frequency. At the intersection are two values of capacity in picofarads preceded by a + or - sign to indicate if the value should be added or subtracted in step j.

i. Remove A7 from the oscillator. Find C102, C103, C122 and C123 on the etched circuit and on the schematic diagram.

j. By capacitor substitution, modify the value of the capacitors listed at the head of the MILLIVOLTS column by the amount specified.

k. Replace A7 and check frequency and voltage at frequency settings of 010.0, 100.0, 500.0 and 999.9 Hz. If necessary, return to step g. and repeat the procedure to obtain specified (±0.2%) frequency accuracy and voltage level (100 to 110 millivolts).

l. Return R20 to setting noted in step d. and read paragraph (5-33) on oscillator distortion adjustment.

5-29. 1.000 TO 9.999kHz FREQUENCY RANGE ADJUSTMENT

5-30. There are no "screwdriver" adjustments for calibrating the 1.000 to 9.999 kHz range. Frequency and amplitude flatness are adjusted by adding or removing capacitor pads as follows:

a. Turn on the 4204A and allow at least five minutes to stabilize at room temperature.

b. After warm-up, remove 4204A top cover for access to A2 and A7.

c. Connect the frequency counter to the 4204A output and set the counter for frequency measurement of 1.000 kHz to five significant figures.

d. Connect the AC voltmeter to R19, R20 junction. After noting the setting of R20, adjust R20 to center position.

e. Set the 4204A controls as follows:

Frequency switches.....5.000 kHz
VERNIER..... center
OUTPUT ATTENUATOR... 3
AMPLITUDE..... 3

f. Voltmeter must read between 100 and 110 millivolts; the counter must read between 4990 and 5001. If they do not, adjustment is needed as follows:

g. If the voltmeter and/or counter reading is out of tolerance, refer to Table 5-3. In the first column of Table 5-3 find the frequency closest to the counter reading; and above the column heads, find the number of millivolts closest to the voltmeter reading. If either error is greater than that listed in the table, locate the defective capacitor by measuring the individual capacitors.

h. Read down the millivolts column until opposite the selected frequency. At the intersection are two values of capacity in picofarads preceded by a + or - sign to indicate if the value is to be added or subtracted in step j.

i. Remove A7 from the oscillator. Find C105, C106, C125, C126 on the etched circuit and on the schematic diagram.

Table 5-2. Frequency Adjustments for the 010.0 to 999.9 Hz Range

		Millivolts at A2R19, A2R20 Junction						
		97	101	103	105	107	109	113
Counter Reading in μsec	% Error	C102 + C103 C122 + C123	C102 + C103 C122 + C123	C102 + C103 C122 + C123	C102 + C103 C122 + C123	C102 + C103 C122 + C123	C102 + C103 C122 + C123	C102 + C103 C122 + C123
1984	+0.8%	+5400 +1000	+4300 +2100	+3800 +2600	+3200 +3200	+2600 +3800	+2100 +4300	+1000 +5400
1992	+0.4%	+3800 - 600	+2700 + 500	+2200 +1000	+1600 +1600	+1000 +2200	+ 500 +2700	- 600 +3800
1996	+0.2%	+3000 -1400	+1900 - 300	+1400 + 200	+ 800 + 800	+ 200 +1400	- 300 +1900	-1400 +3000
1998	+0.1%	+2600 -1800	+1500 - 700	+1000 - 200	+ 400 + 400	- 200 +1000	- 700 +1500	-1800 +2600
2000	0%	+2200 -2200	+1100 -1100	+ 600 - 600	--- ---	- 600 + 600	-1100 +1100	-2200 +2200
2002	-0.1%	+1800 -2600	+ 700 -1500	+ 200 -1000	- 400 - 400	-1000 + 200	-1500 + 700	-2600 +1800
2004	-0.2%	+1400 -3000	+ 300 -1900	- 200 -1400	- 800 - 800	-1400 - 200	-1900 + 300	-3000 +1400
2008	-0.4%	+ 600 -3800	- 500 -2700	-1000 -2200	-1600 -1600	-2200 -1000	-2700 - 500	-3800 + 600
2016	-0.8%	-1000 -5400	-2100 -4300	-2600 -3800	-3200 -3200	-3800 -2600	-4300 -2100	-5400 -1000

Table 5-3. Frequency Adjustments for the 1.000 kHz to 9.999 kHz Range

		Millivolts at A2R19, A2R20 Junction													
		97		101		103		105		107		109		113	
Counter Reading in kHz	% Error	C105 + C106	C125 + C126	C105 + C106	C125 + C126	C105 + C106	C125 + C126	C105 + C106	C125 + C126	C105 + C106	C125 + C126	C105 + C106	C125 + C126	C105 + C106	C125 + C126
504.0	+0.8%	+540	+100	+430	+210	+380	+260	+320	+320	+260	+380	+210	+430	+100	+540
502.0	+0.4%	+380	- 60	+270	+ 50	+220	+100	+160	+160	+100	+220	+ 50	+270	- 60	+380
501.0	+0.2%	+300	-140	+190	- 30	+140	+ 20	+ 80	+ 80	+ 20	+140	- 30	+190	-140	+300
500.5	+0.1%	+260	-180	+150	- 70	+100	- 20	+ 40	+ 40	- 20	+100	- 70	+150	-180	+260
500.0	0. %	+220	-220	+110	-110	+ 60	- 60	--	--	- 60	+ 60	-110	+110	-220	+220
499.5	-0.1%	+180	-260	+ 70	-150	+ 20	-100	- 40	- 40	-100	+ 20	-150	+ 70	-260	+180
499.0	-0.2%	+140	-300	+ 30	-190	- 20	-140	- 80	- 80	-140	- 20	-190	+ 30	-300	+140
498.0	-0.4%	+ 60	-380	- 50	-270	-100	-220	-160	-160	-220	-100	-270	- 50	-380	+ 60
496.0	-0.8%	-100	-540	-210	-430	-260	-380	-320	-320	-380	-260	-430	-210	-540	-100

j. By capacitor substitution, modify the value of the capacitors listed at the head of the MILLIVOLTS column by the amount specified.

k. Replace A7 and check frequency and voltage at frequency settings of 1.000, 5.000, and 9.999 kHz. If necessary, return to step g. and repeat the procedure to obtain specified frequency accuracy (±0.2%) and voltage level (100 to 110 millivolts).

l. Return R20 to setting noted in step d. and read paragraph on oscillator distortion adjustments.

5-31. 10.00 TO 99.99 kHz FREQUENCY RANGE ADJUSTMENT

a. Turn on the 4204A and allow at least 5 minutes to stabilize at room temperature.

b. After warm-up, remove 4204A top cover for access to A2 and A7.

c. Connect the frequency counter to the 4204A output terminals and set the counter for measurement of 10 to 100kHz.

d. Connect an electronic rms voltmeter to A2R19, A2R20 junction. After noting setting of R20, adjust R20 to center position.

e. Set the 4204A controls as follows:

Frequency switches..... 50.00 kHz
VERNIER..... center
OUTPUT ATTENUATOR ... 3
AMPLITUDE..... 3

f. If necessary, alternately adjust A7C109 and A7C129 to obtain readings of 105 millivolts on the voltmeter and 50.00 Hz on the frequency counter.

g. Set the frequency switches to 10.00 kHz and the VERNIER to center.

h. If necessary readjust A7C105 and A7C129 to obtain a counter reading of 10.00 kHz and a voltmeter reading between 100 and 110 millivolts.

i. Set the frequency switches to 99.99 kHz and the VERNIER fully clockwise. If necessary, readjust A7C109 and A7C129 to obtain a counter reading between 100.0 kHz and 100.19 kHz and a voltmeter reading between 100 and 110 millivolts.

j. Recheck the rms voltage and frequency at 10.00, 50.00 and 99.99 kHz, and if necessary repeat adjustment of A7C109, A7C129 to bring frequency within ±0.2% and voltage between 100 and 110 millivolts.

k. Return R20 to setting noted in Step d. and read paragraph on oscillator distortion adjustment.

5-32. 100.0 TO 999.9 kHz FREQUENCY RANGE ADJUSTMENT

a. Turn on the 4204A and allow at least 5 minutes to stabilize at room temperature.

b. After warm-up, remove 4204A top cover for access to A2 and A5.

c. Connect the frequency counter to the 4204A output terminals and set the counter for measurement of 100 kHz to 1 MHz.

d. Connect the AC voltmeter to A2R19, A2R20 junction. After noting setting of R20, adjust R20 to center position.

e. Set the 4204A controls as follows:

Frequency switches	500.0kHz
VERNIER	center
OUTPUT ATTENUATOR	3
AMPLITUDE	3

f. If necessary, alternately adjust A5C111 and A5C131 to obtain readings of 105 millivolts on the voltmeter and 500.0 kHz on the counter.

g. Set the frequency switches to 900.0 kHz and allow for five minutes to stabilize.

h. Momentarily disconnect voltmeter and measure frequency.

i. If necessary, adjust A2C2 (900kHz ADJ) for a reading of 900.00 kHz on the counter.

j. Repeat Steps f through j to reduce frequency error to less than ±0.05% at 100.0 kHz and less than -0.05% +0.1% at 900.0 kHz. Voltmeter reading at 100.0 kHz must be between 100 and 110 millivolts.

k. Set frequency control switches to 999.9kHz. Frequency counter reading should be from 997.90kHz to 1001.90kHz. Measure dc voltage at junction of A2R19 and R20. Voltmeter readout should be from 100 to 120 millivolts. Rotate Frequency Vernier control fully cw. Counter reading should change more than +0.1 kHz.

l. Recheck frequency and voltage at 100.0 and 900.0 kHz and, if necessary, repeat adjustments to bring frequency within ±0.2% and voltage between 100 and 110 millivolts.

m. Return R20 to setting noted in step d. and read paragraph on oscillator distortion adjustment.

5-33. REDUCING DISTORTION IN THE OUTPUT AMPLIFIER

5-34. The 4204A output signal must contain less than 0.3% total harmonic distortion from 30 Hz-100 kHz, and less than 1% below 30 Hz and above 100kHz. The output amplifier may cause excessive distortion if the dc operating voltages in the amplifier are not correctly set. These voltages can be adjusted by selecting the value of *R27 to obtain between +1 and +2 volts dc at L1. The operating voltages may need resetting after replacing components in the output amplifier. If the dc voltmeter used for the above measurement is effected by the signal voltage present at L1 the oscillator may be momentarily disabled by shorting XA2(7) contact to chassis. If distortion in the output signal is excessive when the dc operating voltages are correctly set, test Q2. If only the positive peak of the signal is clipped, test Q4; if the negative peak is clipped, test Q3.

5-35. MEASURING DISTORTION IN THE OUTPUT

a. Connect 4204A output to a 600-ohm resistive load and to the distortion analyzer input. Set analyzer controls for measurement of a 10Vrms, 10 Hz signal.

b. Set the 4204A controls as follows:

OUTPUT ATTENUATOR	10V range
AMPLITUDE	10V on 4204A voltmeter

c. Set the 4204A frequency switches for the following frequencies and record the output distortion for each frequency. The distortion analyzer reading must not exceed the percentage shown after each frequency setting:

010.0 Hz	1%
030.0 Hz	0.3%
99.99 kHz	0.3%
600.0 kHz	1%

5-36. SETTING THE MAXIMUM OUTPUT SIGNAL LEVEL

5-37. The 4204A must be able to produce between 10 and 10.6 volts rms into a 600-ohm external load, at all frequencies. The internal oscillator circuit supplies between 4.1 and 4.5 volts rms to the output amplifier. The gain of the output amplifier can be adjusted by selecting the value of *R28 to obtain specified output level. This adjustment may be necessary after replacing components in the output amplifier. Decreasing the value of *R28 decreases the maximum output level that can be obtained. If the maximum output level is set very much higher than specified, the output signal may show peak clipping, particularly at high frequencies.

5-38. OUTPUT LEVEL METER ADJUSTMENT

5-39. Zero set meter by turning slotted disk below meter face until meter pointer rests on lowest calibration line when the oscillator is turned off.

5-40. To adjust the output meter scale calibration:

a. Remove 4204A top cover.

b. Connect 600-ohm load to OUTPUT terminals; turn power on and allow 5 minute warm-up.

c. Connect the 4204A OUTPUT terminals through short, unshielded test leads to a calibrated rms voltmeter (EVM) having known frequency response to 1 MHz.

d. Set the 4204A controls as follows:

Frequency switches	400.0 Hz
OUTPUT ATTENUATOR	10V
AMPLITUDE	9.8 on output meter

e. The EVM reading must be between 9.6 and 10; if necessary, adjust A3R15 (10V RANGE ADJ) to equalize voltmeter readings.

f. Set the 4204A controls as follows:

Frequency switches.... 010.0 Hz
AMPLITUDE..... 9.8 on output meter

g. The EVM reading must be between 9.6 and 10; if necessary, adjust A3R15 only enough to bring meter reading within specification.

h. Set the 4204A controls as follows:

Frequency switches.... 500.0 kHz
AMPLITUDE..... 9.8 on output meter

i. The EVM reading must be between 9.6 and 10; if the reading is not within specifications, delay adjustment until after the next step.

j. Set the 4204A controls as follows:

Frequency switches.... 999.9 kHz
AMPLITUDE..... 9.8 on output meter

k. The EVM reading must be between 9.6 and 10; if necessary, adjust A3C7 (10V RANGE ADJ (1MHz)) to equalize voltmeter readings, (the value of C8 may also be changed).

l. Set the 4204A controls as follows:

Frequency switches.... 500.0 kHz
AMPLITUDE..... 9.8 on output meter

m. The EVM reading must be between 9.6 and 10; if the reading is not within specifications, troubleshooting in the meter amplifier A3 is necessary.

n. The readings obtained in steps e.g. and l. must not differ by more than 0.1 volt.

o. The readings obtained in steps k. and m. must not differ by more than 0.2 volt.

p. Set the EVM to the 30-volt range and disconnect the 600-ohm load from the OUTPUT terminals.

q. Set the 4204A controls as follows:

Frequency switches..... 400.0 Hz
OUTPUT ATTENUATOR ... 30V
AMPLITUDE..... 20 on output meter

r. The EVM reading must be between 19.4 and 20.6; if necessary, adjust A3R26 [30V RANGE ADJ (400Hz)] to equalize the meter readings.

s. Connect the 600-ohm load to the OUTPUT terminals; set the EVM to the 10-volt (+20 dBm) range.

t. Set the 4204A contorls as follows:

OUTPUT ATTENUATOR... +20 dBm
AMPLITUDE ..... +20 dBm on EVM

u. Set the 4204A OUTPUT ATTENUATOR and the EVM to the following ranges:

+10 dBm	-10 dBm	-40 dBm
0 dBm	-20 dBm	-50 dBm
	-30 dBm	-60 dBm

v. The EVM reading must be between -0.5 dB and +0.5 dB; if the EVM reading is not within specifications, troubleshooting in the attenuator is necessary.

w. Disconnect the EVM and the 600-ohm load; replace instrument top cover.

5-41. METER REPLACEMENT

5-42. To remove the output meter from the instrument.

a. Remove instrument top cover.

b. Disconnect meter leads.

c. Viewing the meter obliquely from the rear, pry out one edge of the grey meter escutcheon only enough to release the meter body.

d. Carefully pull the released end of the meter away from the panel; the opposite end of the meter will release from the escutcheon. The escutcheon will remain on the panel.

e. When replacing the meter, first secure one end of the meter under the escutcheon; then hold the other edge of the escutcheon out enough to push the meter face against the panel. Release the escutcheon, making sure it secures the meter in position.

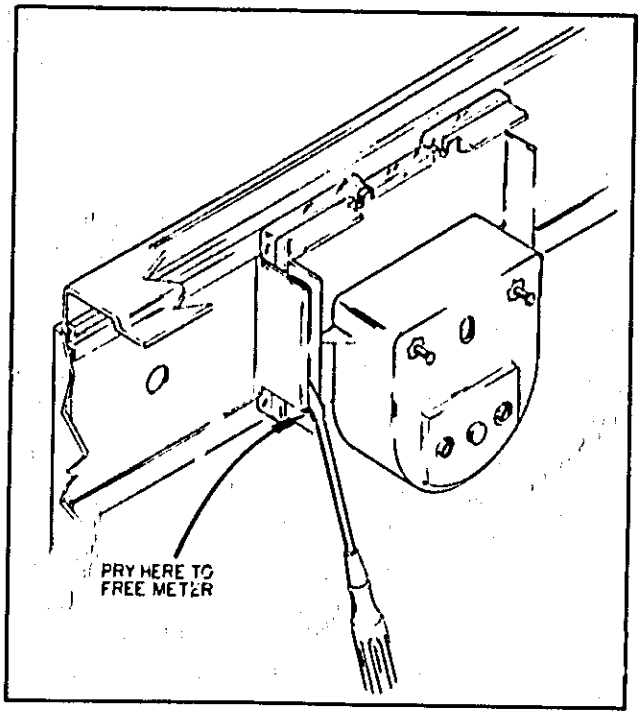


Figure 5-2. Meter Replacement

5-43. TROUBLESHOOTING

5-44. When the Model 4204A operates improperly, first adjust and calibrate it according to the procedures in Paragraphs 5-19 through 5-42. If calibration is impossible, then proceed with the troubleshooting steps.

5-45. Check the instrument for obvious evidence of trouble, such as loose or broken wires or broken connectors. Check the printed circuit boards for cracks and separations, and ensure that all connectors and pins are clean and tight.

5-46. Isolate the trouble to a particular circuit using Troubleshooting Tree No. 1 (Table 5-4) and the Theory of Operation (Section IV). Then refer to the Troubleshooting Trees No. 2 through No. 7.

Table 5-11
Factory Selected Components
(Foldout)

Table 5-11 lists all factory selected instrument components that may be used to bring the unit into its operating performance specifications (when the adjustment procedure is not successful in bringing the unit into specifications). Use appropriate value as required.

Table 5-11. Factory Selected Components.

Component	Nominal Value Range	Effect on Performance	Ref. Manual Paragraph
A2R6	9.1kΩ HP P/N: 0683-9125 ►8.2kΩ HP P/N: 0683-8225 7.5kΩ HP P/N: 0683-7525	Changes dc operating voltage in A2 oscillator amplifier (Also affects distortion in oscillator output). If dc level at amplifier output is too high, use more resistance; if too low, use less resistance.	5-24
A2R19	62Ω HP P/N: 0683-6205 ►56Ω HP P/N: 0683-5605 51Ω HP P/N: 0683-5105	Changes oscillation amplitude. If oscillator level is too high, use more resistance; if too low, use less resistance. The nominal value is usually used.	——
A3C8	51pF HP P/N: 0160-2201 39pF HP P/N: 0140-0190 ►27pF HP P/N: 0160-2306	Changes voltmeter frequency response at 10V range in 1MHz frequency region. If response is excessive, use more capacitance; if insufficient, use less capacitance.	5-40
A3C14	►blank 1.5pF HP P/N: 0160-1478	Improves distortion factor of A3 amplifier output in 1MHz frequency region. If distortion is excessive, add capacitor.	——
A3R4	20kΩ HP P/N: 0686-2035 18kΩ HP P/N: 0686-1835 16kΩ HP P/N: 0686-1635 ►15kΩ HP P/N: 0686-1535	Changes dc operating voltage in A3 amplifier section (Also affects distortion of amplifier output). If dc level at amplifier output is too high, use less resistance; if too low, use more resistance.	5-34
A3R27 (A3R4 =15kΩ)	►91kΩ HP P/N: 0683-9135 82kΩ HP P/N: 0683-8235 75kΩ HP P/N: 0683-7535 68kΩ HP P/N: 0683-6835 62kΩ HP P/N: 0683-6235 56kΩ HP P/N: 0683-5635		
A3R10	9.1kΩ HP P/N: 0683-9125 (Use 91kΩ resistor for A3R28) ►8.2kΩ HP P/N: 0683-8225		
A3R28	470kΩ HP P/N: 0683-4745 220kΩ HP P/N: 0683-2245 150kΩ HP P/N: 0683-1545 110kΩ HP P/N: 0683-1145 91kΩ HP P/N: 0683-9135 ► 82kΩ HP P/N: 0683-8235 75kΩ HP P/N: 0683-7535	Changes amplification gain of A3 amplifier. If amplifier output level is excessive, use less resistance; if insufficient, use more resistance.	5-37
A3R25	270Ω HP P/N: 0683-2715 ►220Ω HP P/N: 0683-2215 180Ω HP P/N: 0683-1815	Changes voltmeter sensitivity on 30V range. If meter deflection is excessive, use more resistance; if insufficient, use less resistance. The nominal value is usually used.	——
A7C102 C103 C122 C123	Refer to Manual Paragraph 5-28 010.0 TO 999.9Hz FREQUENCY RANGE ADJUSTMENT.		
A7C105 C106 C125 C126	Refer to Manual Paragraph 5-30 1.000 TO 9.999kHz FREQUENCY RANGE ADJUSTMENT.		

Note: Component marked (►) in table is usually used.

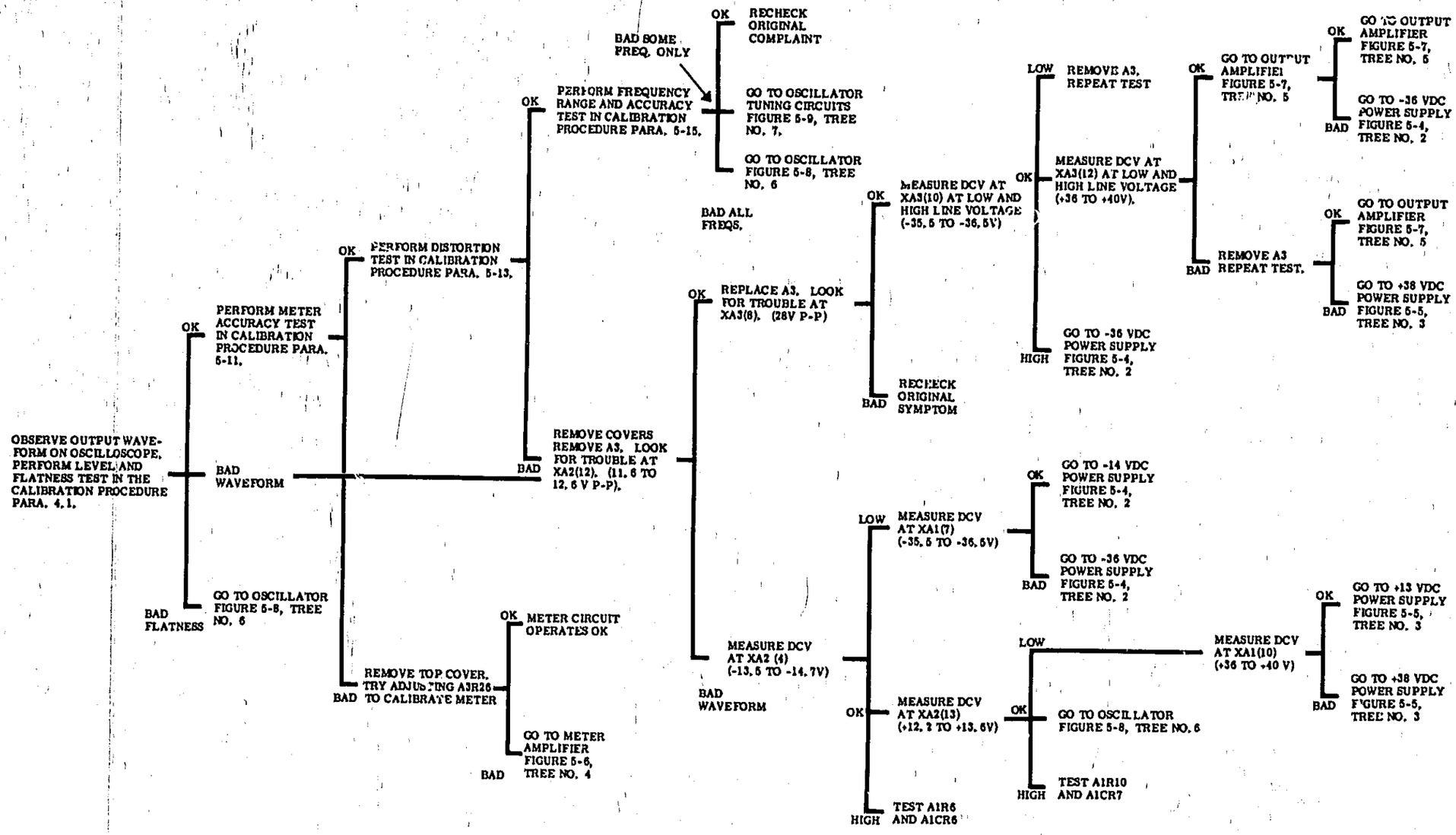


Table 5-4. Troubleshooting Tree No. 1

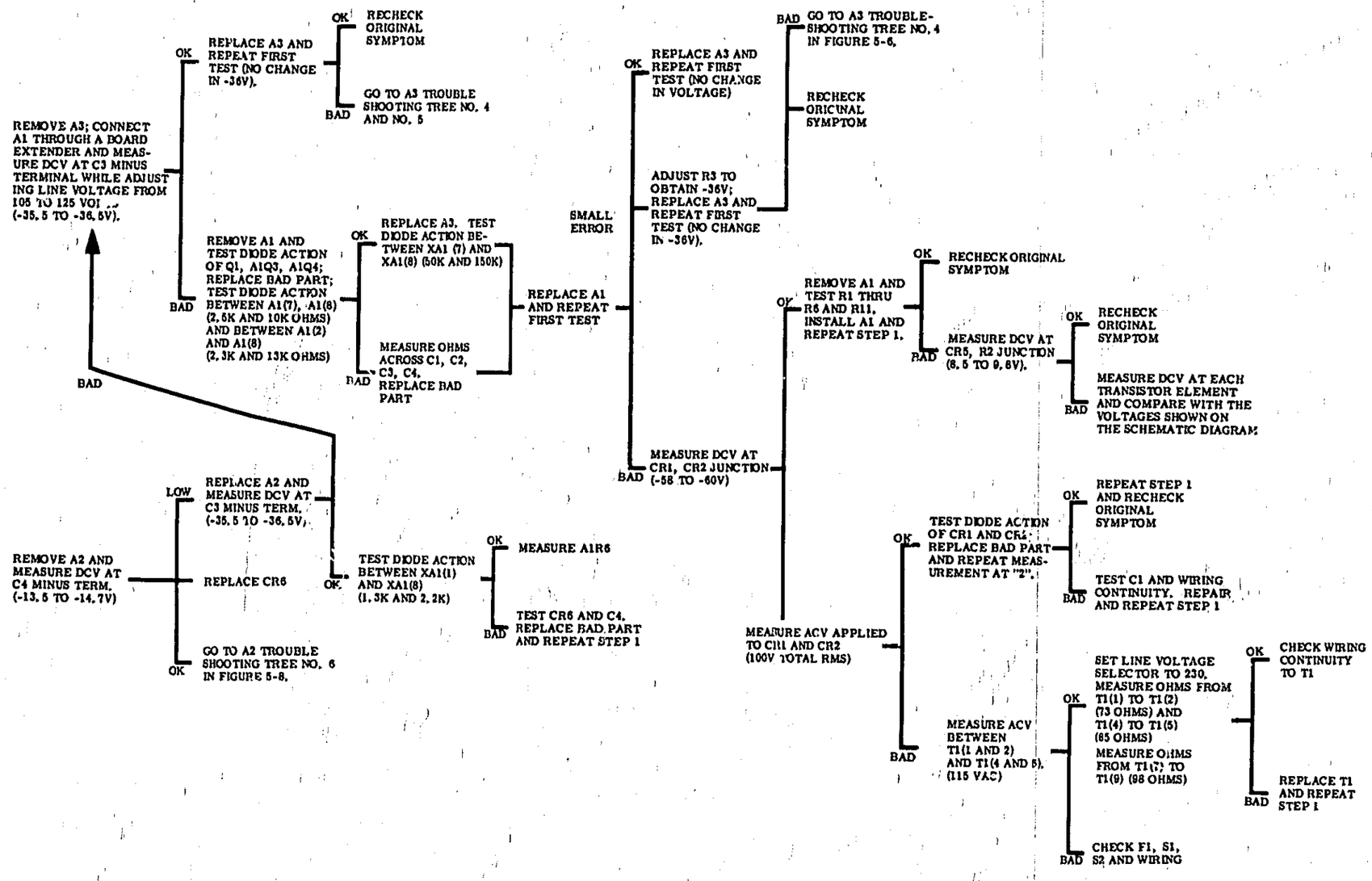


Table 5-5. Troubleshooting Tree No. 2
(P/O A1 Power Supply Ass'y)

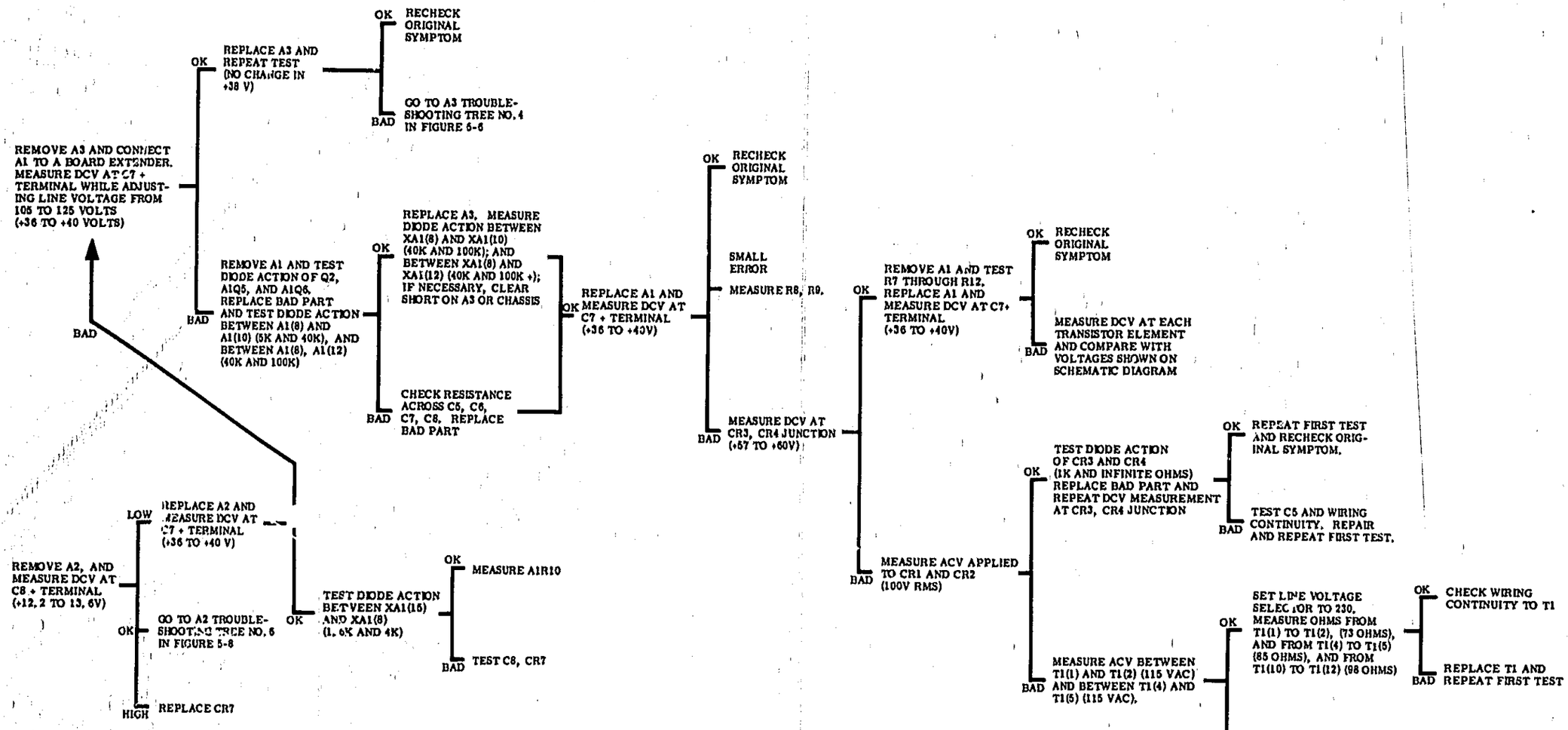


Table 5-6. Troubleshooting Tree No. 3
(P/O A1 Power Supply Ass'y)

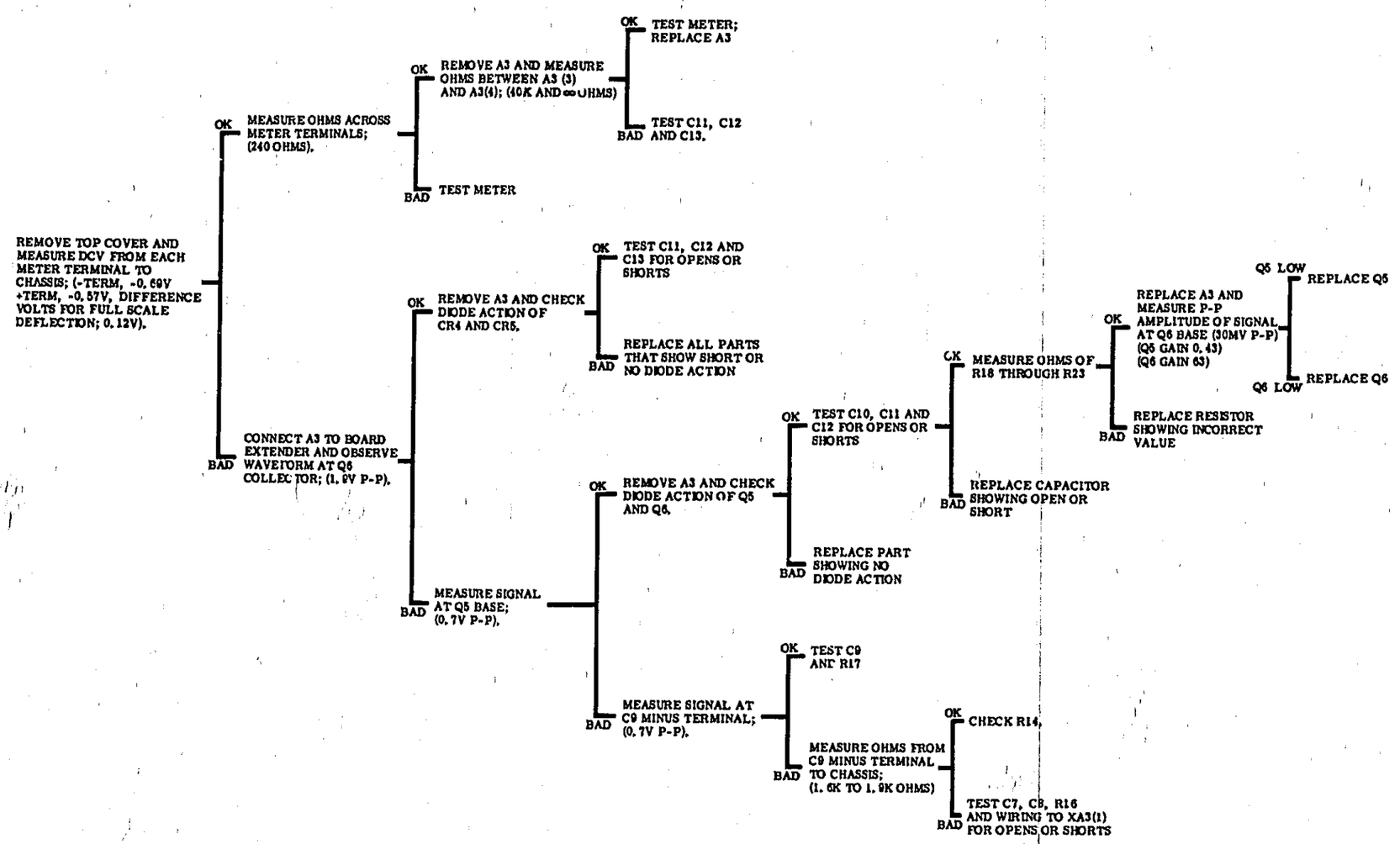


Table 5-7. Troubleshooting Tree No. 4
(P/O A3 Meter Amplifier Ass'y)

TO TEST THE DIODE ACTION OF A DIODE OR TRANSISTOR, USE AN OHMMETER HAVING 1 TO 5V OPEN CIRCUIT AND LESS THAN 10 MA SHORT CIRCUIT. USE THE X1000 RANGE.

DIODE ACTION MUST BE EVIDENT AT THE BASE-EMITTER AND BASE-COLLECTOR JUNCTIONS. EMITTER-COLLECTOR RESISTANCE MUST BE HIGH AND WITHOUT DIODE ACTION.

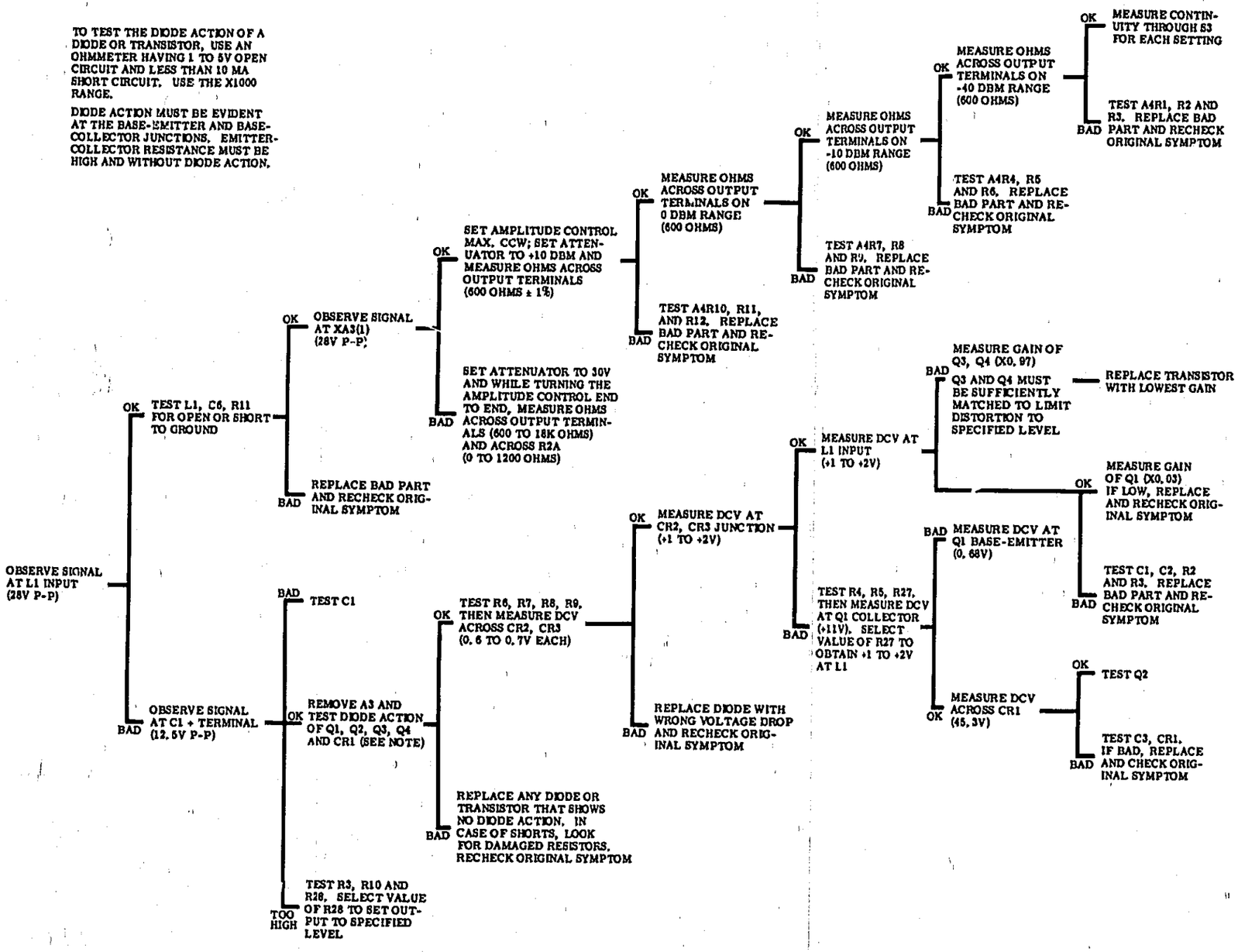


Table 5-8. Troubleshooting Tree No. 5 (P/O A3 Output Amplifier Ass'y)

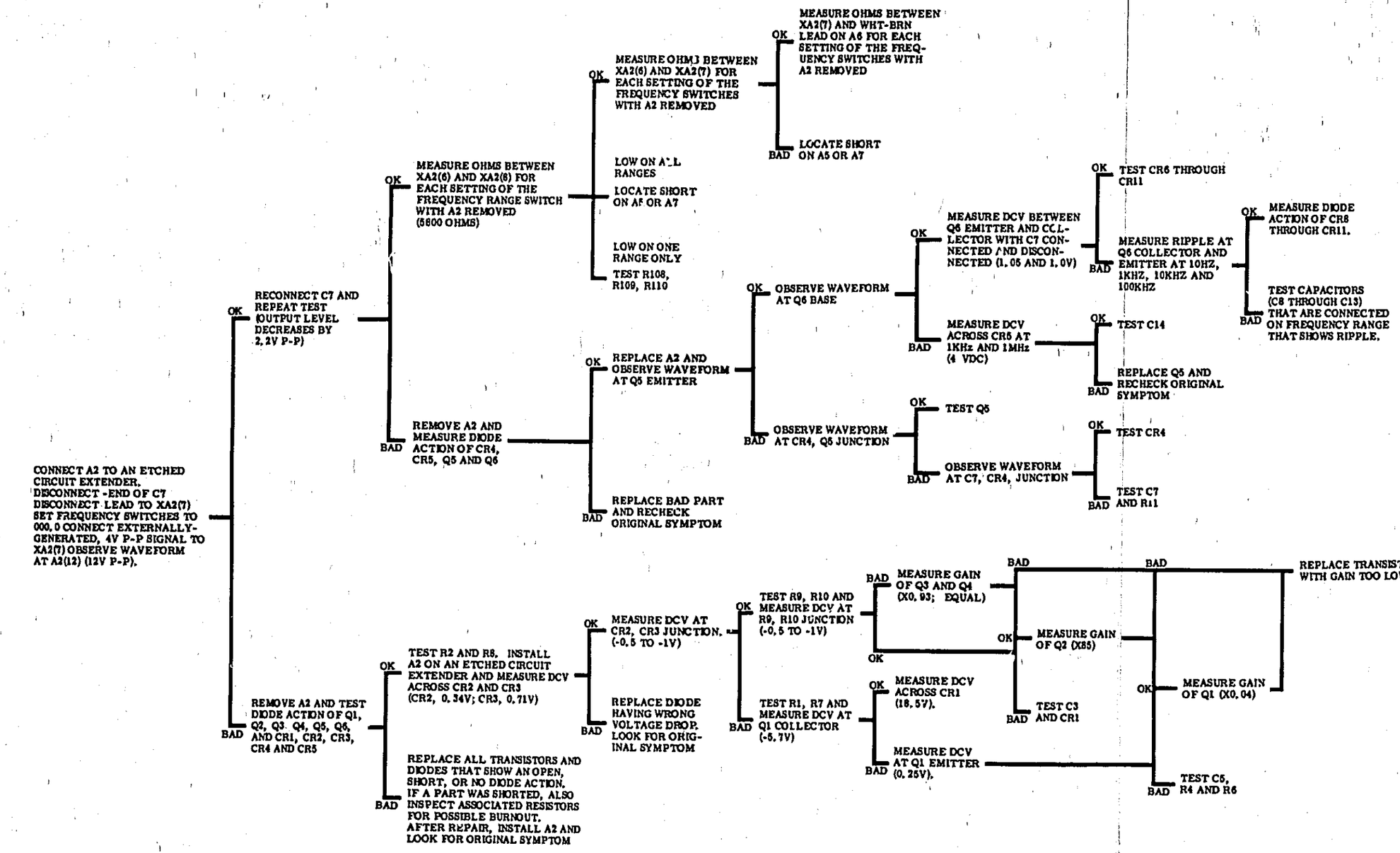


Table 5-9. Troubleshooting Tree No. 6
(A2 Oscillator Ass'y)

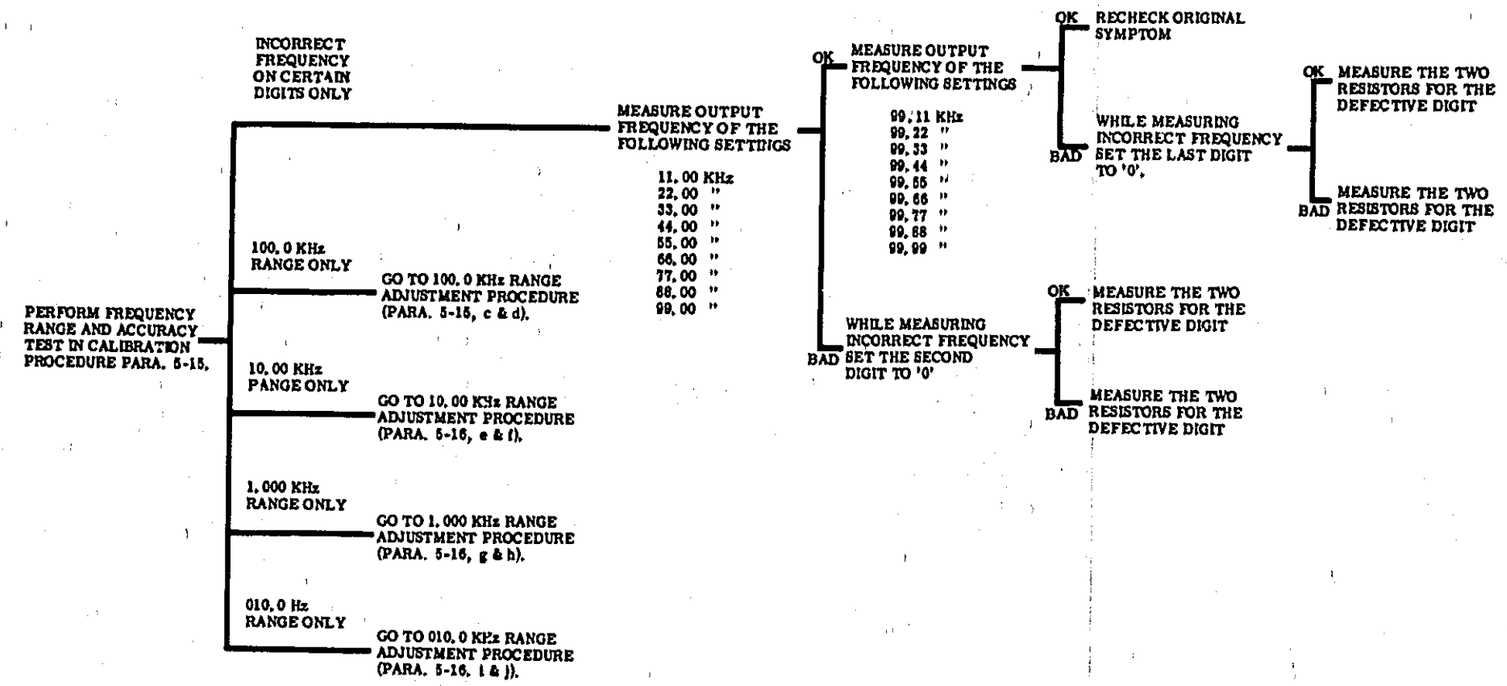


Table 5-10. Troubleshooting Tree No. 7

PERFORMANCE CHECK TEST CARD

Hewlett-Packard Model 4204A Oscillator _____

Serial No. _____

Test Performed by _____

Date _____

Paragraph & Step No.	FUNCTION TESTED	CHECK
	OUTPUT LEVEL FLATNESS	
5-9	010.0 Hz	9.4 _____ 10.0 Vrms
	999.9 Hz	9.4 _____ 10.0 Vrms
	1.000 kHz	9.4 _____ 10.0 Vrms
	9.999 kHz	9.4 _____ 10.0 Vrms
	10.00 kHz	9.4 _____ 10.0 Vrms
	99.99 kHz	9.4 _____ 10.0 Vrms
	100.00 kHz	9.4 _____ 10.0 Vrms
	999.9 kHz	9.4 _____ 10.0 Vrms
	Maximum Output Level	
5-10, (e)		10.0 _____ 10.6 Vrms
	Output Meter Accuracy	
5-12, (b)	010.0 Hz	9.6 _____ 10.0 Vrms
5-12, (d)	1.000 kHz	9.6 _____ 10.0 Vrms
5-12, (f)	100.0 kHz	9.6 _____ 10.0 Vrms
5-12, (h)	500.0 kHz	9.6 _____ 10.0 Vrms
5-12, (j)	999.9 kHz	9.6 _____ 10.0 Vrms
5-12, (p)	1.000 kHz	19.4 _____ 20.6 Vrms
	Attenuator Accuracy	
5-12, (s)	+20 dBm	+19.5 _____ +20.5 dBm
	+10 dBm	+9.5 _____ +10.5 dBm
	0 dBm	-0.5 _____ 0.5 dBm
	-10 dBm	-9.5 _____ -10.5 dBm
	-20 dBm	-19.5 _____ -20.5 dBm
	-30 dBm	-29.5 _____ -30.5 dBm
	-40 dBm	-39.5 _____ -40.5 dBm
	-50 dBm	-49.5 _____ -50.5 dBm
	-60 dBm	-59.5 _____ -60.5 dBm

Paragraph & Step No.	FUNCTION TESTED	CHECK
5-13	**Distortion**	
	010.0 Hz	_____ 1.0% max.
	030.0 Hz	_____ 0.3% max.
	99.99 kHz	_____ 0.3% max.
	600 0 kHz	_____ 1.0% max.
5-15	**Frequency Accuracy**	
	100.0 kHz	99.8 _____ 100.2 kHz
	999.9 kHz	998.0 _____ 1002 kHz
	10.00 kHz	9.980 _____ 10.02 kHz
	99.99 kHz	99.80 _____ 100.2 kHz
	1.100 kHz	1.098 _____ 1.102 kHz
	2.200 kHz	2.196 _____ 2.204 kHz
	3.300 kHz	3.293 _____ 3.307 kHz
	4.400 kHz	4.391 _____ 4.409 kHz
	5.500 kHz	5.489 _____ 5.511 kHz
	6.600 kHz	6.587 _____ 6.613 kHz
	7.700 kHz	7.685 _____ 7.715 kHz
	8.800 kHz	8.782 _____ 8.818 kHz
	9.900 kHz	9.880 _____ 9.919 kHz
	990.0 Hz	988.0 _____ 991.9 Hz
	019.9 Hz	50000 _____ 50505 µsec
	018.8 Hz	52910 _____ 53475 µsec
	017.7 Hz	56180 _____ 56818 µsec
	016.6 Hz	59881 _____ 60606 µsec
	015.5 Hz	64103 _____ 64935 µsec
	014.4 Hz	66966 _____ 69930 µsec
	013.3 Hz	74627 _____ 75757 µsec
	012.2 Hz	81301 _____ 82644 µsec
	011.1 Hz	89286 _____ 90909 µsec
	010.0 Hz	99010 _____ 101010 µsec
5-17	**Frequency Stability**	
	105/210V	999900 _____ 1000100 Hz
	125/250V	999900 _____ 1000100 Hz

PARTS LIST

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replacement parts. Table 6-2 lists parts in alpha-numerical order of their reference designators and indicates the description (see Table 6-1 for abbreviations used) and -hp- Part Number of each part, together with any applicable notes.

6-3. Miscellaneous parts associated with each assembly are listed at the end of each assembly listing. Others are listed at the end of Table 6-2.

6-4. Exploded views of major parts of the instrument are given in Figure 6-1 through 6-5 to aid in identifying mechanical parts. The parts in these figures are keyed to the mechanical parts index which are also included in each figure.

6-5. ORDERING INFORMATION

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

6-7. To obtain a part that is not listed, include:

a. Instrument model number.

b. Instrument serial number.

c. Description of the part.

d. Function and location of the part.

REFERENCE DESIGNATORS

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

ABBREVIATIONS

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

Table 6-1. List of Reference Designators and Abbreviations

Table 6-2. Reference Designation Index

Reference Designation	HP Part No.	Description	Note
A1	04204-7025	POWER SUPPLY ASS'Y	
A1C1	0180-0970	C:FXD ALUM ELEC 200μF -10 +75% 100VDCW	
A1C2	0180-0925	C:FXD ALUM ELEC 10μF -10 +75% 50VDCW	
A1C3	0180-0969	C:FXD ALUM ELEC 50μF -10 +75% 50VDCW	
A1C4	0180-0947	C:FXD ALUM ELEC 200μF -10 +75% 15VDCW	
A1C5	0180-0970	C:FXD ALUM ELEC 200μF -10 +75% 100VDCW	
A1C6	0180-0982	C:FXD ALUM ELEC 1.0μF -10 +75% 150VDCW	
A1C7	0180-0969	C:FXD ALUM ELEC 50μF -10 +75% 50VDCW	
A1C8	0180-0947	C:FXD ALUM ELEC 200μF -10 +75% 15VDCW	
A1CR1	1901-0230	SEMICON DEVICE:DIODE SILICON 0.35A 600VDCW	
A1CR2	1901-0230	SEMICON DEVICE:DIODE SILICON 0.35A 600VDCW	
A1CR3	1901-0230	SEMICON DEVICE:DIODE SILICON 0.35A 600VDCW	
A1CR4	1901-0230	SEMICON DEVICE:DIODE SILICON 0.35A 600VDCW	
A1CR5	1902-3149	SEMICON DEVICE:DIODE SILICON BREAKDOWN 9.1V ±5%	
A1CR6	1902-3199	SEMICON DEVICE:DIODE SILICON BREAKDOWN 13.3V ±2%	
A1CR7	1902-3191	SEMICON DEVICE:DIODE SILICON BREAKDOWN 13.0V ±2%	
A1Q1		NOT ASSIGNED	
A1Q2		NOT ASSIGNED	
A1Q3	1853-0037	TRANSISTOR, SI NPN	
A1Q4	1853-0037	TRANSISTOR, SI NPN	
A1Q5	1854-0022	TRANSISTOR SIMILAR TO 2N2102	
A1Q6	1854-0022	TRANSISTOR SIMILAR TO 2N2102	
A1R1	0683-6825	R:FXD COMP 6800Ω ±10% 1/4W	
A1R2	0683-3325	R:FXD COMP 3300Ω ±5% 1/4W	
A1R3	2100-3207	R:VAR CERMET 5000Ω 1/2W	
A1R4	0683-8225	R:FXD COMP 8200Ω ±10% 1/4W	
A1R5	0683-3325	R:FXD COMP 3300Ω ±5% 1/4W	
A1R6	0690-1521	R:FXD COMP 1500Ω ±10% 1W	
A1R7	0683-1035	R:FXD COMP 10kΩ ±10% 1/4W	
A1R8	0698-3156	R:FXD COMP 14.7kΩ ±1% 1/8W	
A1R9	0698-3540	R:FXD COMP 15.4kΩ ±5% 1/8W	
A1R10	0690-1521	R:FXD COMP 1500Ω ±10% 1W	
A1R11	0683-2215	R:FXD COMP 220Ω ±10% 1/4W	
A1R12	0683-2215	R:FXD COMP 220Ω ±10% 1/4W	

See list of abbreviations in introduction to this section

Table 6-2, Reference Designation Index (Cont'd)

Reference Designation	HP Part No.	Description	Note
A2	04204-7022	OSCILLATOR AMPLIFIER ASSEMBLY	
A2C1	0140-0202	C:FXD MICA 15pF ±5% 500VDCW	
A2C2	0140-0036	C:VAR CER 5.5-18pF	
A2C3	0180-0968	C:FXD ALUM ELEC 20μF 25VDCW	
A2C4	0160-2150	C:FXD MICA 33pF ±5%	
A2C5	0180-0958	C:FXD ALUM ELEC 470μF -10 +75% 6VDCW	
A2C6	0160-2238	C:FXD CER 1.5pF ±0.25pF 300VDCW	
A2C7	0180-0936	C:FXD ALUM ELEC 220μF -10 +75% 6VDCW	
A2C8	0180-0958	C:FXD ALUM ELEC 470μF -10 +75% 6VDCW	
A2C9	0180-0958	C:FXD ALUM ELEC 470μF -10 +75% 6VDCW	
A2C10	0180-0773	C:FXD ALUM ELEC 47μF -10 +75% 16VDCW	
A2C11	0180-0773	C:FXD ALUM ELEC 47μF -10 +75% 16VDCW	
A2C12	0160-1548	C:FXD MYLAR 0.22μF ±10% 200VDCW	
A2C13	0160-1548	C:FXD MYLAR 0.22μF ±10% 200VDCW	
A2C14	0180-2500	C:FXD ALUM ELEC 1500μF -10 +75% 6.3VDCW	
A2C15	0160-1548	C:FXD MYLAR 0.22μF ±10% 200VDCW	
A2C16	0160-1548	C:FXD MYLAR 0.22μF ±10% 200VDCW	
A2CR1	1902-0766	SEMICON DEVICE:DIODE, BREAKDOWN 18.2V 5%	
A2CR2	1901-0025	SEMICON DEVICE:DIODE GERMANIUM	
A2CR3	1901-0025	SEMICON DEVICE:DIODE 100V 100mA	
A2CR4	1910-0016	SEMICON DEVICE:DIODE BREAKDOWN GERMANIUM	
A2CR5	1902-3110	SEMICON DEVICE:DIODE BREAKDOWN 5.9V ±2% 400mW	
A2CR6	1910-0016	SEMICON DEVICE:DIODE BREAKDOWN GERMANIUM	
A2CR7	1910-0016	SEMICON DEVICE:DIODE BREAKDOWN GERMANIUM	
A2CR8	1910-0016	SEMICON DEVICE:DIODE BREAKDOWN GERMANIUM	
A2CR9	1910-0016	SEMICON DEVICE:DIODE BREAKDOWN GERMANIUM	
A2CR10	1910-0016	SEMICON DEVICE:DIODE BREAKDOWN GERMANIUM	
A2CR11	1910-0016	SEMICON DEVICE:DIODE BREAKDOWN GERMANIUM	
A2Q1	1853-0010	TRANSISTOR:PNP SI	
A2Q2	1853-0010	TRANSISTOR:PNP SI	
A2Q3	1853-0036	TRANSISTOR:PNP	
A2Q4	1854-0003	TRANSISTOR:NPN SILICON	
A2Q5	1853-0036	TRANSISTOR:PNP	
A2Q6	1850-0040	TRANSISTOR:PNP GE	
A2R1	0683-8225	R:FXD C FLM 8200Ω ±5% 1/4W	
A2R2	0683-3925	R:FXD C FLM 3900Ω ±5% 1/4W	
A2R3	0757-0339	R:FXD MET FLM 3010Ω ±1% 1/4W	
A2R4	0757-0735	R:FXD MET FLM 1300Ω ±1% 1/4W	
A2R5	0683-4715	R:FXD C FLM 470Ω ±5% 1/4W	

Table 6-2. Reference Designation Index (Cont'd)

Reference Designation	HP Part No.	Description	Note
* A2R6	0683-8225	R:FXD COMP 8200Ω ±5% 1/4W	
A2R7	0684-3321	R:FXD COMP 3300Ω ±10% 1/4W	
A2R8	0684-3901	R:FXD COMP 39Ω ±10% 1/4W	
A2R9	0683-5605	R:FXD COMP 56Ω ±5% 1/4W	
A2R10	0683-5605	R:FXD COMP 56Ω ±5% 1/4W	
A2R11	0684-4701	R:FXD COMP 47Ω	
A2R12	0683-4725	R:FXD C FLM 4700Ω ±5% 1/4W	
A2R13	0684-1041	R:FXD COMP 100kΩ ±10% 1/4W	
A2R14	0683-6815	R:FXD COMP 680Ω ±5% 1/4W	
A2R15	0683-1205	R:FXD COMP 12Ω ±5% 1/4W	
A2R16	0683-1635	R:FXD COMP 16kΩ ±5% 1/4W	
A2R17	0683-7525	R:FXD COMP 7500Ω ±5% 1/4W	
A2R18	0683-7525	R:FXD COMP 7500Ω ±5% 1/4W	
* A2R19	0683-5605	R:FXD COMP 56Ω ±5% 1/4W	
A2R20	2100-3349	R:VAR CERMET 100Ω	
A2R21 thru A2R29		NOT ASSIGNED	
A2R30	0757-0470	R:FXD F 162 kΩ ±1% 1/8W	
A3	04204-7023	AMPLIFIER ASSEMBLY	
A3C1	0180-0975	C:FXD ALUM ELEC 300μF -10+75% 3VDCW	
A3C2	0180-0944	C:FXD ALUM ELEC 100μF -10+75% 6VDCW	
A3C3	0160-2249	C:FXD CER 4.7pF ±0.25pF 500 VDCW	
A3C4	0180-0976	C:FXD ALUM ELEC 20μF -10+75% 50VDCW	
A3C5	0180-0976	C:FXD ALUM ELEC 20μF -10+75% 50VDCW	
A3C6	0180-0936	C:FXD ALUM ELEC 200μF -10+75% 6VDCW	
A3C7	0121-0036	C:VAR CER 5.5-18pF	
*A3C8	0160-2306	C:FXD MICA 27pF ±5% 300VDCW	
A3C9	0180-0773	C:FXD ALUM ELEC 50μF -10 +75% 15VDCW	
A3C10	0180-0773	C:FXD ALUM ELEC 50μF -10 +75% 15VDCW	
A3C11	0180-0945	C:FXD ALUM ELEC 50μF -10 +100% 6VDCW	
A3C12	0180-0945	C:FXD ALUM ELEC 50μF -10 +100% 6VDCW	
A3C13	0180-0945	C:FXD ALUM ELEC 50μF -10 +100% 6VDCW	
*A3C14	0160-1473	C:FXD CER 1.5pF ±0.25pF 500VDCW	

See list of abbreviations in introduction to this section

Table 6-2. Reference Designation Index (Cont'd)

Reference Designation	HP Part No.	Description	Note
A3CR1	1902-3336	SEMICON DEVICE:DIODE, BREAKDOWN 47.5V ±5% 400mW	
A3CR2	1901-0025	SEMICON DEVICE:DIODE 100V 100mA	
A3CR3	1901-0025	SEMICON DEVICE:DIODE 100V 100mA	
A3CR4	1901-0040	SEMICON DEVICE:DIODE SILICON	
A3CR5	1901-0040	SEMICON DEVICE:DIODE SILICON	
A3L1	9140-0115	COIL:22μH ±10%	
A3L2	9140-0137	COIL:1000μH ±5%	
A3Q1	1854-0113	TRANSISTOR:NPN SILICON	
A3Q2	1854-0113	TRANSISTOR:NPN SILICON	
A3Q3	1853-0071	TRANSISTOR:PNP SILICON 2N3494	
A3Q4	1854-0113	TRANSISTOR:NPN SILICON 2SC805-O	
A3Q5	1854-0003	TRANSISTOR:NPN SILICON	
A3Q6	1853-0036	TRANSISTOR:NPN SILICON	
A3R1	0683-2225	R:FXD COMP 2200Ω ±5% 1/4W	
A3R2	0686-2035	R:FXD COMP 20kΩ ±5% 1/2W	
A3R3	0683-1825	R:FXD COMP 1800Ω ±5% 1/4W	
*A3R4	0686-1535	R:FXD COMP 15kΩ ±5% 1/2W	
A3R5	0683-3625	R:FXD COMP 3600Ω ±5% 1/4W	
A3R6	0683-3905	R:FXD COMP 39Ω ±5% 1/4W	
A3R7	0686-1235	R:FXD COMP 12kΩ ±5% 1/2W	
A3R8	0683-5605	R:FXD COMP 56Ω ±5% 1/4W	
A3R9	0683-5605	R:FXD COMP 56Ω ±5% 1/4W	
*A3R10	0683-8225	R:FXD COMP 8200Ω ±5% 1/4W	
A3R11	0686-6215	R:FXD COMP 620Ω ±5% 1/2W	
A3R12	0683-0275	R:FXD COMP 2.7Ω ±5% 1/4W	
A3R13	0683-0275	R:FXD COMP 2.7Ω ±5% 1/4W	
A3R14	0683-6235	R:FXD COMP 62kΩ ±5% 1/4W	
A3R15	2100-3350	R:VAR CERMET 300Ω	
A3R16	0698-4428	R:FXD COMP 1.69kΩ ±1% 1/8W	
A3R17	0683-4325	R:FXD COMP 4300Ω ±5% 1/4W	
A3R18	0683-6845	R:FXD COMP 680kΩ ±5% 1/4W	
A3R19	0683-2415	R:FXD COMP 240Ω ±5% 1/4W	
A3R20	0683-1215	R:FXD COMP 120Ω ±5% 1/4W	
A3R21	0683-9135	R:FXD COMP 91kΩ ±5% 1/4W	
A3R22	0683-1035	R:FXD COMP 10kΩ ±5% 1/4W	
A3R23	0683-1205	R:FXD COMP 12Ω ±5% 1/4W	
A3R24	0683-1035	R:FXD COMP 12Ω ±5% 1/4W	
*A3R25	0683-2215	R:FXD COMP 220Ω ±5% 1/4W	
A3R26	2100-3349	R:VAR CERMET 100Ω	
*A3R27	0683-9135	R:FXD COMP 91kΩ ±5% 1/4W	
*A3R28	0683-6835	R:FXD COMP 68kΩ 5% 1/4W	

See list of abbreviations in introduction to this section

Table 6-2. Reference Designation Index (Cont'd)

Reference Designation	HP Part No.	Description	Note
A4	04204-7028	OUTPUT ATTENUATOR	
A4R1	0698-1440	R:FXD C FLM 9.48kΩ ±0.5% 1/2W	
A4R2	0698-1423	R:FXD C FLM 639Ω ±0.5% 1/2W	
A4R3	0698-1423	R:FXD C FLM 639Ω ±0.5% 1/2W	
A4R4	0698-1440	R:FXD C FLM 9.48kΩ ±0.5% 1/2W	
A4R5	0698-1423	R:FXD C FLM 639Ω ±0.5% 1/2W	
A4R6	0698-1423	R:FXD C FLM 639Ω ±0.5% 1/2W	
A4R7	0698-1439	R:FXD C FLM 2970Ω ±0.5% 1/2W	
A4R8	0698-1422	R:FXD C FLM 733Ω ±0.5% 1/2W	
A4R9	0698-1422	R:FXD C FLM 733Ω ±0.5% 1/2W	
A4R10	0698-1437	R:FXD C FLM 854Ω ±0.5% 1/2W	
A4R11	0698-1438	R:FXD C FLM 1155Ω ±0.5% 1/2W	
A4R12	0698-1438	R:FXD C FLM 1155Ω ±0.5% 1/2W	
A4S3	3100-1129	SWITCH:ROTARY	
A5	04204-7026	FREQUENCY RANGE SWITCH ASSEMBLY	
A5C110	0160-1556	C:FXD MICA 400pF ±1% 300VDCW	
A5C111	0121-0208	C:VAR CER 5-20pF 350VDCW	
A5C112	0140-0159	C:FXD MICA 3000pF ±2% 300VDCW	
A5C113 thru A5C129		NOT ASSIGNED	
A5C130	0160-1555	C:FXD MICA 320pF ±1% 300VDCW	
A5C131	0121-0208	C:VAR CER 5-20pF 350VDCW	
A5C132	0160-1560	C:FXD CER 20pF ±5% 500VDCW	
A5C133	0150-0050	C:FXD CER 3.3pF ±0.25pF	
A5C134	0140-0196	C:FXD MICA 39pF 5%.	
A5C135	0140-0200	C:FXD MICA 390pF 5%	
A5C136	0140-2675	C:FXD MICA 3900pF 5%	
A5R101 thru A5R103		NOT ASSIGNED	
* A5R104	0683-1055	R:FXD COMP 1MΩ ±5% 1/4W	
A5R105	0683-2005	R:FXD COMP 20Ω ±5% 1/4W	
A5R106		NOT ASSIGNED	
A5R107		NOT ASSIGNED	
A5R108	0683-3325	R:FXD COMP 3300Ω ±5% 1/4W	
A5R109		NOT ASSIGNED	
A5R110	0683-1525	R:FXD COMP 1500Ω ±5% 1/4W	
A5R111		NOT ASSIGNED	
A5S4	3100-1130	SWITCH:ROTARY	

See list of abbreviations in introduction to this section

Table 6-2, Reference Designation Index (Cont'd)

Reference Designation	HP Part No.	Description	Note
A6	04204-7127	FREQUENCY SELECTOR SWITCH ASSEMBLY	
A6R1	0698-1441	INFINITE	
A6R2	0698-1390	R:FXD MET FLM 4000Ω ±0.1% 1/4W	
A6R3	0698-1389	R:FXD MET FLM 2000Ω ±0.1% 1/4W	
A6R4	0698-1388	R:FXD MET FLM 1333Ω ±0.1% 1/4W	
A6R5	0698-1387	R:FXD MET FLM 1000Ω ±0.1% 1/4W	
A6R6	0698-1386	R:FXD MET FLM 799.8Ω ±0.1% 1/4W	
A6R7	0698-1385	R:FXD MET FLM 666.5Ω ±0.1% 1/4W	
A6R8	0698-1384	R:FXD MET FLM 571.2Ω ±0.1% 1/4W	
A6R9	0698-1383	R:FXD MET FLM 499.7Ω ±0.1% 1/4W	
A6R10	0698-1382	R:FXD MET FLM 444.1Ω ±0.1% 1/4W	
A6R11	0698-1441	INFINITE	
A6R12	0698-1390	R:FXD MET FLM 4000Ω ±0.1% 1/4W	
A6R13	0698-1389	R:FXD MET FLM 2000Ω ±0.1% 1/4W	
A6R14	0698-1388	R:FXD MET FLM 1333Ω ±0.1% 1/4W	
A6R15	0698-1387	R:FXD MET FLM 1000Ω ±0.1% 1/4W	
A6R16	0698-1386	R:FXD MET FLM 799.8Ω ±0.1% 1/4W	
A6R17	0698-1385	R:FXD MET FLM 666.5Ω ±0.1% 1/4W	
A6R18	0698-1384	R:FXD MET FLM 571.2Ω ±0.1% 1/4W	
A6R19	0698-1383	R:FXD MET FLM 499.7Ω ±0.1% 1/4W	
A6R20	0698-1382	R:FXD MET FLM 444.1Ω ±0.1% 1/4W	
A6R21	0698-1441	INFINITE	
A6R22	0698-1399	R:FXD MET FLM 40kΩ ±0.1% 1/4W	
A6R23	0698-1398	R:FXD MET FLM 20kΩ ±0.1% 1/4W	
A6R24	0698-1397	R:FXD MET FLM 13.33kΩ ±0.1% 1/4W	
A6R25	0698-1396	R:FXD MET FLM 10kΩ ±0.1% 1/4W	
A6R26	0698-1395	R:FXD MET FLM 8000Ω ±0.1% 1/4W	
A6R27	0698-1394	R:FXD MET FLM 6667Ω ±0.1% 1/4W	
A6R28	0698-1393	R:FXD MET FLM 5714Ω ±0.1% 1/4W	
A6R29	0698-1392	R:FXD MET FLM 5000Ω ±0.1% 1/4W	
A6R30	0698-1391	R:FXD MET FLM 4444Ω ±0.1% 1/4W	
A6R31	0698-1441	INFINITE	
A6R32	0698-1399	R:FXD MET FLM 40kΩ ±0.1% 1/4W	
A6R33	0698-1398	R:FXD MET FLM 20kΩ ±0.1% 1/4W	
A6R34	0698-1397	R:FXD MET FLM 13.33kΩ ±0.1% 1/4W	
A6R35	0698-1396	R:FXD MET FLM 10kΩ ±0.1% 1/4W	
A6R36	0698-1395	R:FXD MET FLM 8000Ω ±0.1% 1/4W	
A6R37	0698-1394	R:FXD MET FLM 6667Ω ±0.1% 1/4W	
A6R38	0698-1393	R:FXD MET FLM 5714Ω ±0.1% 1/4W	
A6R39	0698-1392	R:FXD MET FLM 5000Ω ±0.1% 1/4W	
A6R40	0698-1391	R:FXD MET FLM 4444Ω ±0.1% 1/4W	

See list of abbreviations in introduction to this section

Table 6-2. Reference Designation Index (Cont'd)

Reference Designation	HP Part No.	Description	Note
A6R41	0698-1442	INFINITE	
A6R42	0698-1427	R:FXD C FLM 400kΩ ±0.5% 1/4W	
A6R43	0698-1426	R:FXD C FLM 200kΩ ±0.5% 1/4W	
A6R44	0698-1425	R:FXD C FLM 133.3kΩ ±0.5% 1/4W	
A6R45	0698-1424	R:FXD C FLM 100kΩ ±0.5% 1/4W	
A6R46	0698-1421	R:FXD C FLM 80kΩ ±0.25% 1/4W	
A6R47	0698-1420	R:FXD C FLM 66.67kΩ ±0.25% 1/4W	
A6R48	0698-1419	R:FXD C FLM 57.14kΩ ±0.25% 1/4W	
A6R49	0698-1418	R:FXD C FLM 50kΩ ±0.25% 1/4W	
A6R50	0698-1417	R:FXD C FLM 44.44kΩ ±0.25% 1/4W	
A6R51	0698-1442	INFINITE	
A6R52	0698-1427	R:FXD C FLM 400kΩ ±0.5% 1/4W	
A6R53	0698-1426	R:FXD C FLM 200kΩ ±0.5% 1/4W	
A6R54	0698-1425	R:FXD C FLM 133.3kΩ ±0.5% 1/4W	
A6R55	0698-1424	R:FXD C FLM 100kΩ ±0.5% 1/4W	
A6R56	0698-1421	R:FXD C FLM 80kΩ ±0.25% 1/4W	
A6R57	0698-1420	R:FXD C FLM 66.67kΩ ±0.25% 1/4W	
A6R58	0698-1419	R:FXD C FLM 57.14kΩ ±0.25% 1/4W	
A6R59	0698-1418	R:FXD C FLM 50kΩ ±0.25% 1/4W	
A6R60	0698-1417	R:FXD C FLM 44.44kΩ ±0.25% 1/4W	
A6R61	0698-1442	INFINITE	
A6R62	0698-1436	R:FXD C FLM 4MΩ ±5% 1/4W	
A6R63	0698-1435	R:FXD C FLM 2MΩ ±2% 1/4W	
A6R64	0698-1434	R:FXD C FLM 1.33MΩ ±2%	
A6R65	0698-1433	R:FXD C FLM 1MΩ ±1% 1/4W	
A6R66	0698-1432	R:FXD C FLM 800kΩ ±1% 1/4W	
A6R67	0698-1431	R:FXD C FLM 667kΩ ±1% 1/4W	
A6R68	0698-1430	R:FXD C FLM 571kΩ ±1% 1/4W	
A6R69	0698-1429	R:FXD C FLM 500kΩ ±1% 1/4W	
A6R70	0698-1428	R:FXD C FLM 444kΩ ±1% 1/4W	
A6R71	0698-1442	INFINITE	
A6R72	0698-1436	R:FXD C FLM 4MΩ ±5% 1/4W	
A6R73	0698-1435	R:FXD C FLM 2MΩ ±2% 1/4W	
A6R74	0698-1434	R:FXD C FLM 1.33MΩ ±2% 1/4W	
A6R75	0698-1433	R:FXD C FLM 1MΩ ±1% 1/4W	
A6R76	0698-1432	R:FXD C FLM 800kΩ ±1% 1/4W	
A6R77	0698-1431	R:FXD C FLM 667kΩ ±1% 1/4W	
A6R78	0698-1430	R:FXD C FLM 571kΩ ±1% 1/4W	
A6R79	0698-1429	R:FXD C FLM 500kΩ ±1% 1/4W	
A6R80	0698-1428	R:FXD C FLM 444kΩ ±1% 1/4W	
A6S5	04204-7134	SWITCH ASSY	

See list of abbreviations in introduction to this section

Table 6-2. Reference Designation Index (Cont'd)

Reference Designation	HP Part No.	Description	Note
A7	04204-7021	FREQUENCY RANGE ADJUSTMENT CAPACITOR ASS'Y	
*A7C102	0160-2226	C:FXD MICA 2200pF ±5% 300VDCW	
*A7C103	0160-2215	C:FXD MICA 750pF ±5% 300VDCW	
A7C104		NOT ASSIGNED	
*A7C105	0140-0208	C:FXD MICA 680pF ±5% 300VDCW	
*A7C106	0140-0192	C:FXD MICA 68pF ±5% 300VDCW	
A7C107	0160-2675	C:FXD MICA 3900pF ±1% 300VDCW	
A7C108		NOT ASSIGNED	
A7C109	0121-0219	C:VAR CER 10-110pF 500VDCW	
A7C110 thru A7C121		NOT ASSIGNED	
*A7C122	0160-2229	C:FXD MICA 3000pF ±5% 300VDCW	
*A7C123	0160-2218	C:FXD MICA 1000pF ±5% 300VDCW	
A7C124		NOT ASSIGNED	
A7C125	0140-0208	C:FXD MICA 680pF ±5% 300VDCW	
*A7C126	0160-0134	C:FXD MICA 220pF ±5% 300VDCW	
A7C127	0160-2675	C:FXD MICA 3900pF ±1% 300VDCW	
A7C128		NOT ASSIGNED	
A7C129	0121-0219	C:VAR CER 10-110pF 500VDCW	
A7R101	0683-1255	R:FXD COMP 1.2MΩ ±5% 1/4W	
A7R102	0683-1855	R:FXD COMP 1.8MΩ ±5% 1/4W	
A7R103	0683-3955	R:FXD COMP 3.9MΩ ±5% 1/4W	
A7R104 thru A7R110		NOT ASSIGNED	
A7R111	0683-4705	R:FXD COMP 47Ω ±5% 1/4W	

See list of abbreviations in introduction to this section

Table 6-2. Reference Designation Index (Cont'd)

Reference Designation	HP Part No.	Description	Note
C101A	0160-1552	C:FXD 0.395μF 0.5% S.MICA 300V	
C101B	0160-1552	C:FXD 0.039μF	
C121A	0160-1552	C:FXD 0.395μF 0.5% S.MICA 300V	
C121B	0160-1552	C:FXD 0.039μF	
C1	0160-3007	C:FXD CER 4700pF ±20% 4000VDCW	
C2	0160-3007	C:FXD CER 4700pF ±20% 4000VDCW	
C3	0160-1554	C:FXD MYLAR 0.47μF ±10% 100VDCW	
C4	0160-1554	C:FXD MYLAR 0.47μF ±10% 100VDCW	
DS1	2140-0101	LAMP:GLOW EN-2T NEON	
F1	2110-0235	FUSE:CARTRIDGE 0.2A SLOW BLOW FOR 115V OPERATION	
	2110-0234	FUSE:CARTRIDGE 0.1A SLOW BLOW FOR 230V OPERATION	
M1	1120-0750	METER:500μA 0-1, 0-3 AND DB SCALES	
	1120-0754	METER:500μA dB SCALE (OPT. 001 ONLY)	
Q1	1853-0252	TRANSISTOR:SILICON PNP	
Q2	1853-0252	TRANSISTOR:SILICON PNP	
R1	0684-1041	R:FXD COMP 100kΩ ±10% 1/4W	
R2	2100-0113	R:VAR COMP 2-SECT 100k/25kΩ 2W	
R3	0686-6215	R:FXD COMP 620Ω ±5% 1/2W	
R4	0686-6215	R:FXD COMP 620Ω ±5% 1/2W	
R5	0698-5884	R:FXD MET FLM 22Ω ±5% 1/2W	
R109	2100-1179	R:VAR FLM 1000Ω	
S1	3101-0279	SWITCH:TOGGLE SPST	
S2	3101-1234	SWITCH:SLIDE DPDT 115/230	
T1	04204-8601	TRANSFORMER:POWER	
W1	8120-1378	CABLE ASS'Y:POWER CORD	

See list of abbreviations in introduction to this section

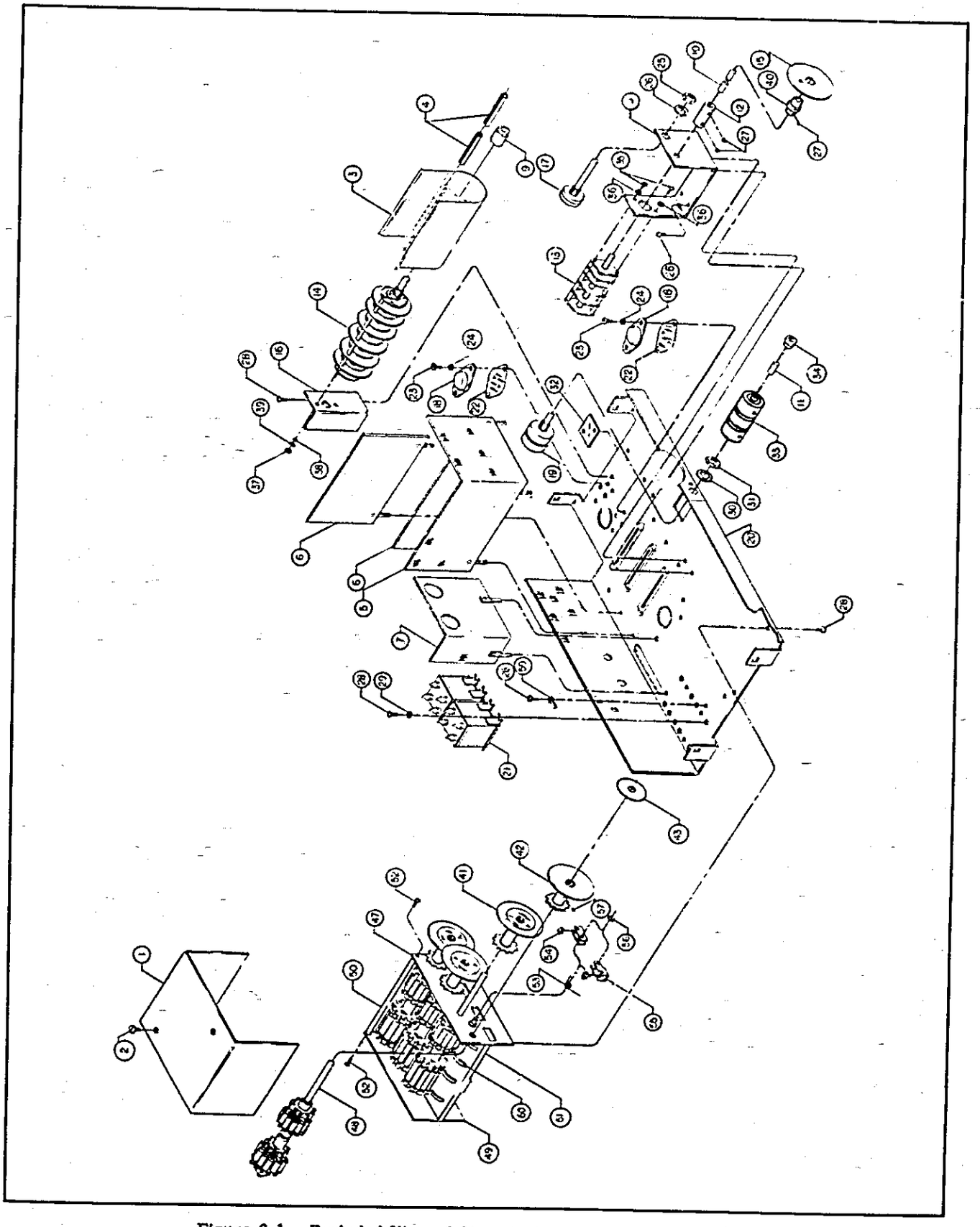


Figure 6-1. Exploded View of Chassis Assembly (I) (Sheet 1 of 2)

Ref.	HP Part No.	Q'ty	Description	Note
1	04204-1034	1	SHIELD	
2	2360-0113	2	SCREW, BH 6-32 x 1/4"	
3	04204-1030	1	SHIELD	
4	04204-3021	2	KEY, ATTEN. SHIELD	
5	04204-1024	1	SHIELD	
6	04204-1025	2	SHIELD	
7	04204-1026	1	SHIELD	
8	04204-1028	1	BRACKET, MTG.	
9	04204-3023	1	BUSHING, INSULATOR	
10	04204-3029	1	SHAFT, .236" x 3-1/16"	
11	04204-23001	1	SHAFT, 6mm x 32mm.	
12	04204-3035	1	COUPLER, SHAFT	
13	04204-7026	1	SWITCH ASS'Y, (FREQUENCY RANGE)	
14	04204-7028	1	SWITCH ASS'Y,(ATTENUATOR)	
15	04204-7136	1	INDICATOR, DIAL, FREQUENCY RANGE	
16	04204-1029	1	BRACKET, MTG.	
17	2100-1179	1	RESISTOR VAR, 1kΩ CARBON FILM	
18	1850-0098	2	TRANSISTOR, POWER	
19	2100-0113	1	RESISTOR VAR. 100k/25k 2W	
20	04204-7000	1	CHASSIS	
21	0160-1552	2	CAPACITOR, FREQ. SEL. 0.395μF +0.034μF 0.5% SM	
22	1200-0043	2	INSULATOR, TRANSISTOR	
23	2200-0147	4	SCREW, FIL HD 4-40 x 7/16"	
24	3050-0105	4	WASHER, BRASS .2812 OD .125 ID	
25	0590-0221	1	NUT, HEX	
26	2190-0016	1	WASHER, LOCK, SPLIT 3/8" ID	
27	3030-0005	6	SCREW, SET 8-32 x 1/8"	
28	2260-0115	15	SCREW, BH W/LK 6-32 x 5/16"	
29	3050-0016	8	WASHER, BRASS 2812 OD 147/ID	
30	2190-0022	1	WASHER, LOCK, INT 3/8" ID	
31	2950-0001	1	NUT, HEX 3/8" x 32	
32	1200-0041	2	SOCKET TRANSISTOR	
33	04342-5039	2	YOKE, COUPLER	
34	04204-25001	1	BUSHING, SHAFT INSULATOR	
35	0570-0356	2	SCREW, SWITCH MOUNTING	
36	2190-0223	2	WASHER, LOCK SPLIT	
37	0590-0223	2	NUT, HEX M3 x 0.5	
38	3050-0105	2	WASHER, BRASS 2812 OD 125 ID	
39	2190-0019	2	WASHER, LOCK, SPLIT #4	
40	04204-3027	1	FLANGE	
41	04204-7038	2	DIAL, FREQUENCY INDICATOR, SHORT	
42	04204-7039	2	DIAL, FREQUENCY,INDICATOR, LONG	
43			NOT ASSIGNED	
44			NOT ASSIGNED	
45			NOT ASSIGNED	
46			NOT ASSIGNED	
47	04204-1037	1	PLATE, FRONT FREQUENCY SWITCH ASS'Y	
48	04204-7040	4	ROTOR FREQUENCY SWITCH	
49	04204-1038	1	PLATE, REAR, FREQUENCY SW. ASS'Y	
50	04204-3036	3	SPACER, FREQUENCY SW. 6 x 112	
51	04204-5020	4	CONTACT ASS'Y, FREQUENCY SW.	
52	2210-0003	6	SCREW, FH 4-40 x 3/8"	
53	04204-8541	2	SPRING, DETENT ARM	
54	04260-3056	4	ROLLER, DETENT	
55	04260-1067	4	ARM, DETENT	
56	0510-0015	2	RETAINER, RING	
57	1480-0008	4	PIN, DRIVE	
59	0360-0007	1	TERMINAL, SOLDER LUG #6	
60	04204-1041	16	SWITCH CONTACT	

Figure 6-1. Exploded View of Chassis Assembly (I) (Sheet 2 of 2)

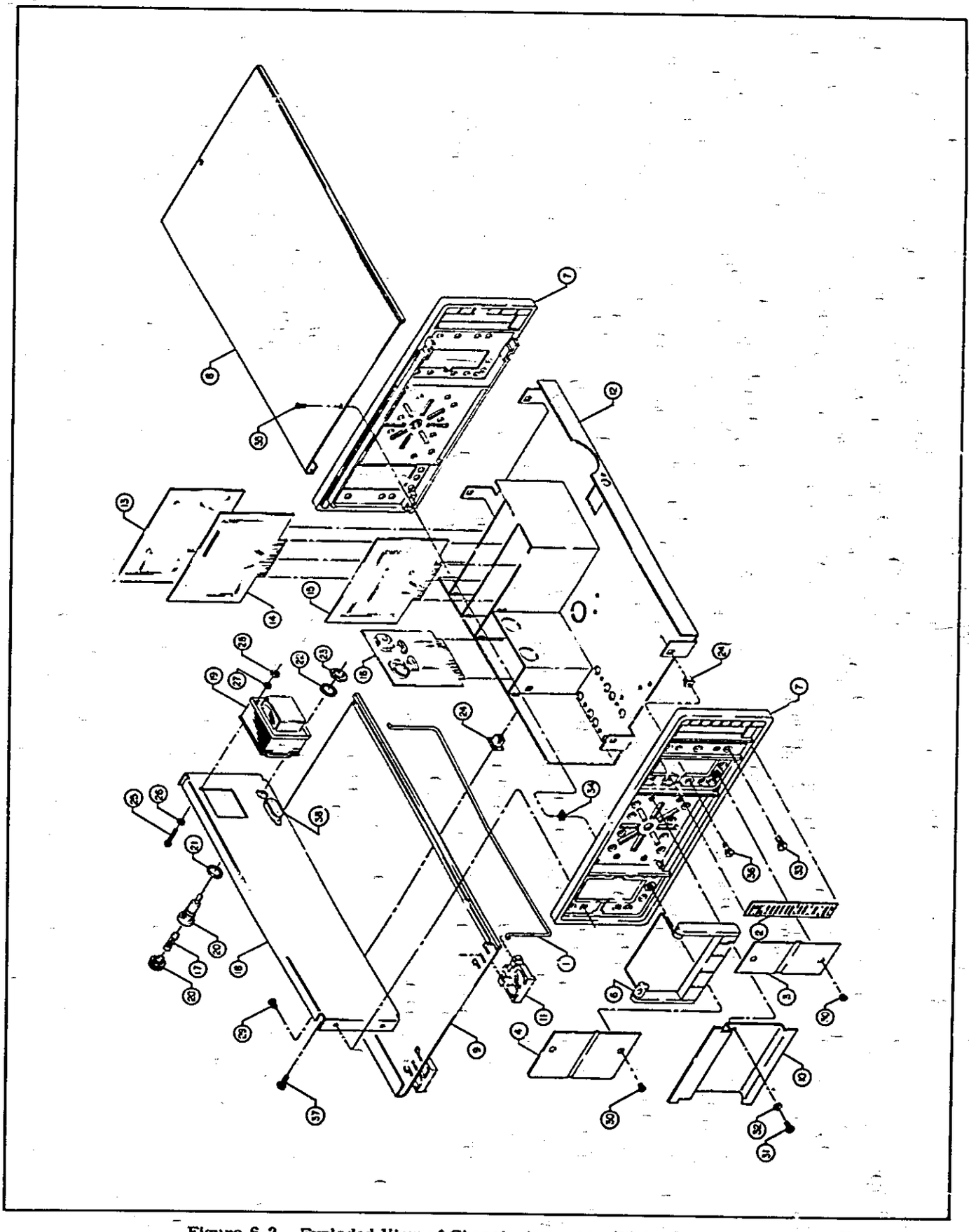


Figure 6-2. Exploded View of Chassis Assembly (II) (Sheet 1 of 2)

Ref.	Part No.	Q'ty	Description	Note
1	1490-0030	1	STAND, TILT	
2	5000-0051	2	STRIP CABINET TRIM 4.56 LG	
3	5000-8593	2	COVER, FRONT SIDE 5 x 11" CABINET	
4	5000-8597	2	COVER, REAR SIDE 5 x 11" CABINET	
5			NOT ASSIGNED	
6	5060-0222	2	HANDLE ASS'Y SIDE	
7	5060-0731	2	FRAME ASS'Y 5 x 11"	
8	04204-1145	1	COVER, TOP 11"	
9	04204-1146	1	COVER, BOTTOM 11"	
10	5060-8737	2	PLATE, SIDE HANDLE	
11	5060-0767	5	FOOT, CABINET	
12	04204-7000	1	CHASSIS	
13	04204-7025	1	POWER SUPPLY ETCHED CKT	
14	04204-7023	1	AMPLIFIER ETCHED CKT	
15	04204-7022	1	OSCILLATOR ETCHED CKT	
16	04204-7021	1	FREQUENCY RANGE CAP. ASS'Y	
17	2110-0235	1	FUSE, CARTRIDGE 0.2A S.B.	
	2110-0234	1	FUSE, CARTRIDGE 0.1A S.B. (FOR 230V OPERATION)	
18	04204-7132	1	PANEL, REAR, FOR 115V/230V	
	04204-7133	1	PANEL, REAR, FOR 100V/200V	
19	04204-8601	1	TRANSFORMER, POWER	
20	1400-0084	1	FUSEHOLDER -3AG FUSE EXTRACTOR POST TYPE	
21	0900-0016	1	O RING RUBBER 11/16 x 1/2 x 3/32 DIA	
22	2190-0037	1	WASHER, LOCK INT. NO. 1/2 .789 OD	
23	2950-0038	1	NUT HEX. 5-24 x .6875	
24	0340-0117	6	GROMMET - NYLON #8 SCREW	
25	2200-0125	4	SCREW, 4-40 1-1/2 LG, PH SS	
26	3050-0105	4	WASHER, BRASS .2812 OD .125 ID	
27	2190-0003	4	WASHER-LOCK HELICAL NO. 4	
28	2260-0001	4	NUT, HEX. SS 4-40 .25 WD	
29	2510-0041	4	SCREW, SS 8-32 x 1/4 P.H.	
30	2360-0181	4	SCREW, MACH. SS 6-32 x .250 F.H.	
31	2510-0101	4	SCREW-MACH. SS 8-32 x .312 P.H.	
32	2190-0015	4	WASHER-LOCK INT. NO. 8 PHZ BRZ	
33	2510-0046	6	SCREW-MACH. SS 8-32 x .375 F.H.	
34	0590-0053	4	NUT SHT MTL TYPE J6-32	
35	2360-0183	4	SCREW-MACH. SS 6-32 x .375 F.H.	
36	2510-0052	4	SCREW-MACH. SS 8-32 x .625 F.H.	
37	2510-0049	2	SCREW-MACH. SS 8-32 x .50 PH	
38	1251-2357	1	CONNECTOR-AC POWER 3 PIN	

Figure 6-2. Exploded View of Chassis Assembly (II) (Sheet 2 of 2)

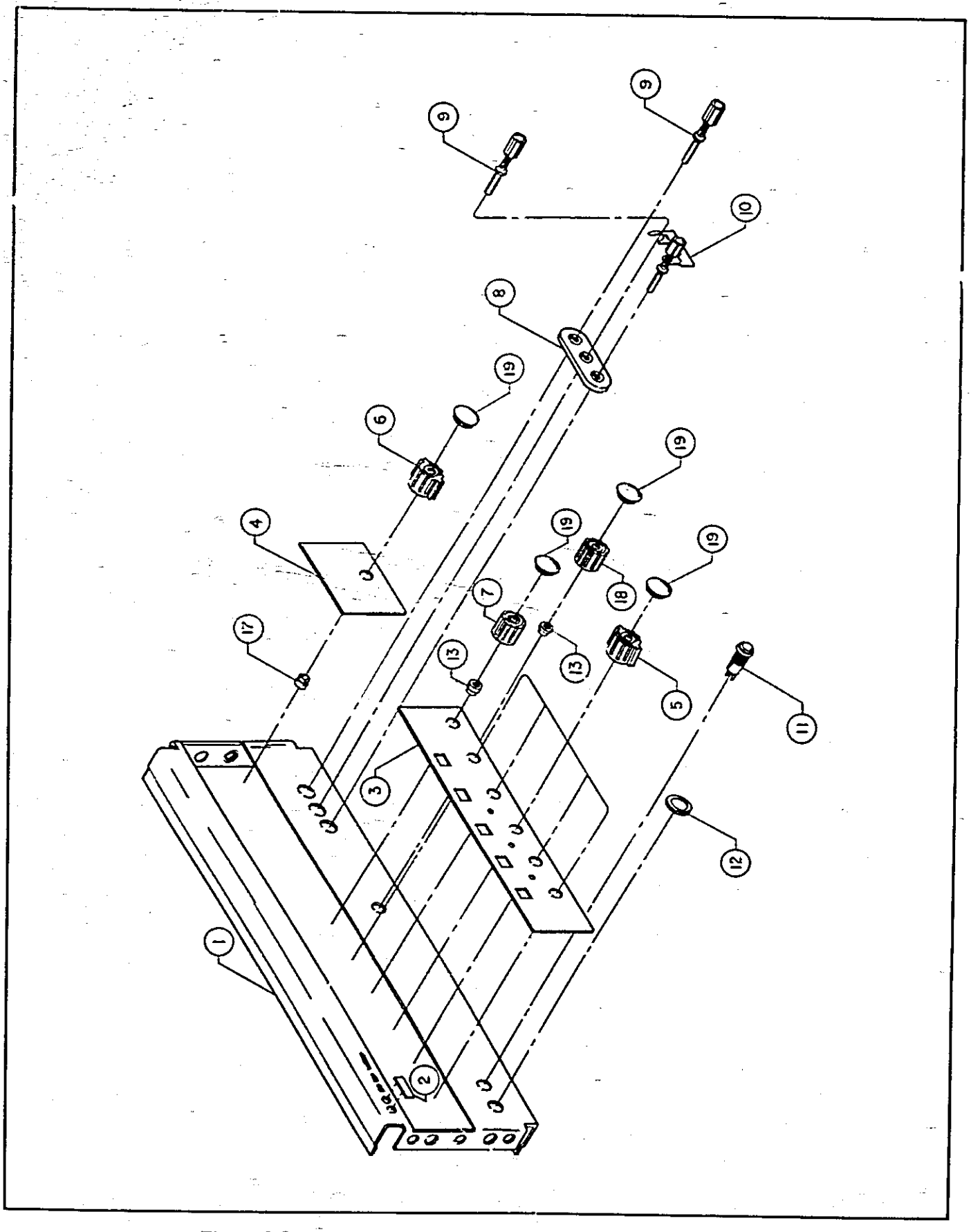


Figure 6-3. Exploded View of Front Panel Assembly (I) (Sheet 1 of 2)

Ref.	HP Part No.	Q'ty	Description	Note
1	04204-1119	1	CONTROL PANEL	
2	7120-1254	1	NAME PLATE, HP TRADEMARK	
3	04204-1021	1	PLATE, VERNIER - BLACK	
4	04204-1022	1	PLATE, OUTPUT - BLACK	
5	0370-0286	5	KNOB, DIA 6.35mm WING, BLACK (FREQUENCY SELECTOR)	
6	0370-0287	1	KNOB, DIA 6.35mm WING, BLACK (OUTPUT ATTENUATOR)	
7	0370-0284	1	KNOB, DIA 6mm, WHITE LINE BLACK (VERNIER)	
8	0340-0091	1	INSULATOR BDG POST, TRIPLE IN LINE W/KEY	
9	1510-0008	2	BINDING POST -RED .750	
10	5060-0625	1	BINDING POST ASS'Y LEFT HAND LINK	
11	2140-0101	1	LAMP GLOW NEON BN-2T	
12	0590-0220	1	NUT, M12 P1 .015 BRASS	
13	04204-3033	2	INSULATOR, BUSH.	
14 - 16			NOT ASSIGNED	
17	04204-3023	1	INSULATOR, BUSH.	
18	0370-0284	1	KNOB, DIA 6mm, WHITE LINE, BLACK (AMPLITUDE)	
19	0370-0288	8	CAP, BLACK.	

Figure 6-3. Exploded View of Front Panel Assembly (I) (Sheet 2 of 2)

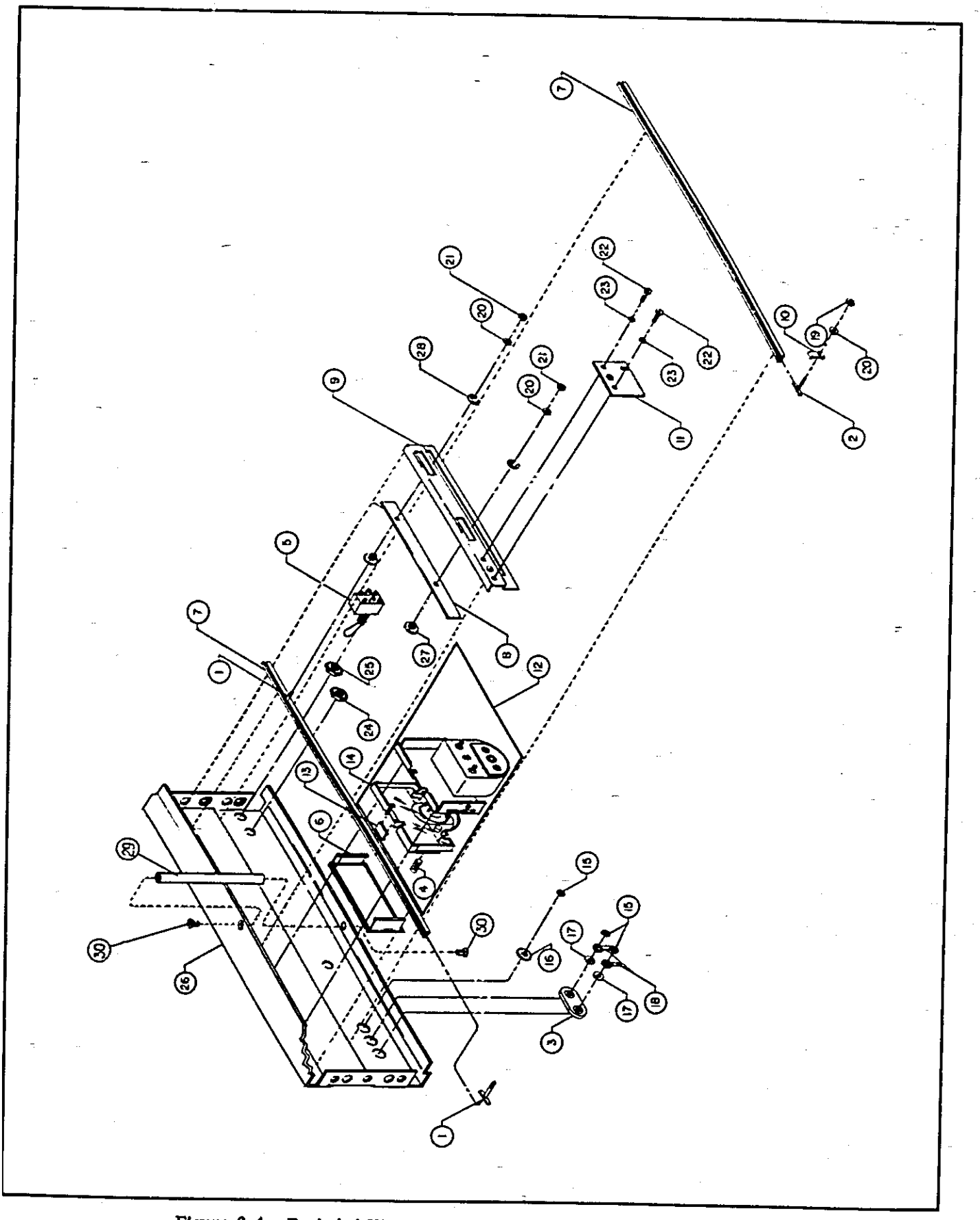


Figure 6-4. Exploded View of Front Panel Assembly (II) (Sheet 1 of 2)

Ref.	HP Part No.	Q'ty	Description	Note
1	04204-3040	2	SCREW, 4-40 x 7/16	
2	04204-3040	2	SCREW, 4-40 x 7/16	
3	0340-0086	1	INSULATOR, B. P. DOUBLE	
4	1460-0256	4	SPRING EXTENSION STL , 187 OD , 218 LG WIRE	
5	3101-0212	1	SWITCH, TOGGLE D, P, D, T, St-22 N	
6	4040-0316	1	BEZEL, METER WINDOW	
7	7200-0273	2	ALUM-EXTRUSION	
8	04204-1032	1	PLATE, ALUM 1/2 x 6-5/8	
9	04204-1133	1	POINT, INDICATOR	
10	04204-1042	2	ANGLE	
11	04204-5022	1	COUPLER DEC. PT. IND.	
12	1120-0750	1	METER, 0-500 μA	
13	4040-0362	1	CLIP, METER CASE	
14	5060-6079	1	COVER ASS'Y W/ZERO ADJUST	
15	2740-0002	3	NUT, HEX SS 10-32 x , 375	
16	2190-0028	1	WASHER, STEEL , 4275 OD , 203 ID	
17	3050-0002	2	WASHER, STEEL , 4275 OD , 203 ID	
18	0360-0053	2	TERMINAL, LOCKING PHOS. BRONZE	
19	2260-0001	2	NUT, HEX , SS 4-40 , 25 WD	
20	2190-0030	4	WASHER, LOCK SPLIT RING NO. 4	
21	2340-0001	2	NUT, HEX. BN-P 4-40 , 188 WD	
22	2200-0103	2	SCREW, MACH. SS 4-40 x , 250	
23	5030-0221	1	WASHER, BRASS , 2812 OD , 147 ID	
24	0590-0221	1	NUT, HEX. M9 PO , 75	
25	0590-0222	1	NUT, HEX. M12 P1	
26	04204-1119	1	PANEL, CONTROL	
27	04204-3025	2	BUSHING, 14MM OD 6MM LG	
28	0510-0083	2	RING-RET. EXT. STL. , 250 DIA	
29	04204-3042	1	STUD:ALUM REINFORCED	
30	2360-0200	2	SCREW:MACH SS FH #6-32	

Figure 6-4. Exploded View of Front Panel Assembly (II) (Sheet 2 of 2)

Ref.	HP Part No.	Q'ty	Description	Note
1			NOT ASSIGNED	
2	3050-0105	4	WASHER, BRASS .2812 O.D. .125 I.D.	
3	1200-0081	4	BUSHING, TRANSISTOR .225 .175	
4	2190-0003	4	WASHER, LOCK HELICAL NO. 4	
5	2260-0001	4	NUT, HEX SS 4-40 .25 WD	
6	0360-0005	2	TERM, LUG PL FL BRS.	
7	1400-0054	3	CLAMP CABLE .125 CABLE	
8	2360-0115	7	SCREW, MACH. SS 6-32 X .312 PH	
9	1400-0015	1	CLAMP, CABLE .25 DIA CABLE	
10	2420-0001	9	NUT HEX. SNP 6-32 .312 WD	
11	0360-0001	3	TERM, LUG INT LOCK FL BRS.	

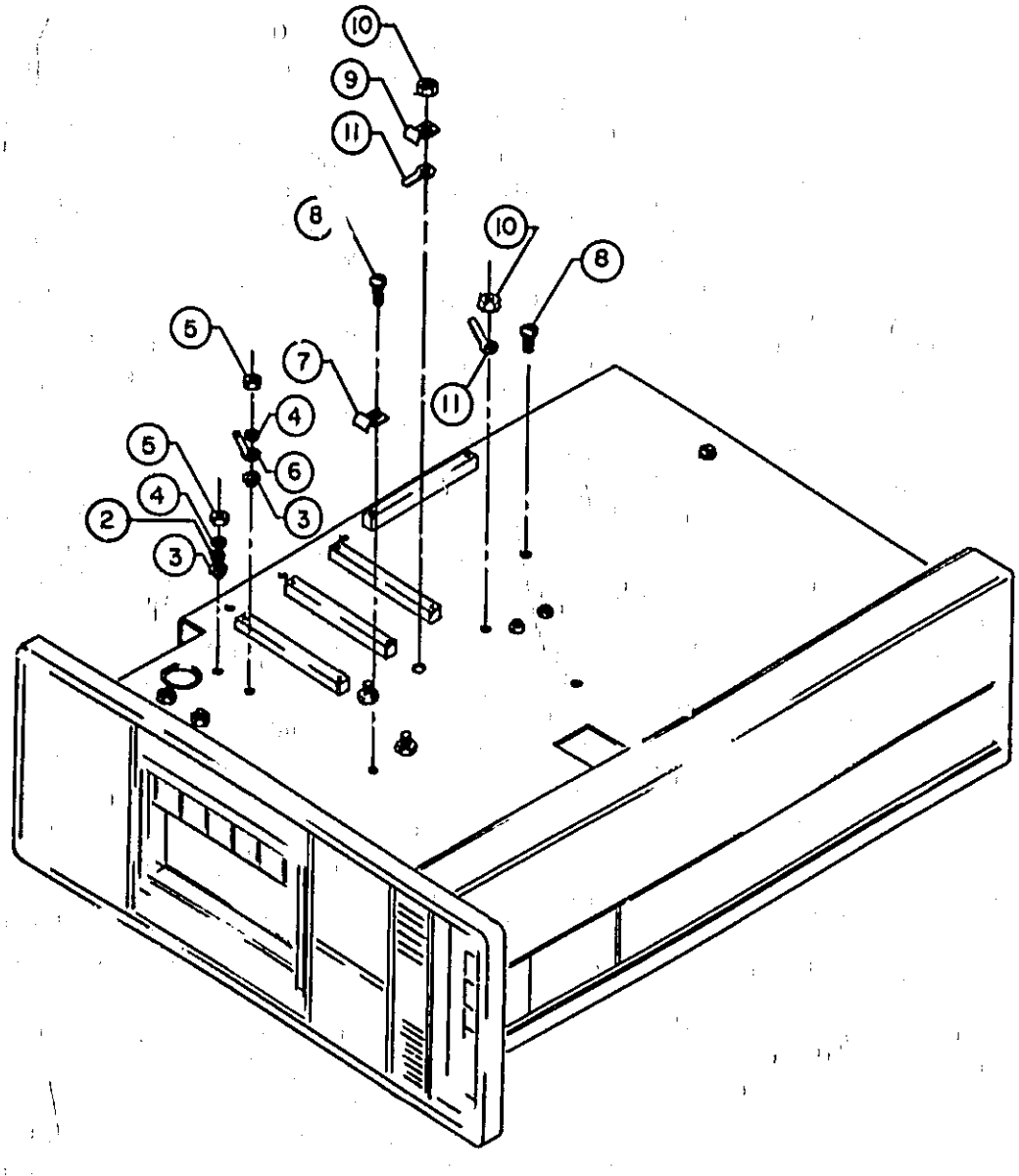


Figure 6-5. Exploded View of Chassis Assembly (III) (Sheet 1 of 1)

SECTION VII
MANUAL CHANGES AND OPTIONS

7-1. OPTIONS.

7-2. Options are standard modifications performed on -hp- instruments at the factory. Option 001 is provided for the 4204A Oscillator which has output monitor top scale calibrated in dBm (0dBm = 1mW into 600Ω) and bottom scale calibrated in volts.

7-3. In all other respects this instrument is electrically identical to the standard Model 4204A and the information in this manual with following changes applies to this option 001 instrument. Make changes: Part No. of the output meter M1 to 1120-0754.

7-4. SPECIAL INSTRUMENTS.

7-5. "Specials" are standard -hp- instruments that are modified according to customer specifications. A separate insert sheet is included with the manual for special instruments having electrical changes. Make the changes specified in addition to any other changes that are necessary.

7-6. MANUAL CHANGES.

7-7. This manual applies directly to the Model 4204A with serials prefixed 1523J-. The following paragraphs explain how to adapt this manual to apply to later instruments with higher serial prefix, or earlier instruments with lower serial prefix. Technical corrections to this manual (if any) are called errata and are listed on a separate "Manual Changes" Sheet supplied with this manual.

7-8. LATER INSTRUMENT: If the serial prefix of your Model 4204A is above 1523J-, refer to a separate "Manual Changes" sheet supplied with this manual. Locate the serial prefix of your instrument and make the indicated changes.

7-9. EARLIER INSTRUMENTS:
(Backdating Changes)
If the serial prefix of your Model 4204A is below 1523J-, refer to table 7-1 for the changes necessary to adapt this manual to your particular instrument. Locate the serial prefix of your instrument in the table and make the indicated changes. Note that instrument-component values that differ from those in this manual, yet are not listed in this backdating changes, should be replaced using the part number given in this manual.

Table 7-1. Manual Backdating Changes.

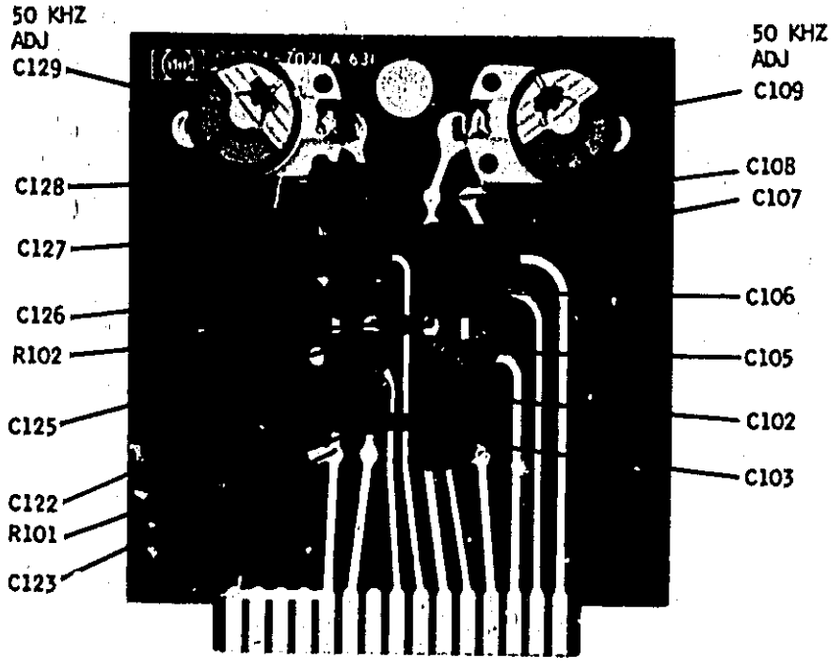
Serial Prefix or Number	Make Backdating Changes
631	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
631/632- 701/702- 721/722-	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
703 731/732- 743/744-	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
751/752- 825/826-	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19,
905/909-01310 and below	5, 6, 7, 8, 9, 10, 11. 12, 13, 14, 15, 16, 17, 18, 19
905/906- and below	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 19
1019J/1020J-02025 and below	9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
1019J/1020J-02070 and below	10, 11, 12, 13, 14, 15, 16, 17, 18, 19
1019J/1020J-02120 and below	11, 12, 13, 14, 15, 16, 17, 18, 19
1029J/1020J and below	12, 13, 14, 15, 16, 17, 18, 19
1203J/1204J and below	13, 14, 15, 16, 17, 18, 19
1204J-02805 and below	14, 15, 16, 17, 18, 19
1204J-02900 and below	15, 16, 17, 18, 19
1204J-02940 and below	16, 17, 18, 19
1204J-03045 and below	17, 18, 19
1204J-03140 and below	18, 19
1321J-03890 and below	19

CHANGE 1

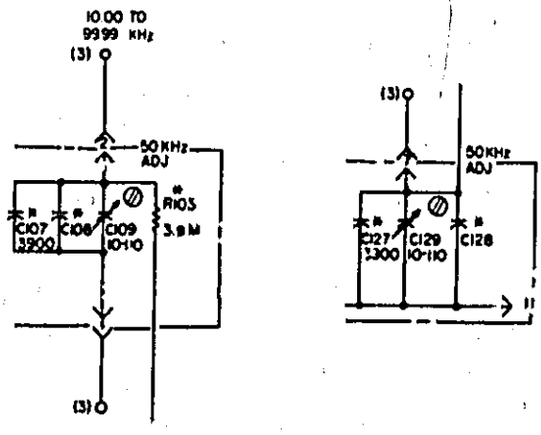
Page 6-10, Table 6-2
Add A7C108 and A7C128, HP Part No. 0160-2215; C:FXD MICA 750pF ±5% 300VDCW.

Page 8-8,
Change Figure as follows:

A7 Range Adjustment Capacitor Assembly for Serial Prefix 631 and below. (R111 mounted on XA7).



Page 8-9, Figure 8-4
Change Figure as follows:



CHANGE 2

Page 6-6, Table 6-2
Change to 0683-9105; R:FXD COMP 91Ω 5% 1/4W.
Selection of A3R25 of centers adjustment of A3R26. Use 91Ω for grey (500Ω) OUTPUT METER M1, use 180Ω for block (600Ω) meter.

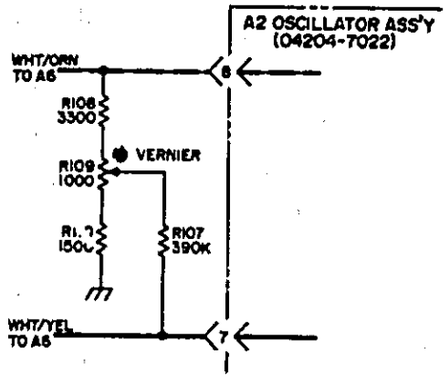
CHANGE 3

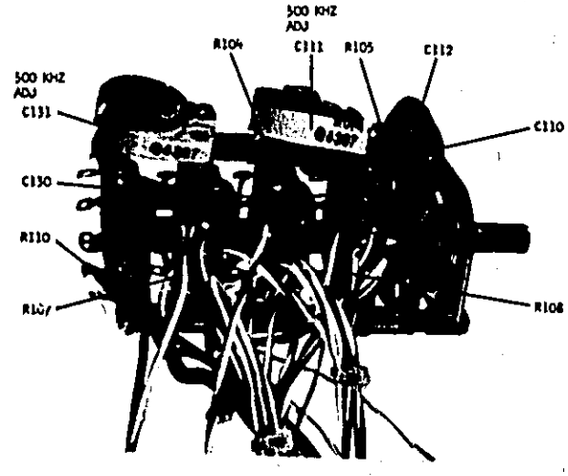
Page 8-3, Figure 8-2
Delete R5 22Ω resistor connected in series to Q2 (Series Regulator for +38V POWER SUPPLY).

CHANGE 4

Page 8-5, Figure 8-3
Delete C133 thru C136.
Add R107, 0683-3945; R:FXD COMP 390kΩ 5% 1/4W.
Change the schematic diagram (sheet 4) as follows:

Page 8-9, Figure 8-5
Change Components Location Illustration of A5 RANGE SWITCH ASS'Y as follows:





CHANGE 5

Page 6-5, Table 6-2
Add A3C3 in parallel with A3CR1, HP Part No. 0180-0822; C:FXD ELECT ALUM 10μF 100VDCW.
Delete A3C3* in parallel with A3CR1, HP Part No. 0160-2261; C:FXD MICA 15pF ±5% 500VDCW.

CHANGE 6

Page 6-15, Figure 6-2
Delete 2110-0235, FUSE CARTRIDGE 0.2A S.B.
Delete 2110-0234, FUSE CARTRIDGE 0.1A S.B. (For 230V Operation).
Delete 04204-7132, PANEL, REAR for 115/230V.
Delete 04204-7132, PANEL, REAR for 100V/200V.
Add 2110-0106, FUSE CARTRIDGE 0.2A S.B.

CHANGE 6 (Cont'd)

Page 6-11, Table 6-2
Change S2 to 3101-0033, SWITCH:SLIDE DPDT 115/230.
Change W1 to 8120-0078, CABLE ASS'Y:POWER CORD.

CHANGE 7

Page 6-19, Figure 6-4
Delete 04204-5022, COUPLER DEC. PT. IND.
Add 04204-3026, COUPLER DEC. PT. IND.

CHANGE 8

Page 6-19, Figure 6-4
Delete 04204-3040, SCREW 4-40 x 7/16.
Add 04204-3024, SCREW 4-40 x 5/6.

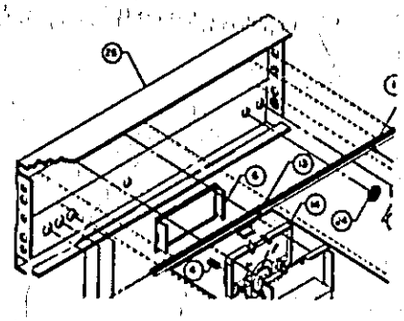
CHANGE 9

Page 6-11, Table 6-2
Change C1 to 0150-0119, C:FXD CER 0.01 μF 2-SECT ±20% 250VDCW.
Delete C2.

Page 6-17, Figure 6-3
Change Ref. 7 to 0370-0026, KNOB-ROUND 3/4" W/ARROW, BLK (VERNIER).

CHANGE 10

Page 6-18, Figure 6-4
Delete STUD (ref. 29) and SCREW (Ref. 30) from the illustration as follows.



Page 6-19, Figure 6-4
Delete Ref. 29 and Ref. 30.

CHANGE 11

Page 6-15, Figure 6-2
Change TOP COVER ASS'Y to 5060-0739, BOTTOM COVER to 5060-0751.

CHANGE 12

Page 8-7, Figure 8-4
Change the value of CR1 in Circuit Diagram to 45.3V.
Change the value of A3C3 in Circuit Diagram to 4.7pF.

Page 6-6, Table 6-2
Change A3CR1 to 1902-0038 DIODE BREAKDOWN 45.3V ±5% 400mW.

Page 6-5, Table 6-2
Change A3C3 to 0160-2261; C:FXD MICA 4.7pF ±5% 500VDCW.

CHANGE 13

Page 6-6, Table 6-2
Change A3Q5 to HP P/N 1854-0005; TRANSISTOR: NPN SILICON.

Page 6-7, Table 6-2
Change A5R104 to HP P/N 0683-2055; R:FXD COMP 2MΩ ±5% 1/4W.

Page 6-8, Table 6-2
Change A6 to HP P/N 04204-7027; FREQUENCY SELECTOR SWITCH ASSEMBLY.

Page 6-11, Table 6-2
Change W1 to HP P/N 8120-1348; CABLE ASS'Y:POWER CORD.

Page 6-13, Figure 6-1
Change Ref. No 15 to HP P/N 04204-7036; INDICATOR DIAL.
Change Ref. No 43 to HP P/N 04204-1040; WASHER MYLAR.

Page 6-15, Figure 6-2
Change Ref. No. 3 to HP P/N 5000-0733; COVER, FRONT SIDE 5 x 11" CABINET.
Change Ref. No. 4 to HP P/N 5000-0732; COVER, REAR SIDE 5 x 11" CABINET.
Change Ref. No. 8 to HP P/N 04204-1045; COVER, TOP 11".
Change Ref. No. 9 to HP P/N 04204-1046; COVER, BOTTOM 11".
Change Ref. No. 10 to HP P/N 5060-0766; PLATE, SIDE HANDLE.

Page 6-17, Figure 6-3
Change Ref. No. 1 to HP P/N 04204-1019; CONTROL PANEL.

Page 6-19, Figure 6-4
Change Ref. No. 26 to HP P/N 04204-1019; CONTROL PANEL.

CHANGE 14

Page 6-6, Table 6-2
Change A3R25 to HP P/N 0683-9105; R:FXD COMP 91Ω ±5% 1/4W.

Page 8-7, Figure 8-4
Change value of A3R25 to 91Ω.

Page 6-19, Figure 6-4
Change Ref. No. 9 to HP P/N 04204-1033; POINT, INDICATOR.

CHANGE 15

Page 6-3, Table 6-2
Change A1CR7 to HP P/N 1902-0031; DIODE BREAKDOWN 12.7V ±5%.

CHANGE 15 (Cont'd)

Page 8-3, Figure 8-2
Change Breakdown voltage of A1CR1 to 13V.

Page 6-4, Table 6-2
Change A2Q6 to HP P/N 1850-0267; TRANSISTOR GE PNP.
Change A2R5 to HP P/N 0684-5611; R:FXD COMP 560Ω ±10% 1/4W.

Page 8-5, Figure 8-3
Change Value of A2R5 to 470Ω.

Page 6-11, Table 6-2
Change S1 to HP P/N 3101-0212; SWITCH:TOGGLE SPST.

CHANGE 16

Page 6-5, Table 6-2
Change A2R6 to HP P/N 0683-9125; R:FXD COMP 9100Ω ±5% 1/4W.

Page 8-5, Figure 8-3
Change Value of A2R6 to 8200Ω.

CHANGE 17

Page 6-3, Table 6-2
Change A1CR6 to HP P/N 1902-3203; DIODE BREAKDOWN 14.7V ±5%.

Page 8-3, Figure 3-2
Change Breakdown voltage of A1CR6 to 14.7V.

CHANGE 18

Page 6-3, Table 6-2
Change A1Q3, A1Q4 to HP P/N 1850-0128; TRANSISTOR 2N398B.

Page 6-4, Table 6-2
Change A2CR2 to HP P/N 1910-0016; DIODE BREAKDOWN.
Change A2Q1 and Q2Q2 to HP P/N 1850-0096; TRANSISTOR PNP SILICON.
Change A2Q3 and A2Q5 to HP P/N 1850-0096; TRANSISTOR PNP SILICON.

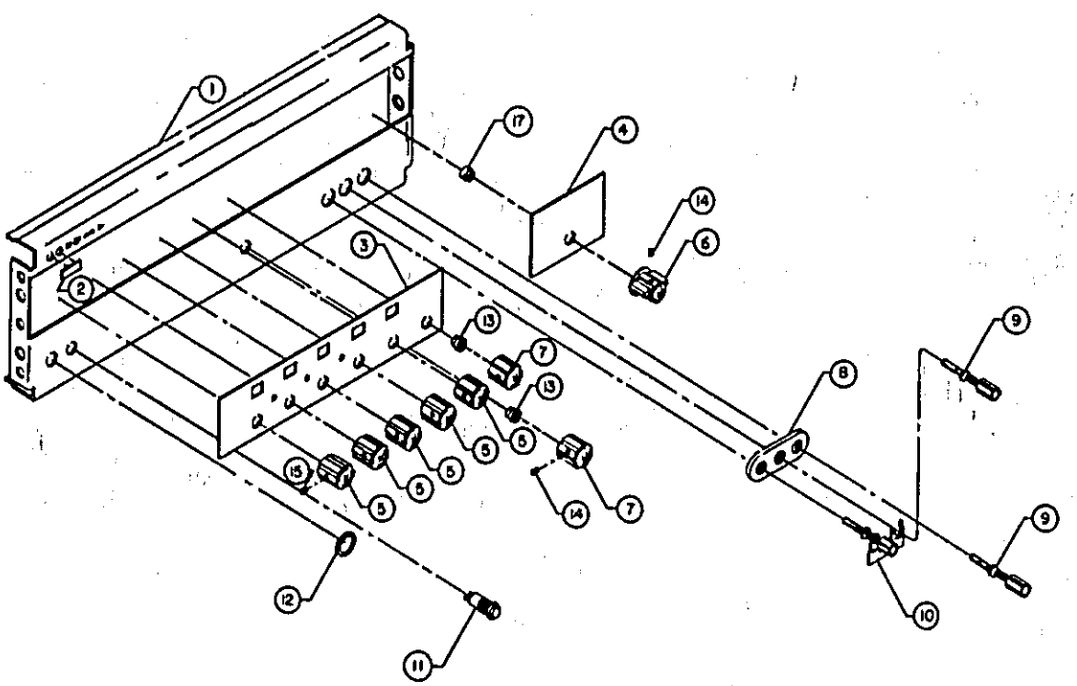
Page 6-5, Table 6-2
Delete A2R30, HP P/N 0757-0470; R:FXD FLM 162kΩ 1/8W.

Page 8-5, Figure 8-3
Delete R30, 162kΩ.

Page 6-6, Table 6-2
Change A3Q6 to HP P/N 1850-0096; TRANSISTOR.

CHANGE 19

Page 6-16 and 6-17, Figure 6-3
Delete Ref. 19
Change Figure 6-3 partially as shown in Figure 7-1.



Ref.	Part No.	Q'ty	Description
5	0370-0330	5	KNOB, BAR TYPE
6	0370-0226	1	KNOB SKIRTED BAR, BLACK
7	0370-0256	1	KNOB ROUND 19mm W/ARROW, BLACK
14	3030-0005	6	SCREW, SET 8-32 x .125
15	3030-0033	10	SCREW, SET SH 6-32 x .1875
18	0370-0026	1	KNOB ROUND 3/4" W/ARROW, BLACK

Figure 7-1. Exploded View of Front Panel Assembly (I).

SECTION VIII
CIRCUIT DIAGRAMS

8-1. INTRODUCTION

8-2. This section includes the following:

a. General Notes for schematic diagrams.

b. Functional Overall Block Diagram (Figure 8-2).

c. Schematic Diagrams and Parts Location Illustrations. Waveforms and voltages at indicated test points are also included.

8-3. Circuit diagrams of Option 001 are given in APPENDIX. A1 and A5 Ass'y circuit diagrams are different from the Standard Model 4204A. For other assemblies, refer to this section.

8-4. GENERAL NOTES

a. Unless otherwise indicated, resistance in ohms, capacitance in microfarads and inductance in microhenries.

b. Components assigned an asterisk (*) are factory selected, average values shown.

c. (9, 4, 7) indicates wire color code. Wire color code (MIL-STD-681) same as resistor color code. First number identifies ground color, second number identifies wide stripe, third number identifies narrow stripe, i.e. (9, 4, 7) denotes white ground, yellow wide stripe, violet narrow stripe.

d. The components mounted on chassis or mainframe parts are not assigned an assembly designation (i.e. R1, Q1, etc.).

e. Reference designations (R1, Q1, etc.) within assembly (A1, A2....etc.) use assembly designation as prefix to form complete designation. (i.e, R1 in A1 assembly is A1R1).

8-5. Additional notes are shown in Figure 8-1.

REFERENCE DESIGNATIONS

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

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

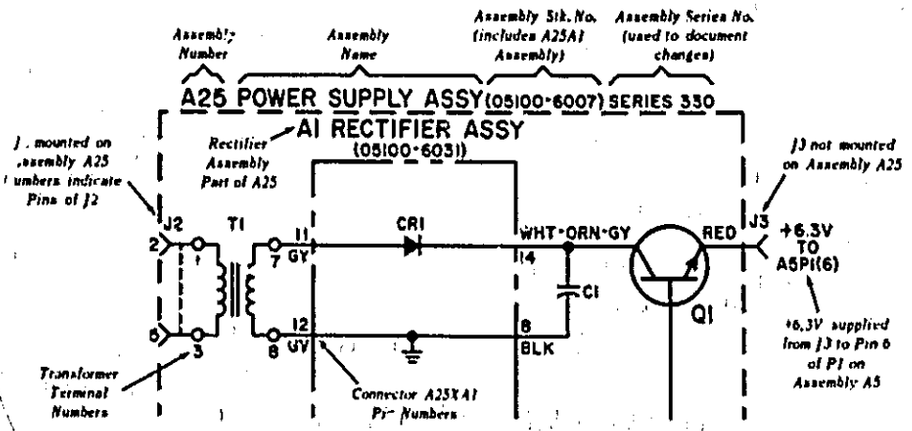
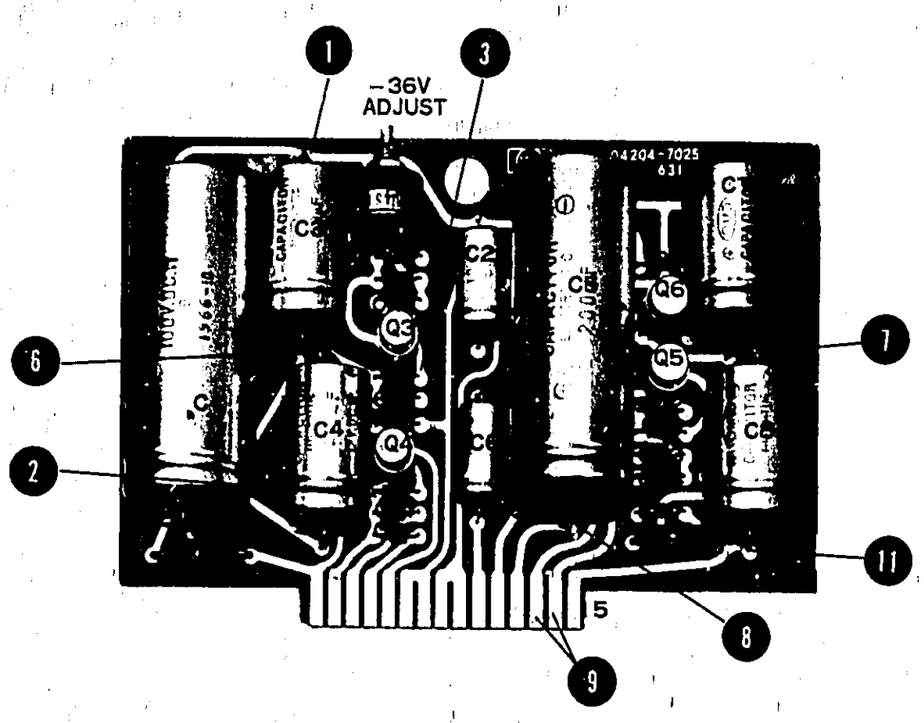
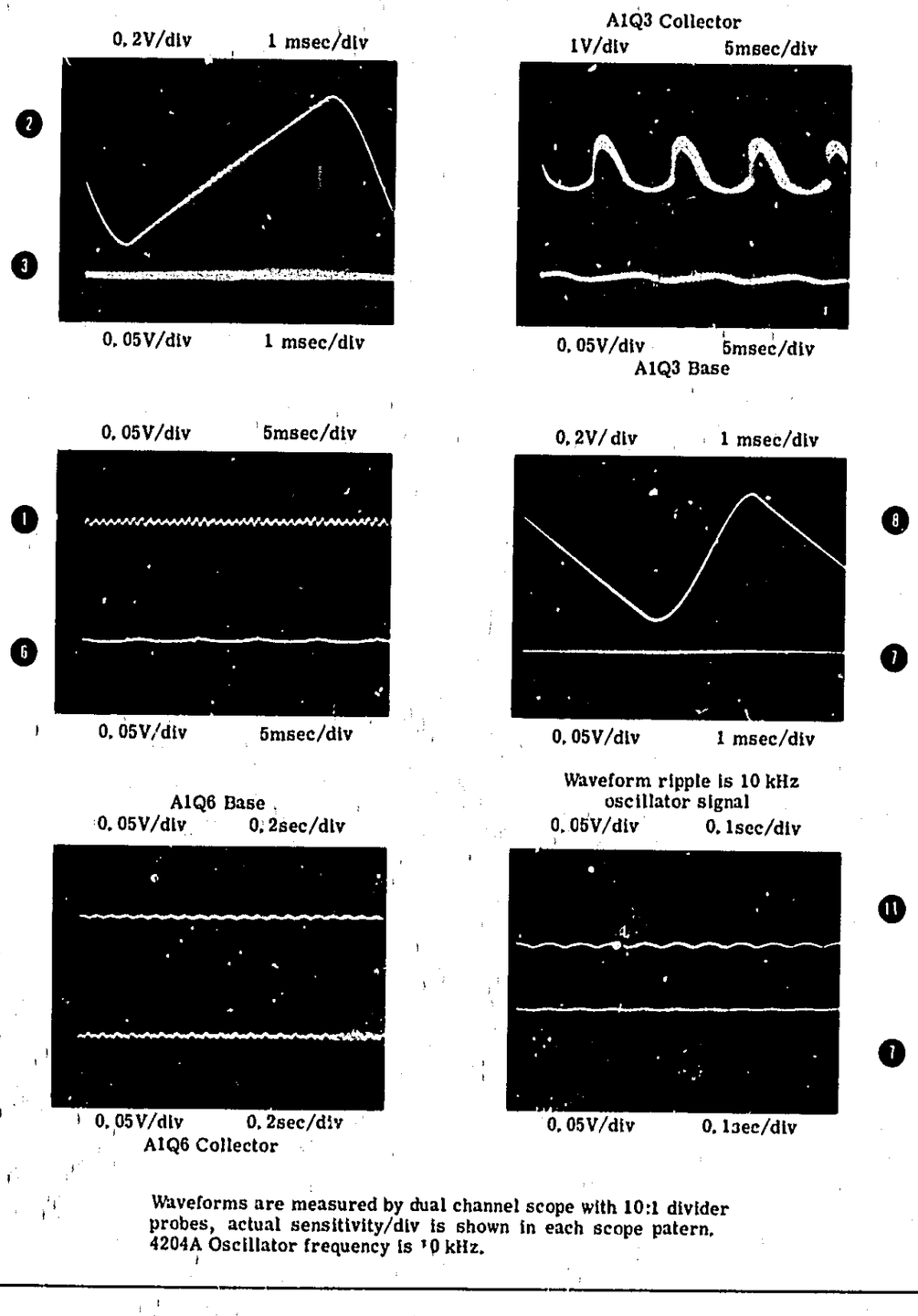


Figure 8-1. Schematic Diagram Notes



A1 POWER SUPPLY ASS'Y
PART LOCATION & TEST POINT



Waveforms are measured by dual channel scope with 10:1 divider probes, actual sensitivity/div is shown in each scope patern. 4204A Oscillator frequency is 10 kHz.

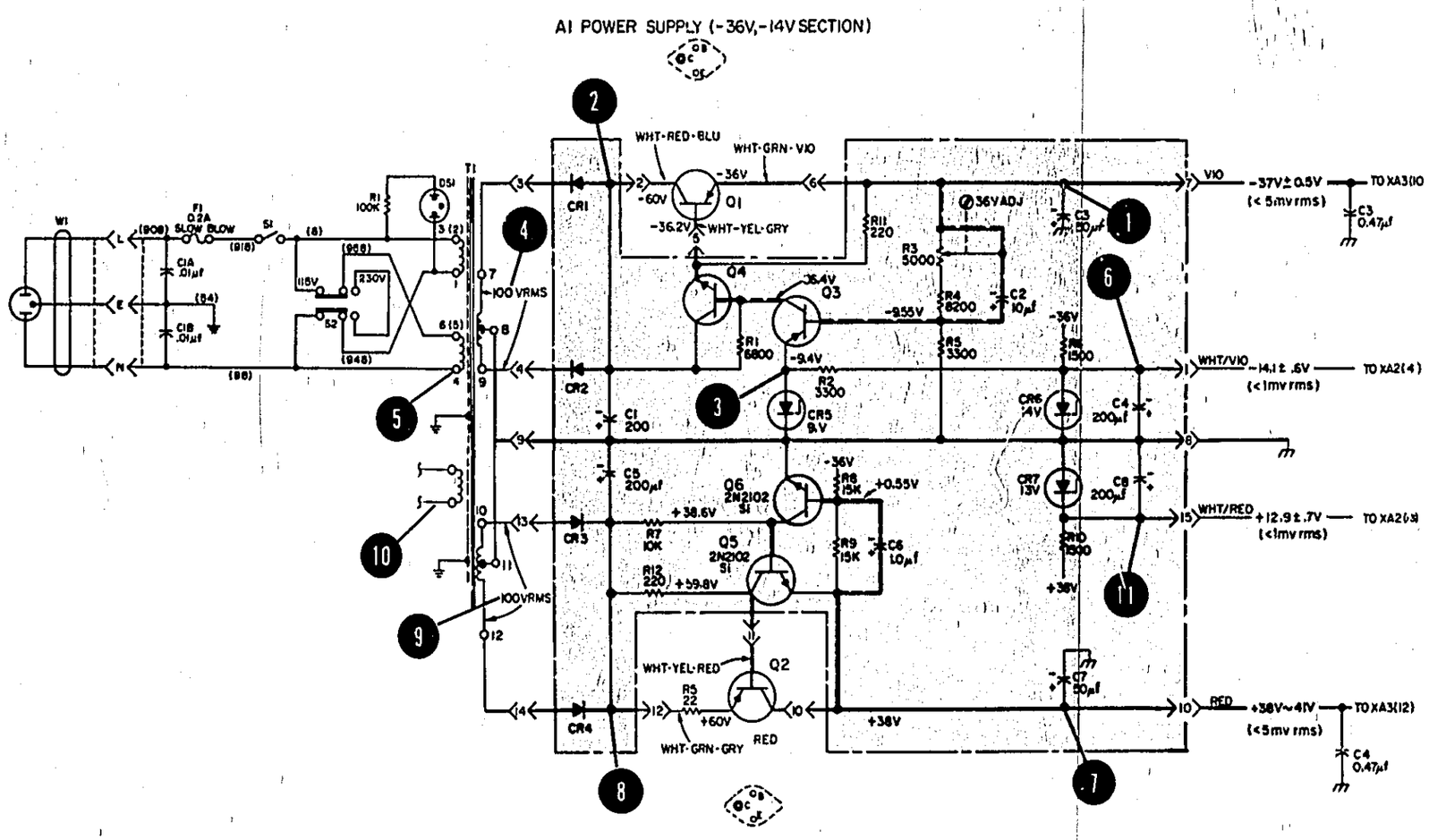
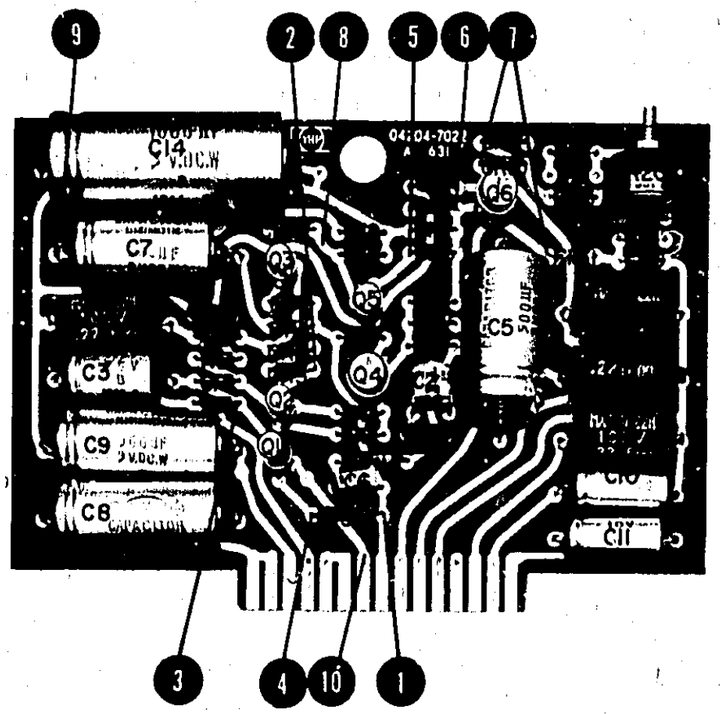
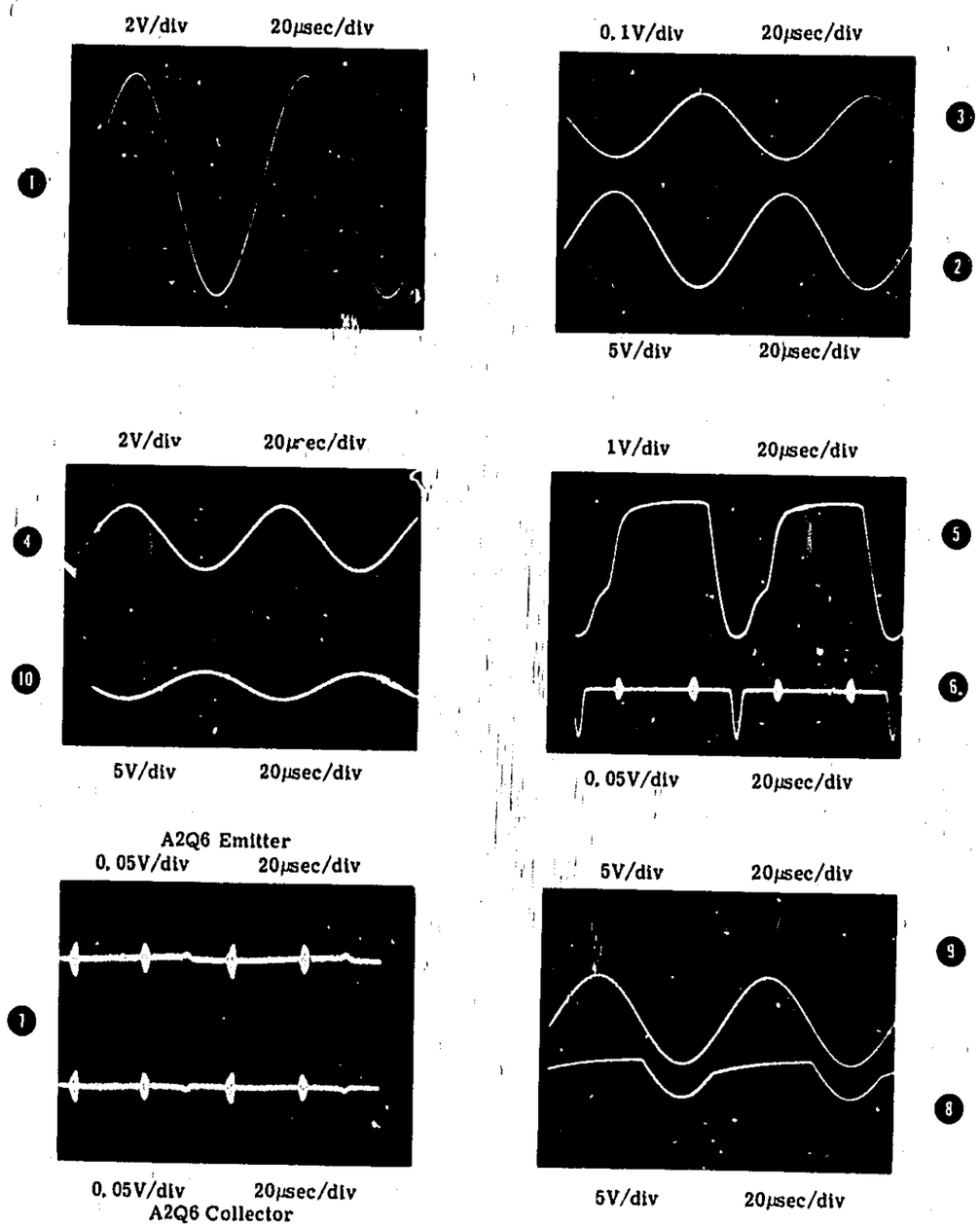


Figure 8-2. Power Supply Ass'y A1



A2 OSCILLATOR AMPLIFIER ASS'Y
PART LOCATION & TEST POINT



Waveforms are measured by dual channel scope with 10:1 divider probes, actual sensitivity/div is shown in each scope patern. 4204A oscillator frequency is 10 kHz.

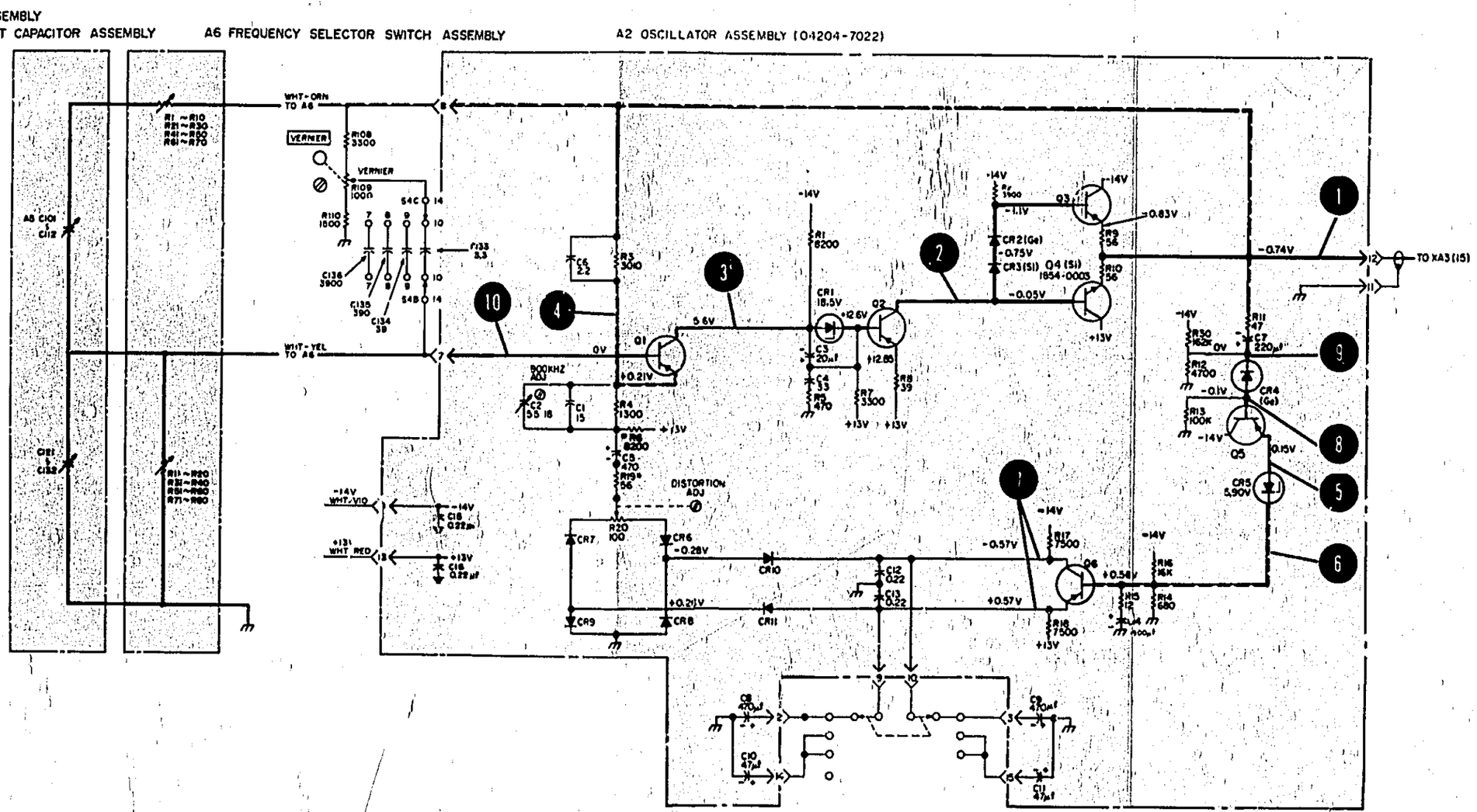
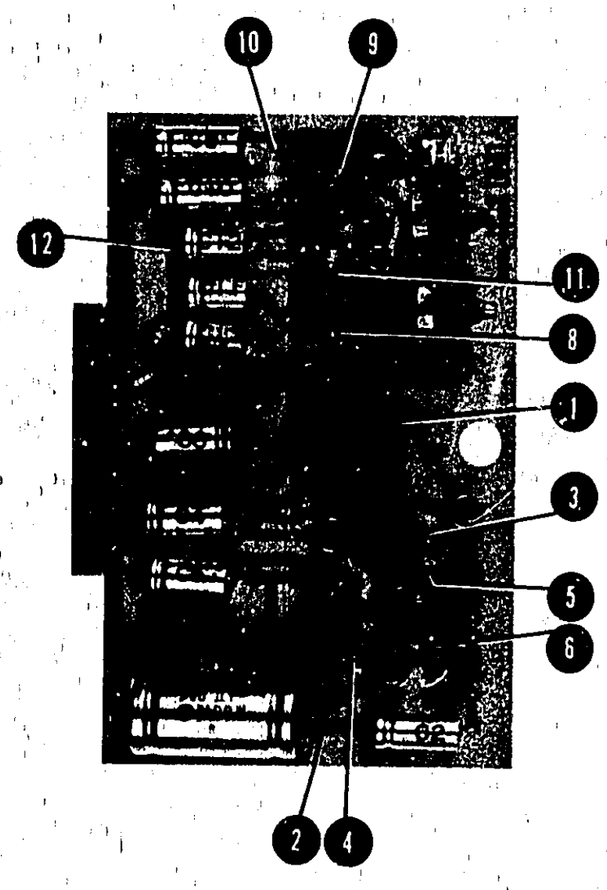
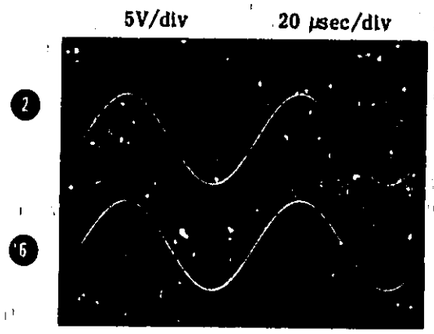
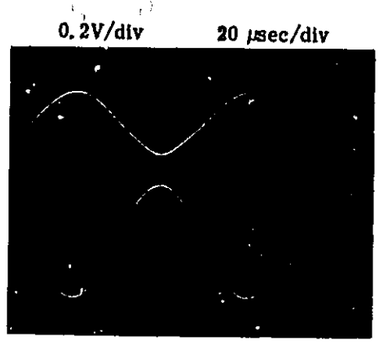


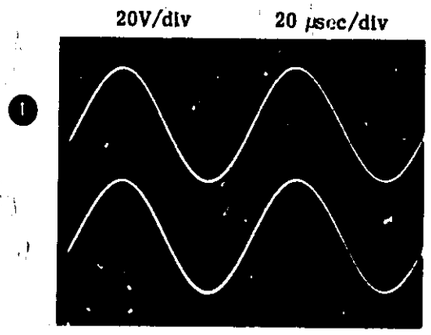
Figure 8-3. Oscillator/Amplifier Ass'y A2

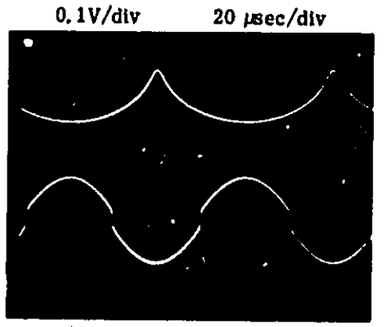


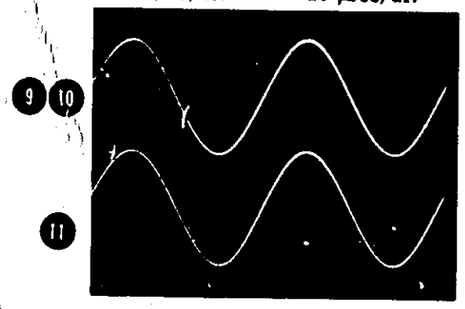
A3 AMPLIFIER ASS'Y
PART LOCATION & TEST POINT











Waveforms are measured by dual channel scope with 10:1 divider probes, actual sensitivity/div is shown in each scope patern. 4204A oscillator frequency is 10 kHz.

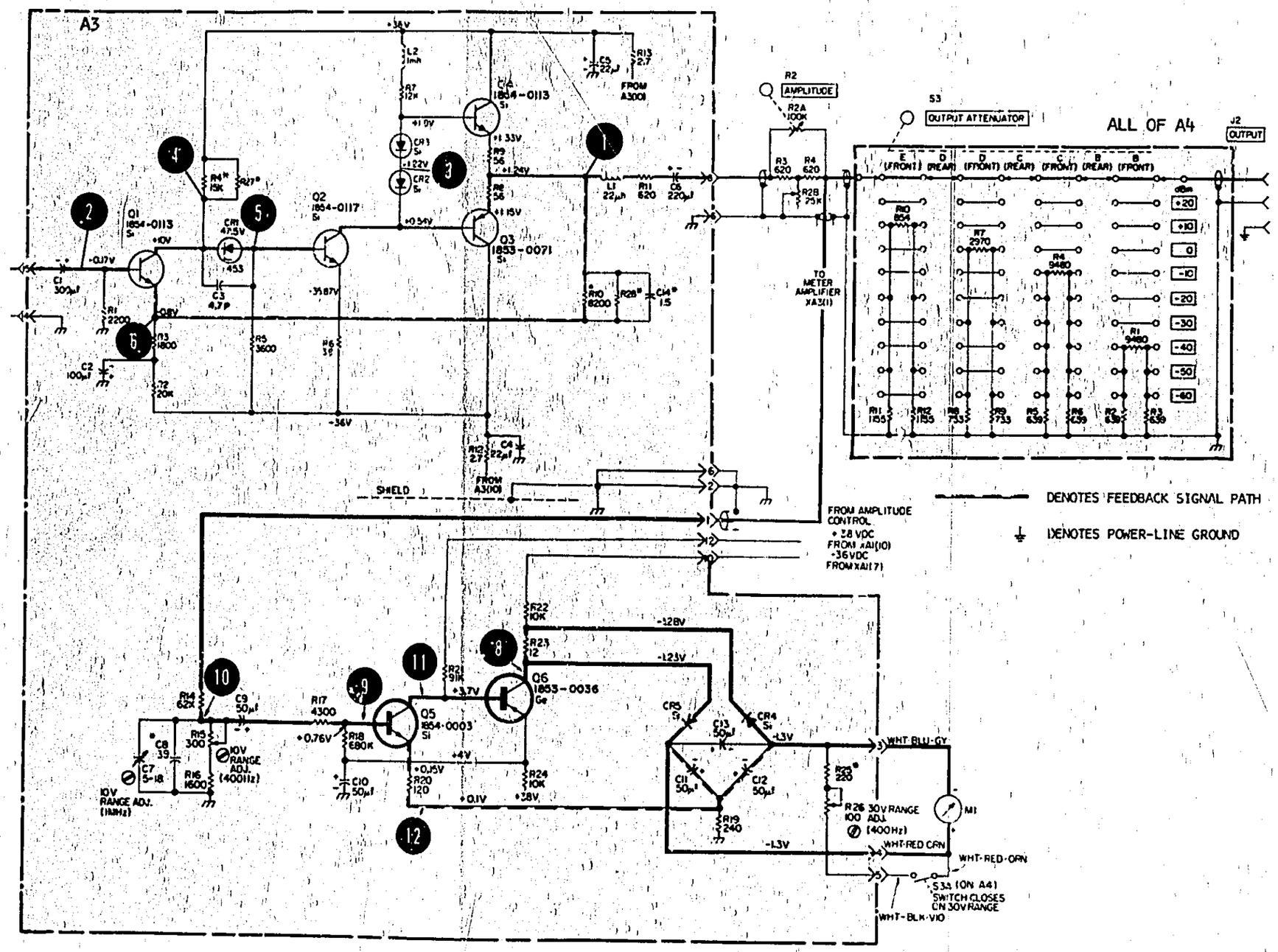
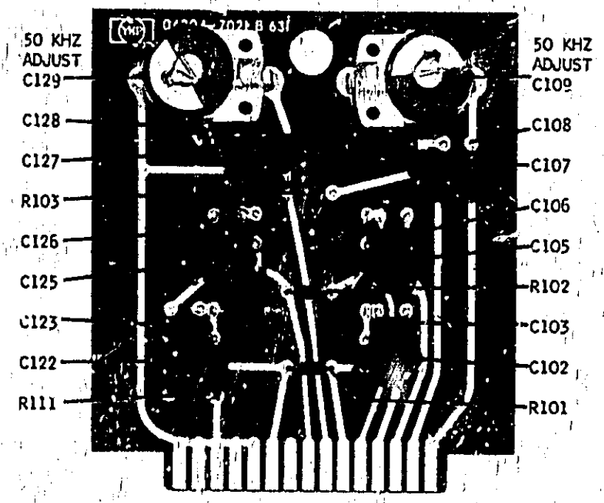
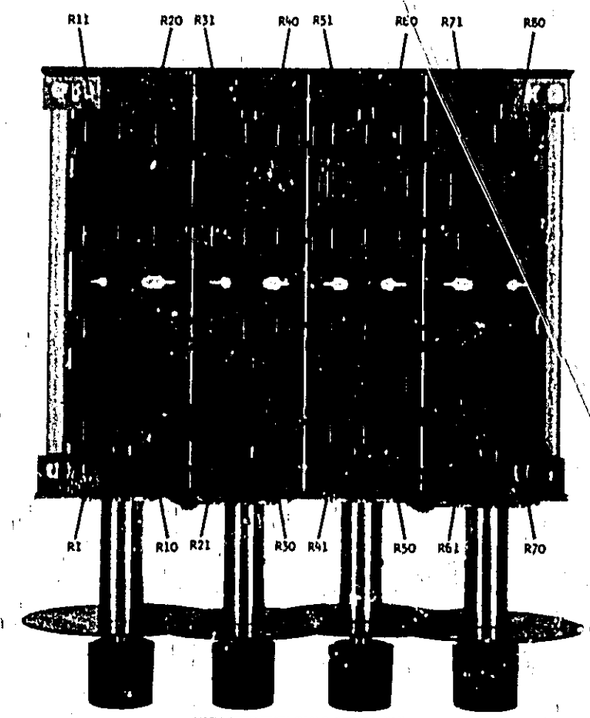


Figure 8-4. Amplifier Ass'y A3

A7 Range Adjustment Capacitor Assembly for Serial Prefix 701 and above. (R111 mounted on A7).

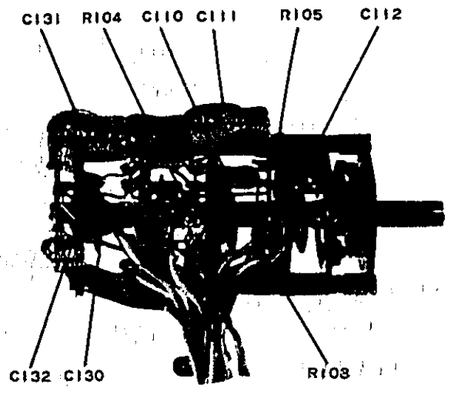


A7 RANGE ADJUSTMENT CAPACITOR ASS'Y
PART LOCATION

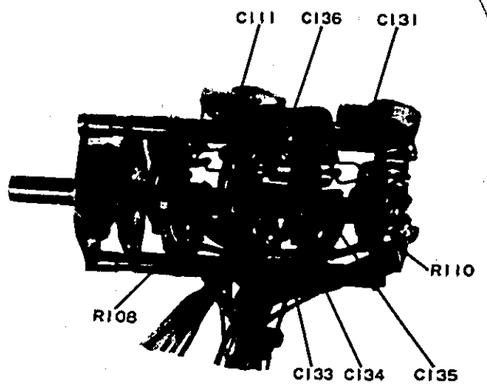


WITH FREQUENCY DIALS SET TO "5"

A6 FREQUENCY SELECTOR ASS'Y
PART LOCATION



(TOP VIEW)



(BOTTOM VIEW)

A5 RANGE SWITCH ASS'Y
PART LOCATION

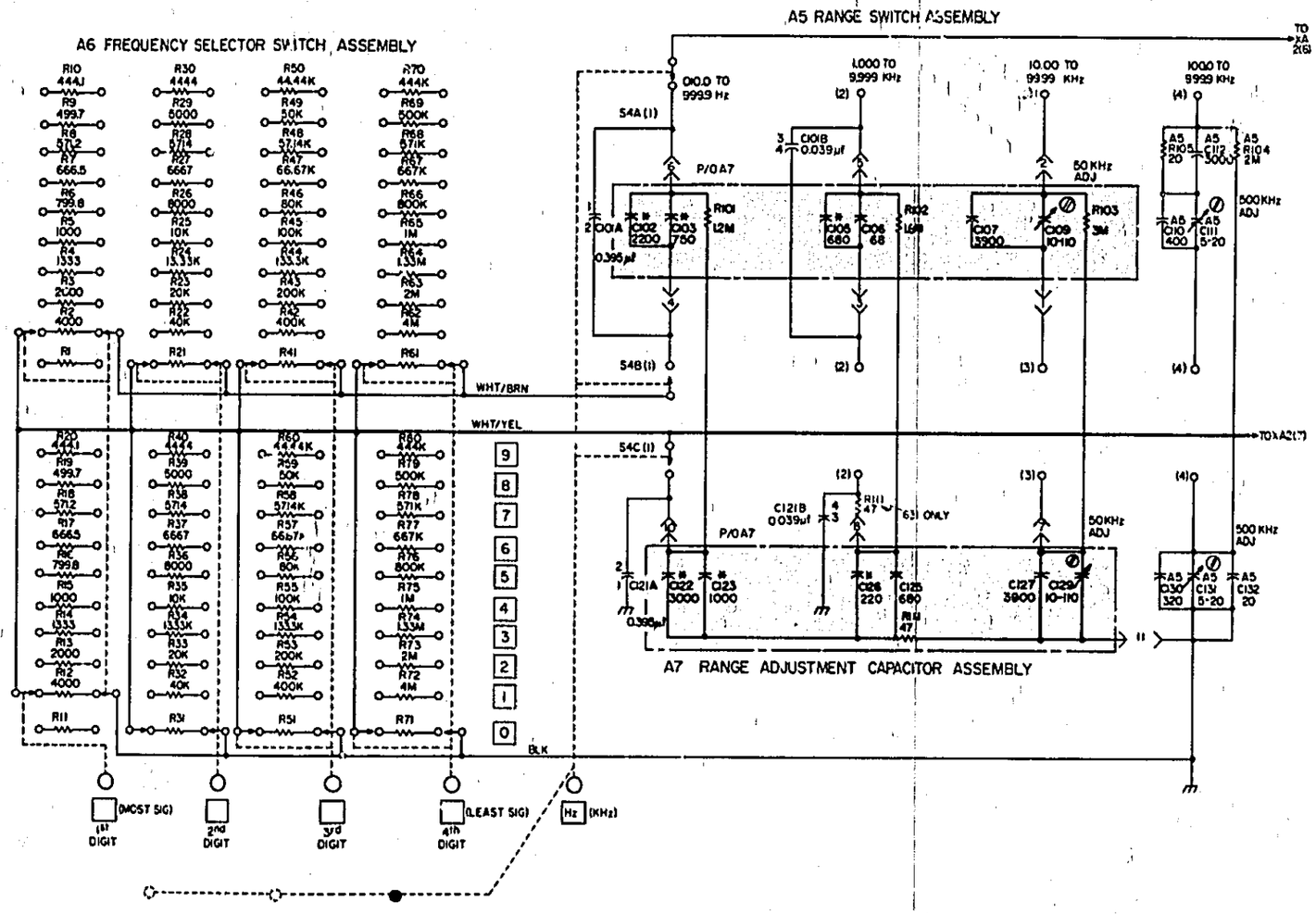


Figure 8-5

Range Switch Ass'y A5
Frequency Selector Switch Ass'y A6
Adjustment Capacitor Ass'y A7

MANUAL CHANGES

4204A

OSCILLATOR

MANUAL IDENTIFICATION

Model Number: 4204A
Date Printed: AUG. 1981
Part Number: 04204-90010

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:
Make all ERRATA corrections.
Make all appropriate serial number related changes indicated in the tables below.

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES
ALL	1
1523J0486 and avove	2
1825J04891 and above	3
1908J05651 and avove	4

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES
ALL	5
1908J05891 and above	6
ALL	ERRATA

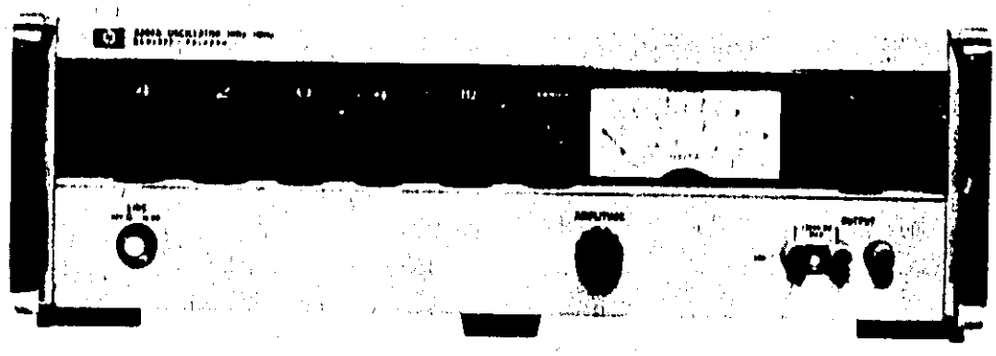
▶ NEW ITEM

▶ CHANGE 1

Page 6-3 and 6-11, Table 6-2, Reference Designation Index:
See Table 1, Parts Information.

▶ CHANGE 2

Cover:
Change the photo of instrument as follows.



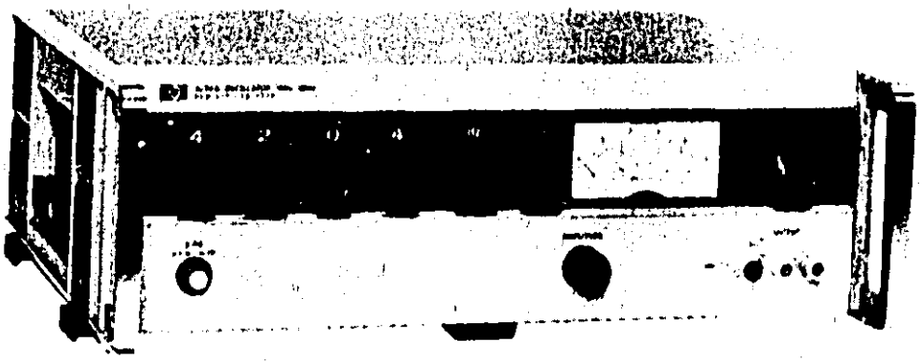
NOTE

Manual change supplements are revised as often as necessary to keep manuals as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

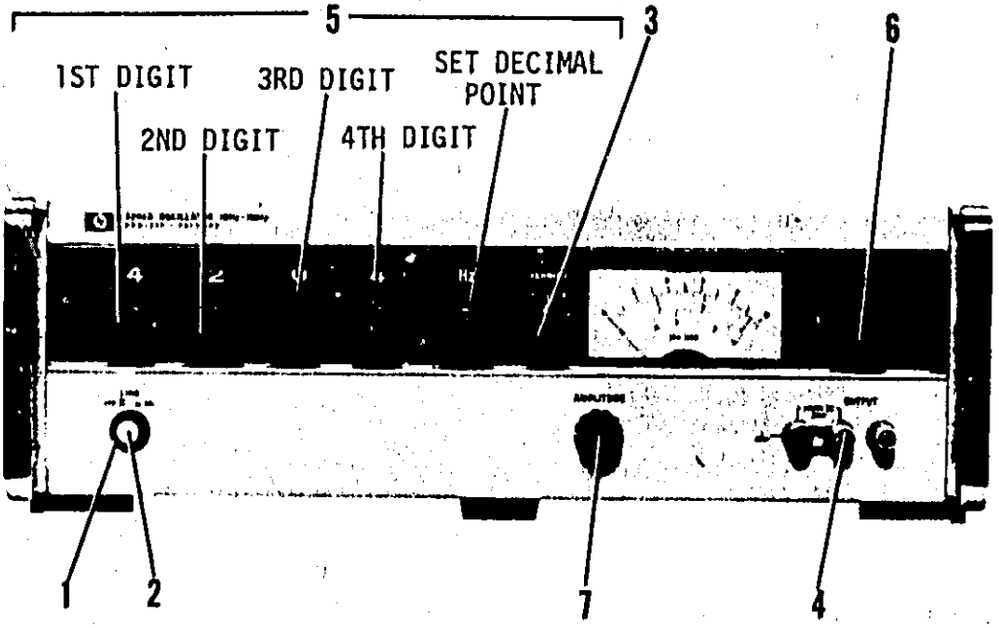
HEWLETT PACKARD

Printed in Japan

Page 1-0, Figure 1-1, Model 4204A Oscillator:
Change the Figure as follws.



Page 3-0, Figure 3-1, Front Panel Controls, Connectors and Indicators:
Change the photo of instrument as follows.



Page 6-15, Figure 6-2, Exploded view of Chassis Assembly (II):
Change Ref. 12 to HP P/N 04204-00101.

Page 6-16 and 6-17, Figure 6-3, Exploded View of Front Panel Assembly (I):
Partially change the figure as shown in Figure 1 (change 2).

Page 6-18 and 6-19, Figure 6-4, Exploded View of Front Panel Assembly (II):
Partially change the figure as shown in Figure 2 (change 2).

▶ CHANGE 3

Page 6-16 and 6-17, Figure 6-3 Exploded View of Front Panel Assembly (I):
Partially change the figure as shown in Figure 1 (change 3).

Page 6-18 and 6-19, Figure 6-4 Exploded View of Front Panel Assembly (II):
Partially change the figure as shown in Figure 2 (change 3).

▶ CHANGE 4

Page 6-6, Table 6-2, Reference Designation Index:
See Table 1, Parts Information.

Page 8-7, Figure 8-4, Amplifier Ass'y A3:
Partially chage the diagram as shown in Figure 3 (change 4).

▶ CHANGE 5

Page 6-5 and 6-6, Table 6-2, Reference Designation Index:
See Table 1, Parts Information.

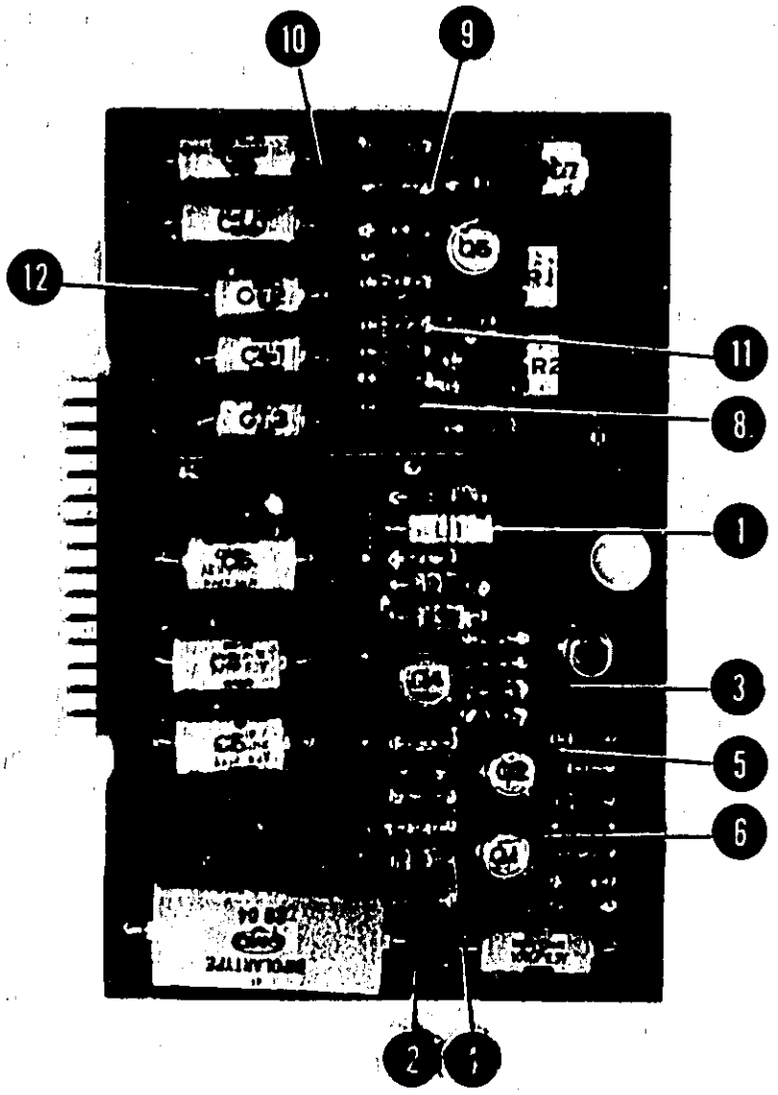
Page 8-7, Figure 8-4, Amplifier Ass'y A3:
Partially change the diagram as shown in Figure 3 (change 5).

▶ CHANGE

Page 6-6, Table 6-2, Reference Designation Index:
See Table 1, Parts Information.

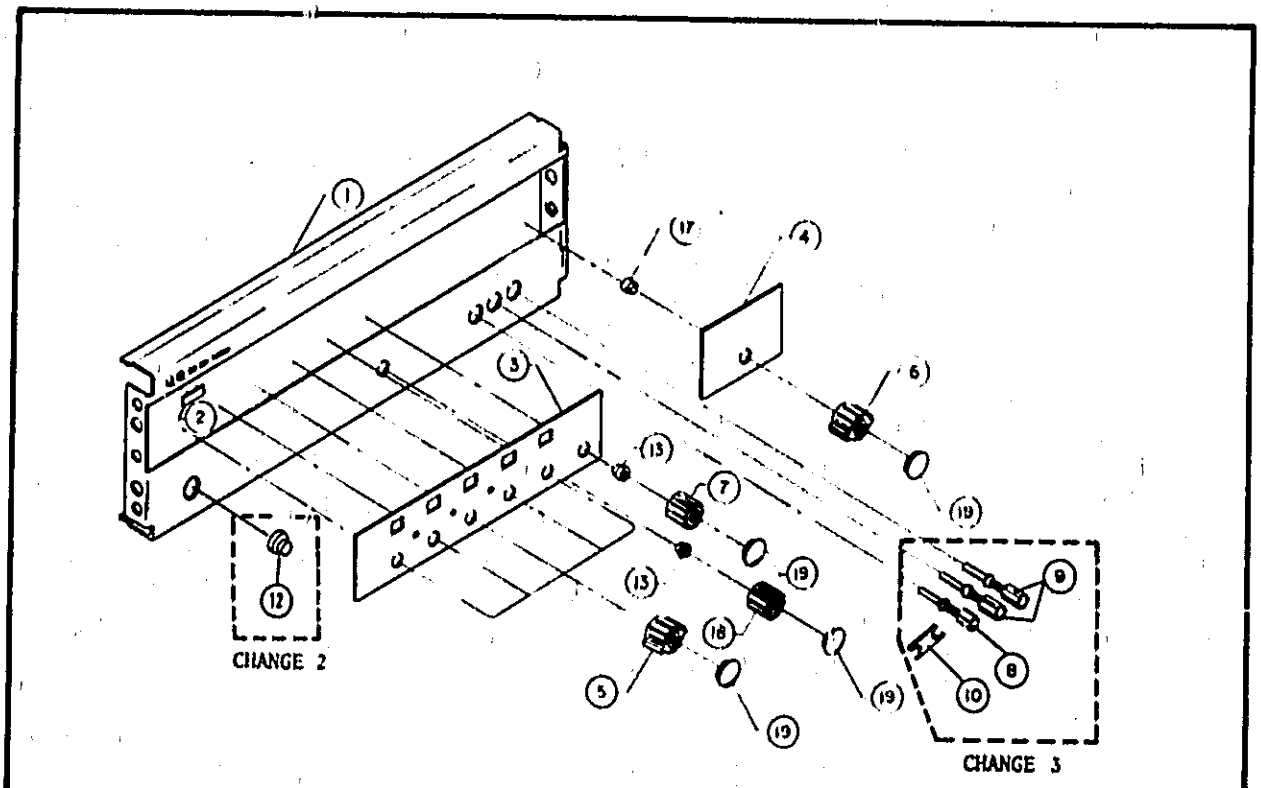
Page 8-7, Figure 8-4, Amplifier Ass'y A3:
Partially change the diagram as shown in Figure 3 (change 6).

Page 8-6, A3 AMPLIFIER ASS'Y PART LOCATION & TEST POINTS:
change the figure as follows.



▶ ERRATA

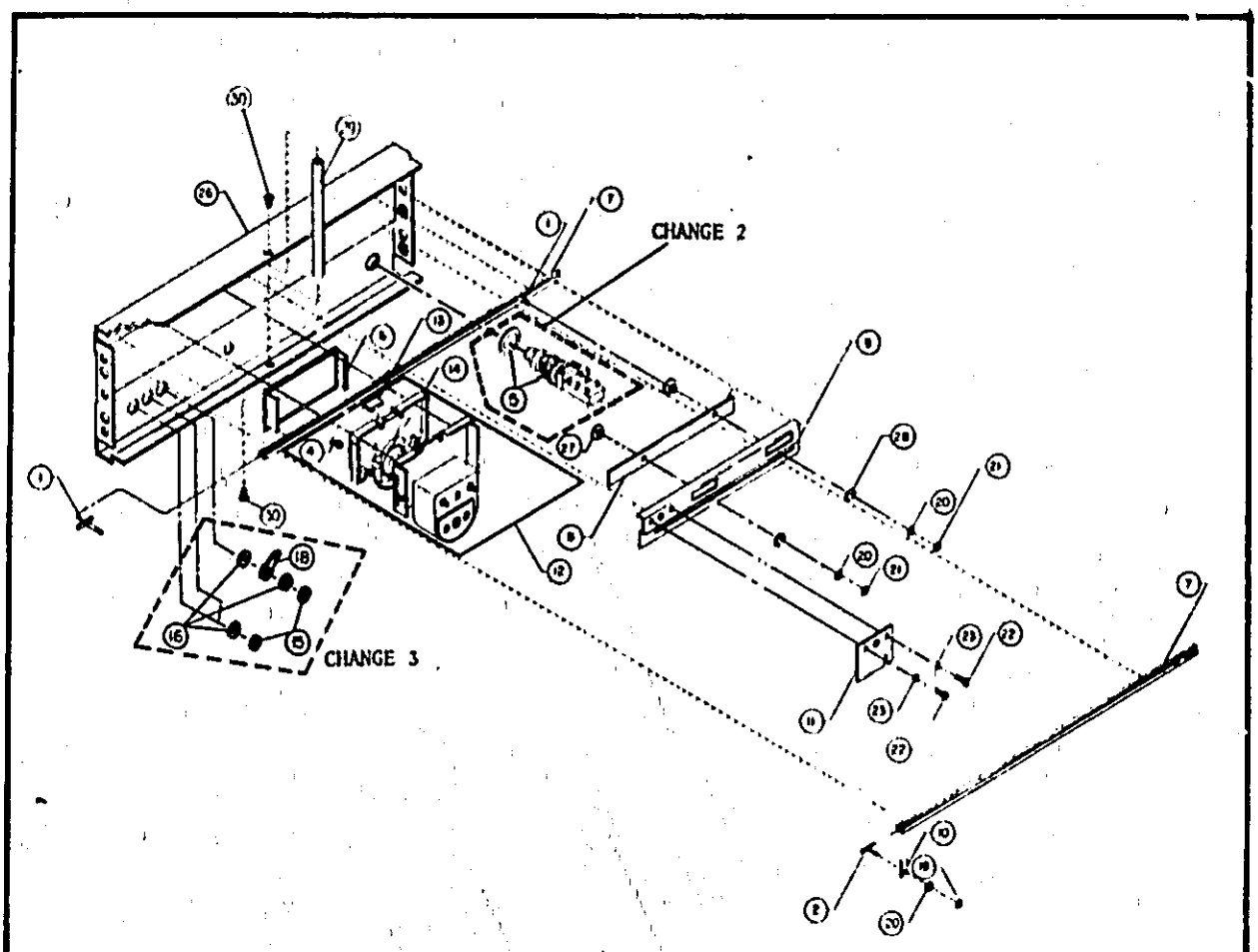
Page 6-15, Figure 6-2. Exploded View of Chassis Assembly (II) (Sheet 2 of 2):
See Table 1, Parts Information.



CHANGE	Note	Ref.	HP Part No.	Qty	Description
CHANGE 2	▶ C	1	04204-00201	1	CONTROL PANEL
	▶ C	11			NOT ASSIGNED
	▶ C	12	3101-2139	1	SWITCH, PUSH BUTTON
CHANGE 3	▶ C	8	1510-0107	1	BINDING POST-BLACK
	▶ C	9	1510-0090	2	BINDING POST-GRAY
	▶ C	10	5000-4206	1	SHORT BAR

▶ : New Item C: Change

Figure 1.



CHANGE	Note	Ref.	HP Part No.	Qty	Description
CHANGE 2	▶ C	5	3101-2139	1	SWITCH PUSH BUTTON
	▶ C	24			NOT ASSINED
	▶ C	25			NOT ASSINED
	▶ C	26	04204-00201	1	PANEL, CONTROL
CHANGE 3	▶ C	3			NOT ASSINED
	▶ C	15	2950-0043	3	NUT, HEX
	▶ C	16	2190-0016	4	WASHER, LOCK
	▶ C	17			NOT ASSINED
	▶ C	18	0360-1190	1	TERMINAL, SOLDER LUG

▶ : New Item C: Change

Figure 2.

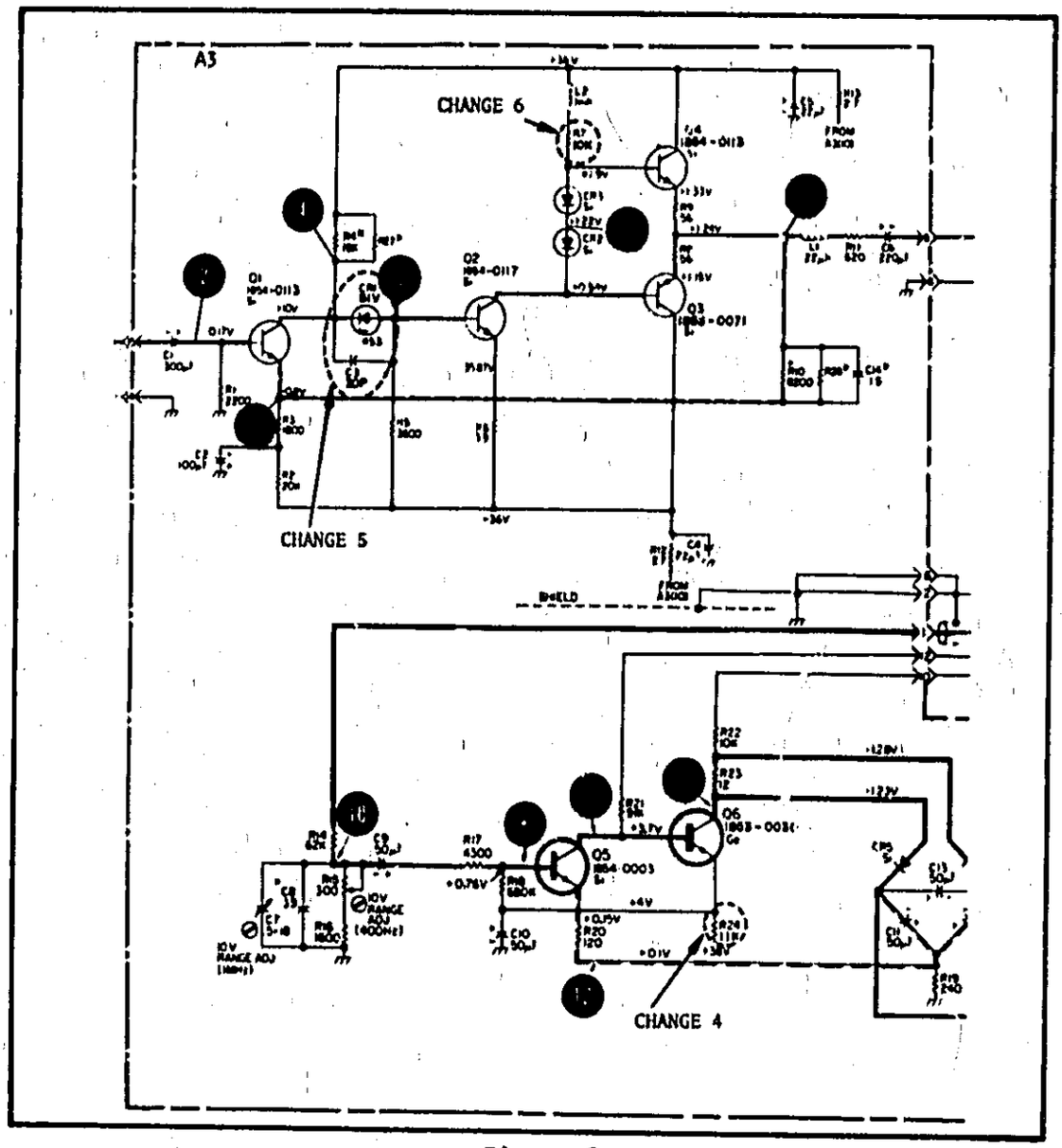


Figure 3.

Table 1. Parts Information

CHANGE	Page	Note	Reference Designation	Part Number	Description
CHANGE 1	6-3	▶ C	A1R6	0761-0015	R: FXD COMP 150CkΩ ±5% 1W
		▶ C	A1R10	0761-0015	R: FXD COMP 1500kΩ ±5% 1W
	6-11	▶ C	C1	0160-5379	C: FXD CER 4700pF ±20% 4KVDCW
		▶ C	C2	0160-5379	C: FXD CER 4700pF ±20% 4KVDCW
CHANGE 4	6-6	▶ C	A3R24	0683-1135	R: FXD COMP 11kΩ ±5% 1/4W
CHANGE 5	6-5	▶ C	A3C3	0160-2199	C: FXD MICA 30pF ±5% 300VDCW
	6-6	▶ C	A3CR1	1902-1389	SEMICON DEVICE: DIODE, BRAKDOWN 51V ±5% 500mW
CHANGE 6	6-6	▶ C	A3R7	0757-0839	R: FXD MTL 10kΩ ±1% 1/2W
ERRATA	6-15	▶ C	32	2190-0009	WASHER-LOCK INT.

▶ : New Item C: Change A: Add D: Delete