

TECHNICAL MANUAL

**OPERATOR'S, ORGANIZATIONAL,
DIRECT SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS
AND SPECIAL TOOLS LIST)**

FOR

**VIDEO AMPLIFIER AM-4380/U
(HEWLETT-PACKARD MODEL 5261A)
(NSN 6625-00-269-4593)**

HEADQUARTERS, DEPARTMENT OF THE ARMY

8 OCTOBER 1980



SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

- ① DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL
- ② IF POSSIBLE, TURN OFF THE ELECTRICAL POWER
- ③ IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL
- ④ SEND FOR HELP AS SOON AS POSSIBLE
- ⑤ AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY

NO. 11-6625-2906-14&P }
}

Washington, DC, 8 October 1980

**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)**

FOR
VIDEO MIPLIFIER ,MI-4380/U
(HEWLETT - PACKARD)
MODEL 5261A
(NSN 6625-00-269-4595)

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028-2 located in the back of the manual. Simply tear out the self-addressed form, fill it out as shown on the sample, fold it where shown, and drop it in the mail.

If there are no blank DA Forms 2028-2 in the back of your manual, use the standard DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME--MQ, Fort Monmouth, NJ 07,03.

In either case a reply will be forwarded direct to you.

SERIAL PREFIX: 1124A

This manual applies directly to HP Model 5261A
Video Amplifiers having serial number prefix 1124A.

This manual is an authentication of the manufacturer's commercial literature which, through usage, has been found to cover the data required to operate and maintain this equipment. Since the manual was not prepared in accordance with military specifications and AR 310-3, the format is not structured to consider levels of maintenance.

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**SECTION 0
INTRODUCTION**

0-1. SCOPE.

- a. This manual describes Video Amplifier AM-4380/U (fig. 1-1) and provides maintenance instructions. Throughout this manual, AM-4380/U is referred to as the Hewlett-Packard (HP) Model 5261A Video Amplifier.

P4030.29A and DLAR 4145.8.

- c. *Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 7518/MCO P4610.19C and DLAR 4500.15.

0-2. INDEXES OF PUBLICATIONS.

- a. *DA Pam 310-4.* Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

- b. *DA Pam 310-7.* Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

0-3. FORMS AND RECORDS.

- a. *Reports of Maintenance and Unsatisfactory Equipment.* Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

- b. *Report of Packaging and Handling Deficiencies.* Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 70058/NAVSUPINST 4030.29/AFR 71-13/MCO

0-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

EIR's will be prepared using SF 368 (Quality Deficiency Report). Instructions for preparing EIR's are provided in TN) 38-750, the Army Maintenance Management System. EIR's should be mailed direct to Commander, US Army Communication and Electronics Materiel Readiness Command, ATTN: DRSEL-NIE-NIQ, Fort Monmouth, NJ 07703. A reply will be furnished direct to you.

0-5. ADMINISTRATIVE STORAGE.

Administrative storage of equipment issued to and used by Army activities shall be in accordance with T%, 740-90-1 and paragraph 2-8.

0-6. DESTRUCTION OF ARMY ELECTRONICS MATERIEL.

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

FIGURE 1-1. Model 5261A



SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. DESCRIPTION.

1-3. The Hewlett-Packard Model 5261A Video Amplifier is a plug-in unit which increases the sensitivity of the Model 52431, 52451, and 5345A Electronic Counters. The Model 5261A provides for measurement of signals as low as 1 millivolt over the frequency range of 10 cps to 20 Mc (52431) or 50) Mc (52451,). The input impedance is 1 megohm and may be increased to 10 megohms by using a 10: 1 divider probe (HP stock no. 1000: 3A) An output signal is available at the OUTPITT 50-ohm connector for monitoring the Video Amplifier output or for activating external instruments. This signal is identical in frequency and amplitude to the amplified signal supplied to the counter input circuit.

1-4. INSTRUMENT IDENTIFICATION.

1-5. Hewlett-Packard uses a two-section serial number mounted on the rear panel. Earlier instruments use an eight-digit serial number (000-00000). The first three digits are a serial prefix number; the last five digits refer to the specific instrument. Later instruments use a nine-digit serial number (0000A00000). The first four digits are the serial instrument. If the serial prefix on your instrument does not appear on the title page of this manual, there may be differences between the manual prefix and the last five digits refer to the specific

and your instrument. If there are differences, they will be described in a change sheet included with the manual.

1-6. ACCESSORY SUPPLIED.

1-7. A 50 ohm, low microphonic cable HP 10507fi001, with BNC connectors is supplied in the package with the Model 5261A.

1-8. ACCESSORIES AVAILABLE.

1-9. Table 1-2 lists the accessories available for the Model 5261iA Video Amplifier.

TABLE 1-2. Accessories Available

Description	HP Stock No.
10:1 divider probe, 10 pf shunt 600V max., dc to 40 Mc	10003A
50-ohm feed-through termination	10100A
50-conductor extender cable	10506C
Plug-in adapter (for use with 5345A)	10509A

TABLE 1-1. Specifications*

<p>BANDWIDTH: 10 cps to 50 Mc with 52451,; 10 cps to 20 Mc with 52431,.</p> <p>INPUT SENSITIVITY: 1 mV to 300 mV rms.</p> <p>INPUT IMPEDANCE: Approximately 1 megohm, 15 pf shunt; HP 10003A Probe increases impedance to 10 megohms, 10 pf shunt.</p> <p>ATTENUATOR RANGES: 1, 3, 10, :30, and 100 mV rms.</p> <p>MAXIMUM INPUT 100 volts dc, 5 volts rms (ranges: 1, 3, 10, 30, 100 mV).</p> <p>MONITOR: Meter shows when the signal level is acceptable to the counter.</p> <p>ACCURACY: Retains accuracy of 5243L, 5245L, or 5345A Electronic Counters.</p>	<p>50 OHM OUTPUT: Separate BNC front panel output for oscilloscope monitoring or for driving external equipment; 50-ohm source impedance. On amplifier's most sensitive attenuator range, 1 mV rms at input results in at least 100 mV rms at auxiliary output into 50-ohm load. Maximum undistorted output is 300 mV rms into 50-ohm load.</p> <p>ACCESSORY FURNISHED: HP 1001 3A 10:1 Probe, 10 pf shunt, 600 volts maximum; HP 10100A 50-ohm Feed-thru Termination, 10506B Extender Cable, 10590A Plug-In Adapter.</p> <p>WEIGHT: Net 2 lbs (0,90 kg); shipping 8 lbs (3,8 kg).</p> <p>POWER: Supplied by 5243L, 5245L, or 5345A Electronic Counters.</p>
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*When installed in the HP Model 5243L, 5245L, or 5345A Electronic Counters.

SECTION II

INSTALLATION

2-1. INITIAL INSPECTION.

2-2 As soon as the Model 5261A is received, verify that the instrument is intact and as ordered. Inspect the plug-in for any physical damage such as scratched panel, broken knob, or bent connectors. If damage is found, refer to the warranty page at the rear of this manual and Paragraph 2-5 for shipping and repackaging instructions.

2-3. STORAGE AND RESHIPMENT.

2-4. ENVIRONMENT. Conditions during storage and shipment should be limited as follows:

- a. Maximum temperature 167-F (75°C).
- b. Minimum temperature -40-F (-40°C).

2-5. PACKAGING. To protect your instrument during shipment or storage, use the best packaging methods available. Your Hewlett-Packard field office can provide materials similar to those used for original factory packaging. Contract packaging companies can provide dependable custom packaging on short notice.

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

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

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

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

e. Refer to the warranty page at the rear of this manual and check with your Hewlett-Packard field office for shipping instructions. All correspondence

should refer to an instrument by model number and the full, eight-digit serial number.

2-6. INSTALLATION.

2-7. To install the Video Amplifier in the compartment provided at the right side of the counter front panel, proceed as follows:

a. Remove AC power from the counter by rotating the SAMPLE RATE control lull counter clockwise to POWER OFF.

b. Loosen locking screws on either side of the plug-in compartment (or single locking screw on left side by turning fully counterclockwise.

c. Remove blank filler panel Or plug-in unit installed.

d. Slide the Model 5261A into the compartment. Make certain the plug-in is properly aligned and tighten the locking screws.

2-8. COOLING

2-9. The Video Amplifier plug-in unit is cooled by the ventilation of the (hp) counter in which it is installed. Refer to the Operating and Service Manual of the Counter for cooling system maintenance instructions.

2-10. POWER REQUIREMENTS

2-11. All voltages required to operate the Model 5261A are supplied by the circuits of the (hp) counter in which the plug-in is installed.

2-12. ELECTRICAL CONNECTIONS.

2-13. The INPUT terminal on the front panel of the plug-in (see Figure 3-2) provides the only connection for the input signal. The front-panel OUTPUT 50 Ω connector supplies the Video Amplifier output for monitoring or external equipment. All connections to the counter are completed through the 50-pin jack at the rear of the plug-in unit.

SECTION III

OPERATION

3-1. MOLEL 5261A CONTROLS.

3-2. Figure 3-2 indicates the functions of the connectors, meter, and SENSITIVITY control on the Model 5261A front panel.

3-3. OPERATING PROCEDURE.

3-4. The Video Amplifier plug-in unit is ac-coupled but does not change any functions of the counter in which it is installed. Using the plug-in, period, multi-period, frequency, totalizing, and ratio measurements can be performed with input signals as low as one millivolt. Since the measurements can be made with or without the Video Amplifier installed, only frequency measurement is illustrated in Figure 3-3. For other measurement procedures, see the Operating and Service Manual for your Electronic Counter. Table 3-1 lists the frequency resolution for all settings of the counter TIME BASE control (Figure 3-3, item 3).

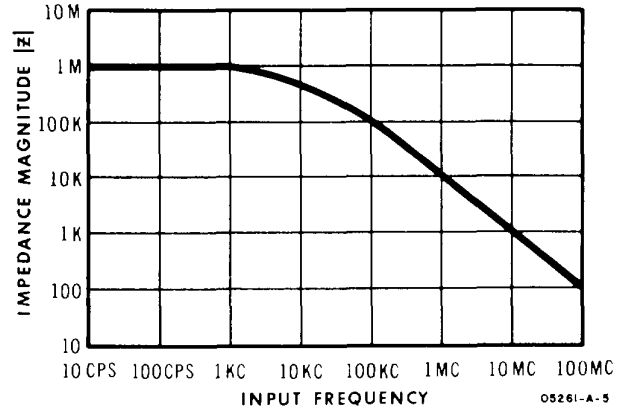


FIGURE 3-1. Input Impedance vs Input Frequency

TABLE 3-1. Frequency Resolution

INPUT FREQUENCY = 11.1223344 Mc	
TIME BASE Setting	Counter Display and Resolution
1 μs	no display
1 μs	11. Mc
10 μs	11.1 Mc
.1 ms	11.12 Mc
1 ms	11122. kc
10 ms	11122.3 kc
.1 s	11122.33 kc
1 s	11122. 334 kc
10 s	11122. 3344 kc

3-5. OPERATION WITH PULSE INPUT SIGNALS.

3-6. The Video Amplifier is designed to amplify sinusoidal input signals. However, pulse input signals can be amplified if the output signal is monitored to ensure a satisfactory output to the counter. Monitor the signal at the OUTPUT 50Q connector with an oscilloscope and set the Video Amplifier SENSITIVITY control for a level which results in satisfactory counter operation. Because the output level meter is an average-responding device, it will read low with a pulse input signal. Do not use the meter as an output level indicator when amplifying pulses.

3-7. OPERATION WITH HIGH IMPEDANCE PROBE

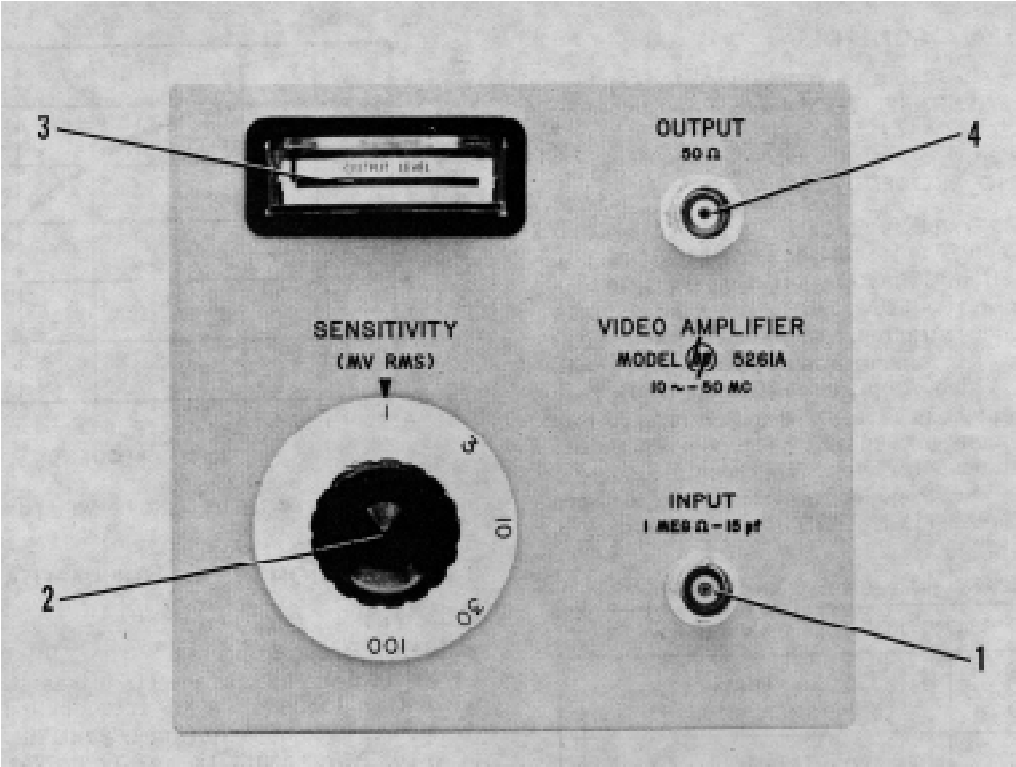
3-8. The (hp) 10003A 10:1 divider probe can be used with the Video Amplifier. The 10:1 divider probe serves to decrease the effects of resistive loading on the external circuit at low frequencies. When using the probe, Video Amplifier sensitivity is decreased by 10. As a result the maximum sensitivity of the Video Amplifier is 10 mv.

3-9. VIDEO AMPLIFIER INPUT IMPEDANCE.

3-10. As illustrated in Figure 3-1, Video Amplifier input impedance decreases at higher frequencies.

This decrease is due to the capacitive loading effect of the amplifier input. Thus when a signal source of fixed impedance is connected to the Video Amplifier INPUT, a meter at the signal source will not indicate the correct input level at the Video Amplifier. To avoid this error, monitor the input level at the Video Amplifier input with an RF Voltmeter such as the (hp) Model 411A to ensure a satisfactory input level. The Video Amplifier input can also be terminated in the signal source characteristic impedance but at frequencies near 50 Mc capacitive loading reduces the input impedance, the signal source is no longer terminated in its characteristic impedance, and a meter at the signal source is incorrect. Thus, the simplest method of ensuring a satisfactory input to the Video Amplifier is to monitor the signal level at the Video Amplifier input.

CONTROLS

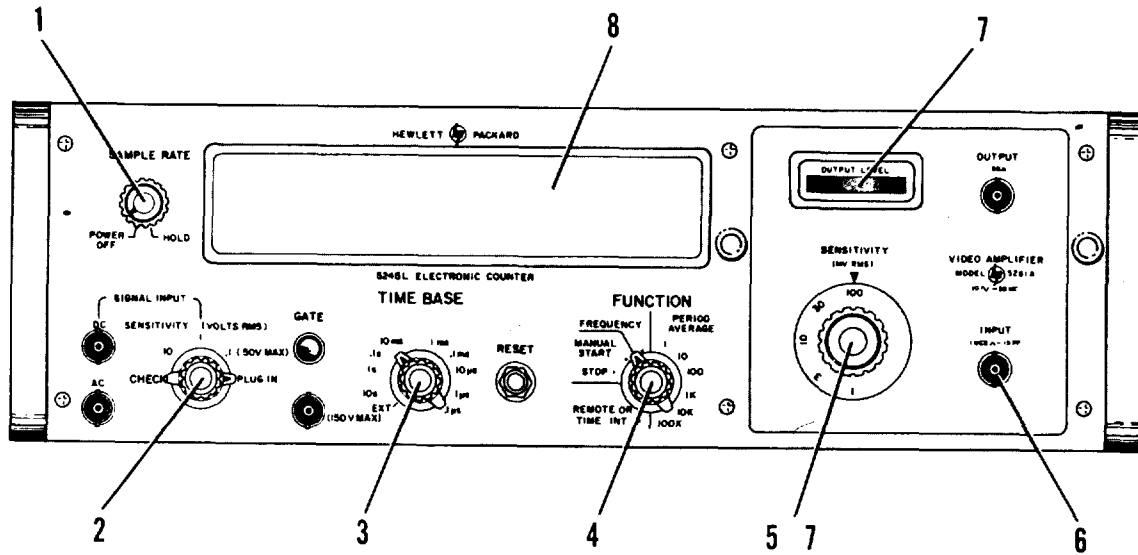


1. INPUT signal connector: apply a 1-100 mv AC signal between 10 cps and 20 Mc (5243L) or 10 cps and 50 Mc (5245L).
2. SENSITIVITY control: calibrated in millivolts, this control determines the sensitivity of the Video Amplifier and is adjusted to keep the signal output to the Counter within limits acceptable to the Counter input circuits as indicated on the OUTPUT LEVEL meter.
3. OUTPUT LEVEL meter: meter monitors the level of the Video Amplifier output to the Counter. When meter indicates in green portion of scale, Video Amplifier output to Counter is satisfactory.
4. OUTPUT 50 Ω connector: when terminated in 50 ohms, the signal at this connector is identical in frequency and amplitude to the Video Amplifier output to the Counter.

05261-A-6

FIGURE 3-2. Controls

OPERATING PROCEDURE



1. Apply power to Counter and Video Amplifier by turning SAMPLE RATE control slightly clockwise from POWER OFF position.
 2. Set Counter SENSITIVITY to PLUG IN.
 3. Set TIME BASE to 10 ms.*
 4. Set FUNCTION to FREQUENCY.
 5. Set Video Amplifier SENSITIVITY to 100 MV.
 6. Connect signal to be measured to INPUT connector on Video Amplifier. DO NOT EXCEED 5 V rms.
 7. Vary SENSITIVITY control until OUTPUT LEVEL meter reads in green portion of scale.
 8. Observe frequency of INPUT signal as displayed by Counter.
- *TIME BASE setting may vary depending upon desired resolution of INPUT signal frequency (Table 3-1).

05261-A-3

FIGURE 3-3. Frequency Measurement with Model 5261A

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. The four functional sections of the Model 5261A are illustrated in Figure 5-4. The preamplifier, attenuator, video amplifier, and output amplifier circuits are combined to amplify AC signals as small as 1 millivolt and provide a usable output level to the counter input circuit. All dc voltages to operate the Model 5261A are supplied from the counter in which the unit is installed. These dc voltages are filtered by components on Amplifier assembly A4, which includes a series regulator in the 15-volt line.

4-3. PREAMPLIFIER ASSEMBLY A1.

4-4. The preamplifier circuit consists of a nuvistor cathode follower driving an emitter follower to provide a high impedance input and a low impedance output. Diodes A1CR1 and A1CR2 limit input signal peaks and prevent damage to A1Q1. Resistor A1R4 limits A1Q1 gate current during overload. Capacitors A1C2, A1C3, A1C4, and A1C5 filter variations from the dc voltage lines.

4-5. ATTENUATOR SWITCH ASSEMBLY A2.

4-6. Resistive attenuator A2 reduces the input signal and establishes the overall gain of the Video Amplifier. The amount of attenuation inserted is controlled by the Video Amplifier SENSITIVITY switch. RC networks A2C2, A2R10, and A219, A2C1 are selected to improve frequency response.

4-7. VIDEO AMPLIFIER ASSEMBLY A3.

4-8. The video amplifier consists of two amplifiers with three transistors each and feedback and drift compensation for gain stability. Feedback is provided by the RC combination of A3R5, A3C4, A3R13, A3C1 and transistors A3Q3, A3Q6 in the feedback loops of the two amplifiers. Drift compensation is also accomplished with the addition of A3Q3 and A3Q6. Positive feedback to amplifier No. 2 from output amplifier A4Q4 increases amplifier No. 2 gain at higher frequencies.

4-9. The addition of A3Q3 and A3Q6 in the feedback loops of the two amplifiers provides three functions: 1) act as negative feedback amplifiers to reduce the gain which reduces any drift caused by temperature changes in the two-stage amplifiers; 2) maintain the amplifier gain at low frequencies; and 3) filter ripple on the -14 volt line, in conjunction with A3C6 and A3C13.

4-10. OUTPUT AMPLIFIER ASSEMBLY A4.

4-11. Output amplifier assembly A4 consists of: 1) output amplifier circuit, 2) meter circuit: 3) plus 20volt filter; and 4) series regulator. These four circuits are discussed in Paragraphs 4-12 through 4-15.

4-12. OUTPUT AMPLIFIER. Emitter follower A4Q4 provides the amplified input signal to the counter via rear panel plug P6, pin 1. This same signal is supplied to OUTPUT 509 jack J2 for monitoring with an oscilloscope or application to other equipment. Positive feedback from A4Q4 emitter to amplifier No. 2 in the video amplifier assembly increases the video amplifier gain at higher frequencies. Capacitors A4C9 and A4C10 are connected in parallel to improve the overall frequency response.

4-13. METER CIRCUIT The signal at A4Q4 emitter is rectified by A4C R2 and A4C R3 and filtered by A4C12. This dc is supplied to OUTPUT LEVEL meter M1. Capacitors A4C11 and A4C13 are connected in parallel to improve the frequency response of the meter circuit. Meter Cal potentiometer A4R13 provides an adjustment for calibrating the OUTPUT LEVEL meter (Paragraph 5-12). Minus 15 volts is supplied to the meter circuit and establishes a bias on diodes A4CR2, 3. This prevents the meter indicating for very small output signals and permits a meter indication in the green scale for ml output signal greater than 100 millivolts. Diode A4CR4 acts to protect the meter during input signals greater than 100 mv. A4CR4 anode is clamped at about -1.5 volts, which corresponds to approximately full scale. When the rectified signal output exceeds this value, A4CR4 conducts and protects the meter.

4-14. PLUS 20 VOLT FILTER. Transistors A4Q1, A4Q2, and associated components filter variations and noise from the +20-volt line. A voltage change at A4Q1 collector causes a change at A4Q2 base and A4Q2 changes conduction to oppose the variation. The emitter-collector voltage drop across A4Q2 is approximately 1 volt and the +20 volts becomes +19 volts at the drain of FET A1Q1. Resistors A4R2 and A4R3 form a dc voltage divider to establish the quiescent voltage at A4Q1 base. Capacitor A4C2 bypasses to ground ac variations at A4Q1 base.

4-15. SERIES REGULATOR. Series regulator A4Q3 provides regulated -14 volts for the Model 5261A circuits. Breakdown diode A4CRI establishes a reference voltage at A4Q3 base. When the -15 volts changes, A4Q3 senses this change through A4R4 and increases conduction to oppose the change. Inductor A4L1 reduces high-frequency transients in the -14 volt regulated output.

TABLE 5-1. Recommended Test Equipment

Instrument Type	Required Characteristics	Use	Instrument Recommended
Electronic Counter		Provide power	(hp) Model 5243L or (hp) Model 5245L
DC Voltmeter	0 v to ± 25 v; 10 M Ω input impedance; 1% accuracy	Troubleshooting	(hp) Model 412A
AC Voltmeter	1 mv to 500 mv; 10 cps to 1 Mc; 2% accuracy	Troubleshooting Circuit adjustment	(hp) Model 403B
RF Millivoltmeter	1 mv to 500 mv; 500 kc to 50 Mc: 3% accuracy	Troubleshooting; Circuit adjustment	(hp) Model 411A with (hp) 11025A Probe (formerly (hp) 411A-21E)
Oscillator	10 cps to 100 kc; 1 mv to 500 mv	Troubleshooting; Circuit adjustment	(hp) Model 200CD
High Frequency Signal Generator	100 kc to 50 Mc: 1 mv- to 500 mv	Troubleshooting; Circuit adjustment	(hp) Model 606A
Oscilloscope	10 cps to 10 Mc; 5 mv/cm	Troubleshooting;	(hp) Model 175A with (hp) Model 1752A
Coaxial Cable	Low Microphonics	Troubleshooting;; Circuit adjustment; Operation	(hp) 10507A
Extender Cable	50-pin connectors; straight-through connections	Permits operation outside of counter	(hp) 10506B
Feed-through Termination	BNC to BNC; 50 Ω	Troubleshooting: Circuit adjustment	(hp) 10100A (2 required)
DC Power Supply	100 vdc	Performance Check	(hp) 711A

SECTION V

MAINTENANCE

5-1. INTRODUCTION.

5-2. This section of the manual provides maintenance and service information for the Model 5261A Video Amplifier. Included are troubleshooting procedures, a table of recommended test equipment, repair information, and in-cabinet performance checks which may be used to verify proper operation of the instrument.

5-3. TEST EQUIPMENT.

5-4. Recommended test equipment for checking performance and troubleshooting is listed in Table 5-1. Test instruments not listed that have specifications equal to or better than the required characteristics listed may be used.

5-5. ASSEMBLY IDENTIFICATION.

5-6. Throughout this manual, printed circuit assemblies are referred to by assembly number. For example, the Video Amplifier Assembly is referred to as A3. Connections to pins of the 50-pin plug on the rear of the instrument are referred to by the plug number and pin number; for example, pin 1 is referred to as P6(1).

5-7. IN-CABINET PERFORMANCE CHECK.

5-8. The performance checks listed in Table 5-2 verify proper operation of circuits in the Video Amplifier and may be used:

- as part of an incoming inspection check of instrument specifications;
- periodically, for instruments in systems where maximum reliability is of primary importance;
- as part of a troubleshooting procedure to locate malfunctioning circuits, and
- after any repairs or adjustments, before returning instrument to regular service.

5-9. ADJUSTMENTS.

5-10. HIGH FREQUENCY RESPONSE ADJUSTMENTS A3C4, A3CII.

5-11. Trimmer capacitors A3C4 and A3CII in video amplifier assembly A3 provide the only adjustments for frequency response. Adjust these capacitors only when the bandwidth check (Table 5-2, In-Cabinet Performance Checks) indicates the frequency response is outside the ± 3 db limits. The access hole for tuning A3C4 is on the bottom of the instrument and A3CII access hole is on the left side. Use a plastic tuning wand for adjustments. Adjust A3C4 and A3CII as follows

a. Remove Video Amplifier plug-in from counter by loosening lock screws and sliding unit out of counter plug-in compartment.

b. Use '10506B extension cable and connect Video Amplifier rear plug to counter lack inside plug-in compartment.

c. Set counter controls as follows:
SAMPLE RATE..... slightly cw out oA POW'ER OFF
SENSITIVITY..... PLUG-IN
TIME BASE..... 1 MS
FUNCTION FREQUENCY

d. Set Video Amplifier SENSITIVITY to 3 MV.

e. Connect Model 411A RF Millivoltmeter through (hp)10100A feed through termination to 50 Ω OUTPUT.

f. Connect Model GOGA generator through (hp)10100A feedthrough termination to Video Amplifier INPUT. Set frequency to 1000 kc and adjust output level for 150 mv indication on voltmeter (use -3 db mark as reference).

g. Slowly change generator frequency from 500 kc to 60 Mc. If voltmeter indicates less than -6 db or more than 0 db. adjust A3C11 to bring the voltmeter indication within these limits.

h. Set generator frequency to 30 Mc and it voltmeter indication is less than -6 db or more than 0db, adjust A3C4.

i. Repeat steps g and h until the voltmeter indication is within the limits for both steps.

j. Slowly change generator frequency between 500 kc and 60 Mc. Observe that voltmeter indication remains between -6 db and 0 db over this frequency range.

5-12. OUTPUT METER CALIBRATION.

5-13. Meter Cal potentiometer A4R13 is located on output amplifier assembly A4 and is accessible from the top when the Video Amplifier is outside the counter plug-in compartment. Adjust A4R13 as follows:

a. Perform operations indicated in Paragraph 5-11, steps a, b, and c.

b. Connect Model 200CD oscillator output to the Video Amplifier INPUT. Set oscillator frequency to 100 kc.

c. Connect Model 403B voltmeter to the Video Amplifier 50 Ω OUTPUT through ; 10100A feedthrough termination.

TABLE 5-2. In-Cabinet Performance Checks

<p>1. BANDWIDTH: 10 cps to 50 Mc</p>
<ul style="list-style-type: none"> a. Set counter controls as follows: SAMPLE RATE slightly clockwise out of POWER OFF SENSITIVITY to PLUG-IN TIME BASE to .1 MS FUNCTION to FREQUENCY b. Set Video Amplifier SENSITIVITY to 3 MV. Connect (hp) 10100A 50-ohm feedthrough terminations to INPUT and OUTPUT c. Connect Model 200CD Oscillator output to Video Amplifier INPUT and Model 403B Voltmeter to 50 Ω OUTPUT. d. Adjust Oscillator frequency to 100 kc and for indication of 120 mv on Voltmeter (use -4 db line as reference). e. Slowly change Oscillator frequency from 100kc to 10cps. Video Amplifier output level should remain between -7 db and -1 db limits. f. Disconnect Model 200CD and connect Model 606A to Video Amplifier INPUT through the (hp)10100A feedthrough termination. Disconnect Model 403B from OUTPUT and connect Model 411A RF Voltmeter. g. Set generator to 1000 kc and adjust output level for -4 db reference as in step d. Remove Voltmeter from OUTPUT and connect to INPUT. Record input level for reference level. h. Connect Voltmeter to 50 Ω OUTPUT and slowly change generator frequency from 1000 kc to 100 kc. Repeat above 100 kc to 50 Mc. Connect Voltmeter to INPUT periodically to check reference level. Video Amplifier output should remain between -7 db and -1 db limits.
<p>2. INPUT SENSITIVITY. 1 mv to 300 mv rms.</p>
<ul style="list-style-type: none"> a. Set Counter controls as in 1 a. b. Set Video Amplifier SENSITIVITY to 1 MV c. Connect (hp) 10100A feedthrough terminations to Video Amplifier INPUT and 50 Ω OUTPUT d. Connect 200CD to INPUT and Model 403B Voltmeter to 50 Ω OUTPUT. Adjust Oscillator frequency to 100 kc and for indication of 100 mv on Voltmeter e. Disconnect Voltmeter from 50 Ω OUTPUT and connect Oscilloscope to 50 Ω OUTPUT. Oscilloscope display should be a sine wave with no clipping. f. Connect Voltmeter to Oscillator output. Voltmeter should indicate less than 1 mv. g. Connect Voltmeter to 50 Ω OUTPUT. h. Set Video Amplifier SENSITIVITY to 100 mv. i. Connect Oscillator to INPUT and set to 100 kc. j. Adjust Oscillator output for 300 mv indication on Voltmeter. k. Observe that Counter correctly counts input frequency.
<p>3. MAXIMUM INPUT: 5 volts rms, 100 vdc</p>
<ul style="list-style-type: none"> a. Set counter controls as in 1 a. b. Connect BNC tee to Video Amplifier INPUT, set Model 711A DC Power Supply for 100 volts, add 1 megohm series resistor, and connect power supply to Video Amplifier. c. Use a 0.1 μ f, 200 wvdc capacitor and connect Oscillator and Voltmeter to INPUT. Set Oscillator for 100 kc and 5 volts rms as indicated on Voltmeter. d.. Observe that counter correctly displays input frequency. (cont'd)

TABLE 5-2. In-Cabinet Performance Checks (cont'd)

4.	MONITOR: OUTPUT METER indicates acceptable signal level to Counter
	<ul style="list-style-type: none"> a. Set Counter controls as in 1 a and Video Amplifier SENSITIVITY to 3 'MV. b. Set Oscillator to 100 kc and connect to Video Amplifier INPUT with 50-ohm termination. c. Connect Voltmeter to 50 19 OUTPUT with 50-ohm feedthrough termination. d. Adjust Oscillator output level for 420 mv on Voltmeter e. Observe that OUTPUT LEVEL meter indicates at right edge of green portion of scale and Counter correctly displays input frequency. g. Observe that OUTPUT LEVEL meter indicates at left edge of green portion of scale and Counter correctly displays input frequency.
5.	ACCURACY: retains accuracy of Model 5243L or Model 5245L Electronic Counter.
	<ul style="list-style-type: none"> a. Set Counter controls as in 1 a. b. Set Oscillator frequency to 100 kc and connect to Video Amplifier INPUT. c. Set Video Amplifier SENSITIVITY to 100 MV. d. Connect Voltmeter to Oscillator output and set signal level to 100 mv. e. Observe and record Counter display. f. Set Counter SENSITIVITY to .1V. Disconnect Oscillator output from Video Amplifier INPUT and connect to Counter AC SIGNAL INPUT. g. Observe that Counter display corresponds with value recorded in step e.
6.	AUXILIARY OUTPUT'
	<ul style="list-style-type: none"> a. 50 Ω OUTPUT on front panel lor monitoring amplified signal to Counter or for driving external equipment checked in 1 under BANDWIDTH specification check. b. 1 mv signal at Video Amplifier INPUT provides at least 100 mv at 50 Ω OUTPUT, checked in 2 under INPUT SENSITIVITY specification check. c. Maximum undistorted output is 300 my into 50-ohm load, checked in 2 under INPUT SENSITIVITY specification check.

d. Set Video Amplifier SENSITIVITY to 100 MV. Adjust Oscillator output for 420 mv on Voltmeter.

e. OUTPUT LEVEL meter should indicate at right edge of green scale. If not, adjust A4R13 for this indication.

f. Adjust Oscillator output for OUTPUT LEVEL indication at left edge of green scale. Voltmeter should indicate not less than 100 mv.

5-14. TROUBLESHOOTING AND REPAIR.

5-15. TROUBLESHOOTING.

5-16. When operation or performance checks indicate an instrument malfunction, refer to Table 5-3 (Troubleshooting) for the more common indications of trouble and checks to isolate the trouble. After the trouble has been isolated to a particular assembly or stage, voltage and resistance checks can be made to determine the defective component.

5-17. PRINTED CIRCUIT COMPONENT REPLACEMENT.

5-18. Component lead holes in the Mode I 5261A printed circuit boards have plated walls to ensure good electrical contact between conductors on opposite sides of the board. To prevent damage to this plating and to the replacement component, apply heat sparingly and work carefully. The following replacement procedure is recommended:

a. Remove defective component by applying heat carefully to the component connection and lifting the component from the board.

b. Melt solder in component lead holes. Use clean dry soldering iron to remove excess solder. Clean holes with toothpick or wooden splinter. Do not use metal tool for cleaning. This may damage through-hole plating.

c. Bend lead of replacement component to the correct shape and insert component leads into component lead holes. Using heat and solder sparingly, solder

leads in place. Heat may be applied to either side of board. A heat sink (longnose pliers, commercial heat-sink tweezers, etc.) should be used when replacing transistors and diodes to prevent conducting excessive heat from the soldering iron to the component.

d. Through-hole plating breaks are indicated by the separation from the board of the round conductor pads against board and solder replacement component lead to conductor pads on both sides of the board.

TABLE 5-3. Troubleshooting

Trouble Symptom	Possible Cause
No output to Counter or 50 Ω OUTPUT jack	DC voltages from Counter, FET A1Q1 dead, A4Q4 shorted, P6(1) or J2 shorted
Low Video Amplifier gain	AQ1 weak, A3Q1-A3Q6 weak, A4R5 increased value
Output low at frequencies near 10 cps	A4C6 open, A1C1, A3R18 increased value
Output low at frequencies above 100 kc	A2C1 changed value, high frequency trimmers A3C4 and A3C11 not correctly adjusted
Output noisy	A1Q1 noisy poor ground connection at P6(3), A3C5, or A3C12 changed value

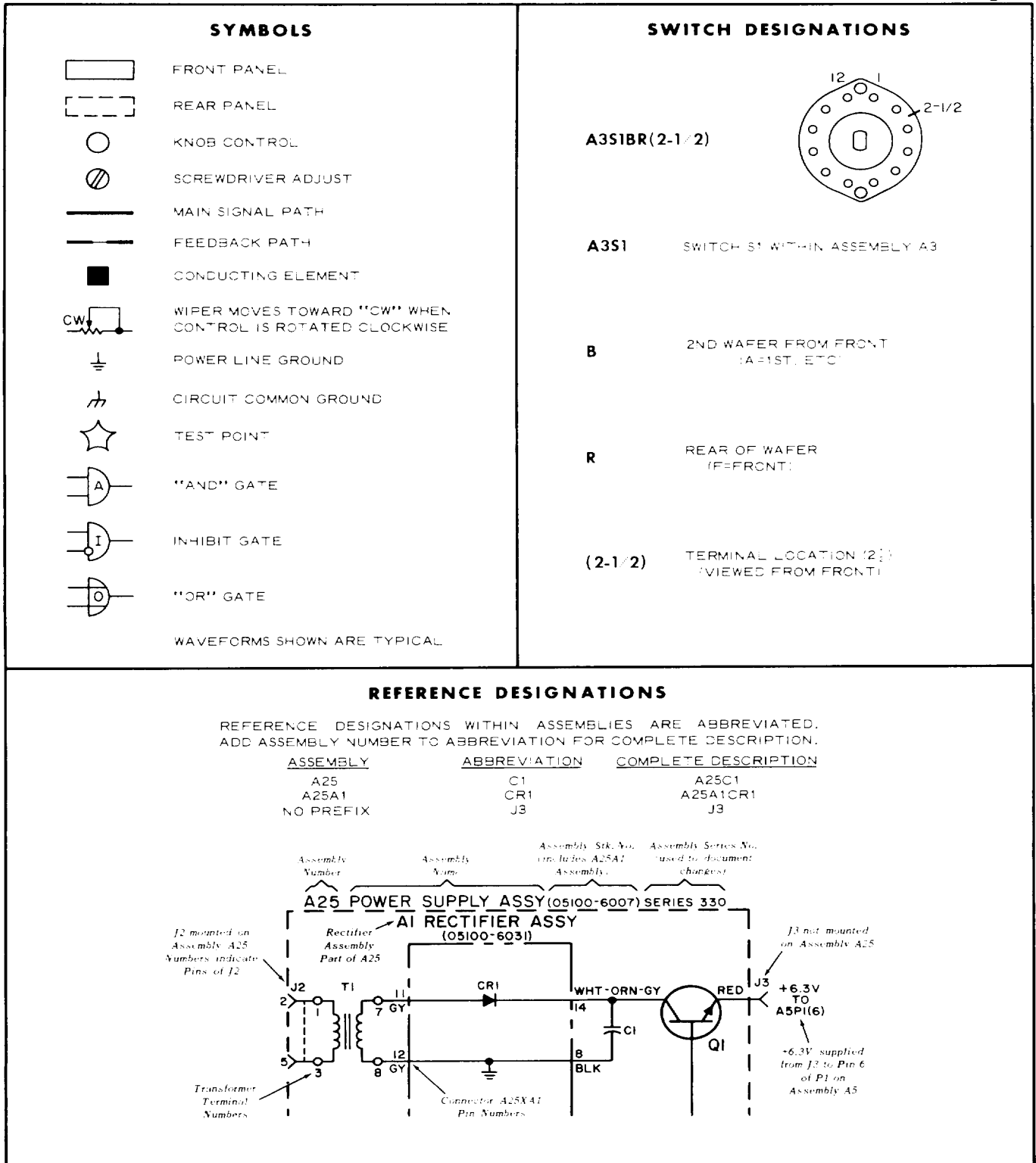


FIGURE 5-1. Schematic Diagram Notes.

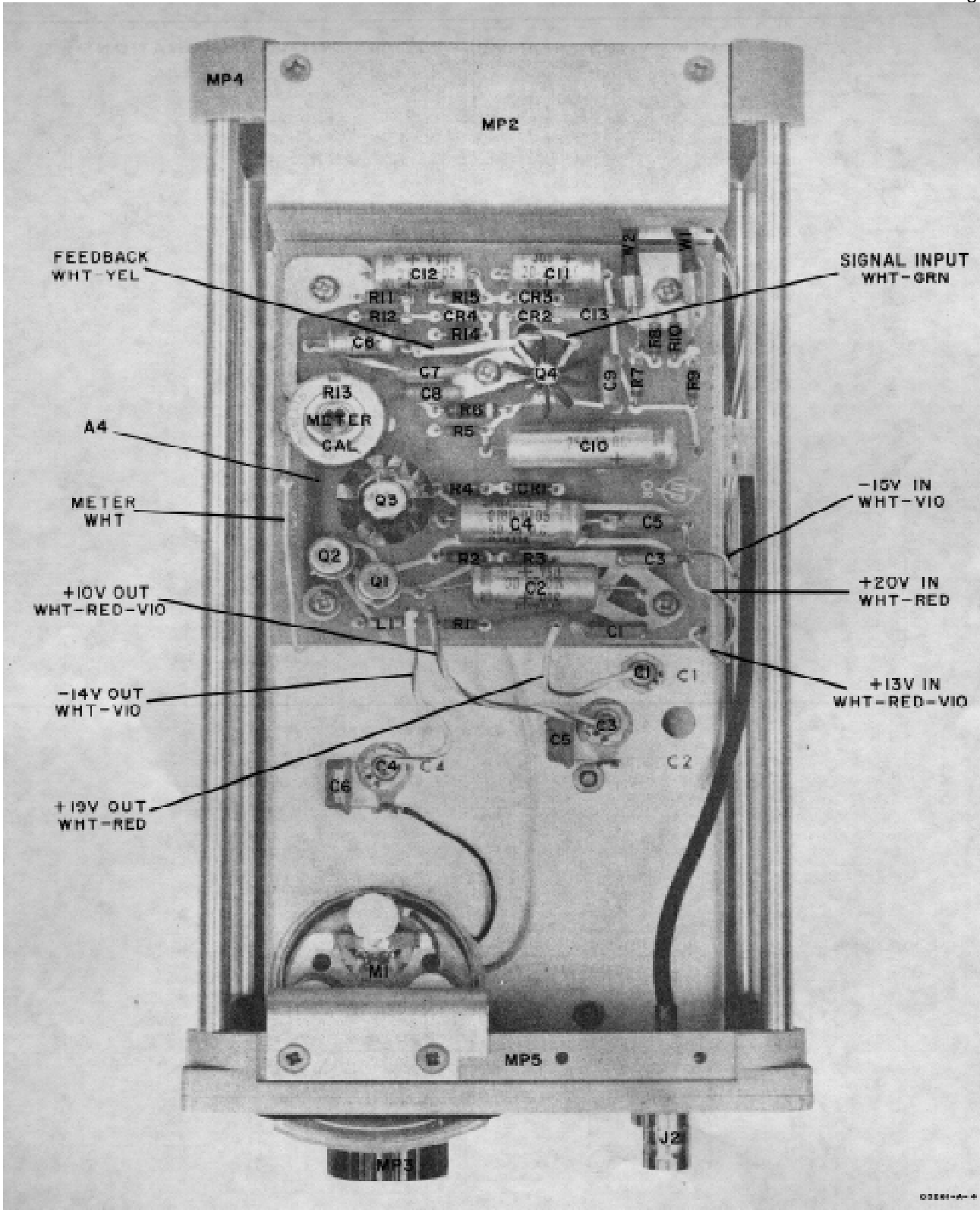


FIGURE 5-2. Top View, Component Location

Model 5261A

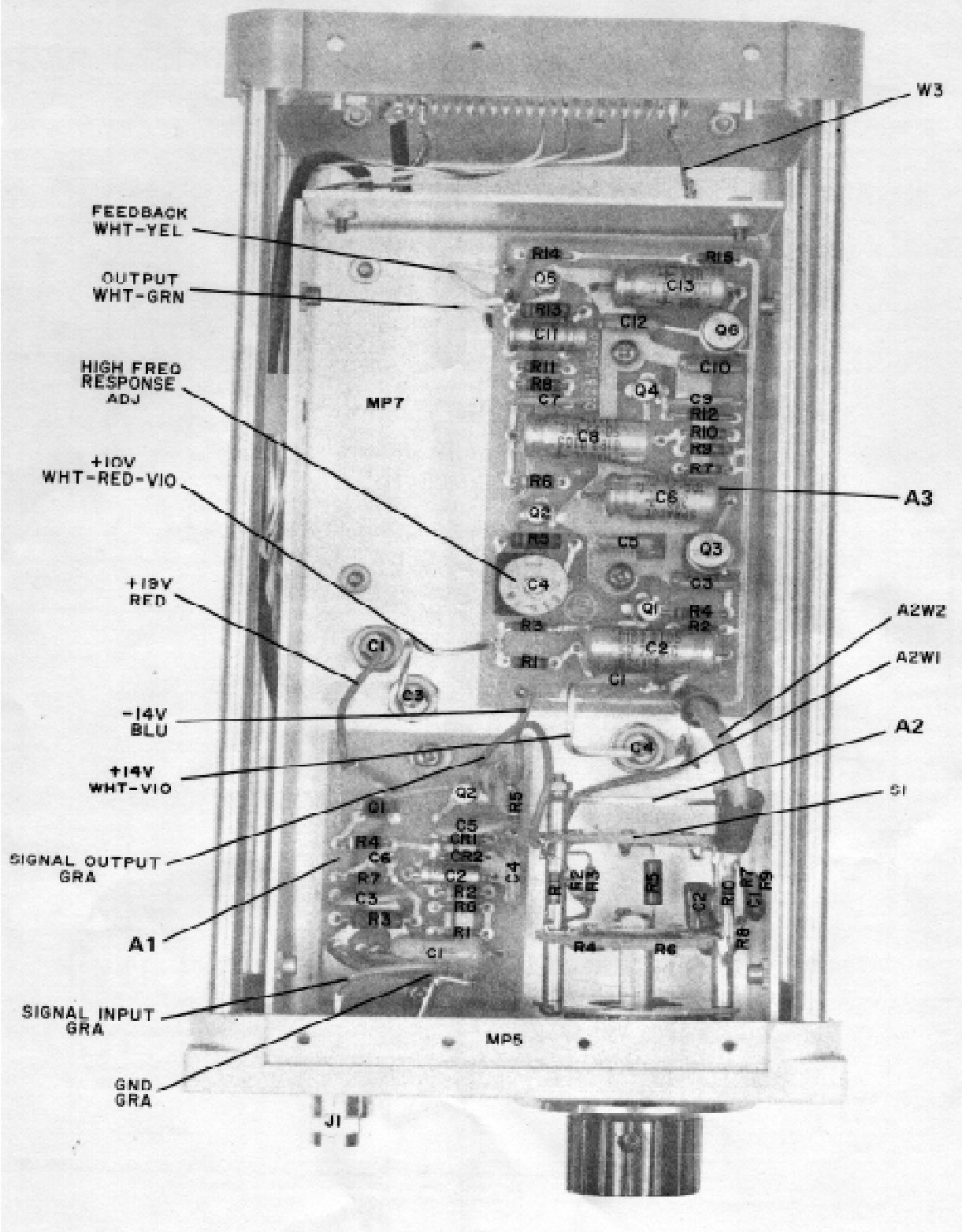


FIGURE 5-3. Bottom View, Component Location

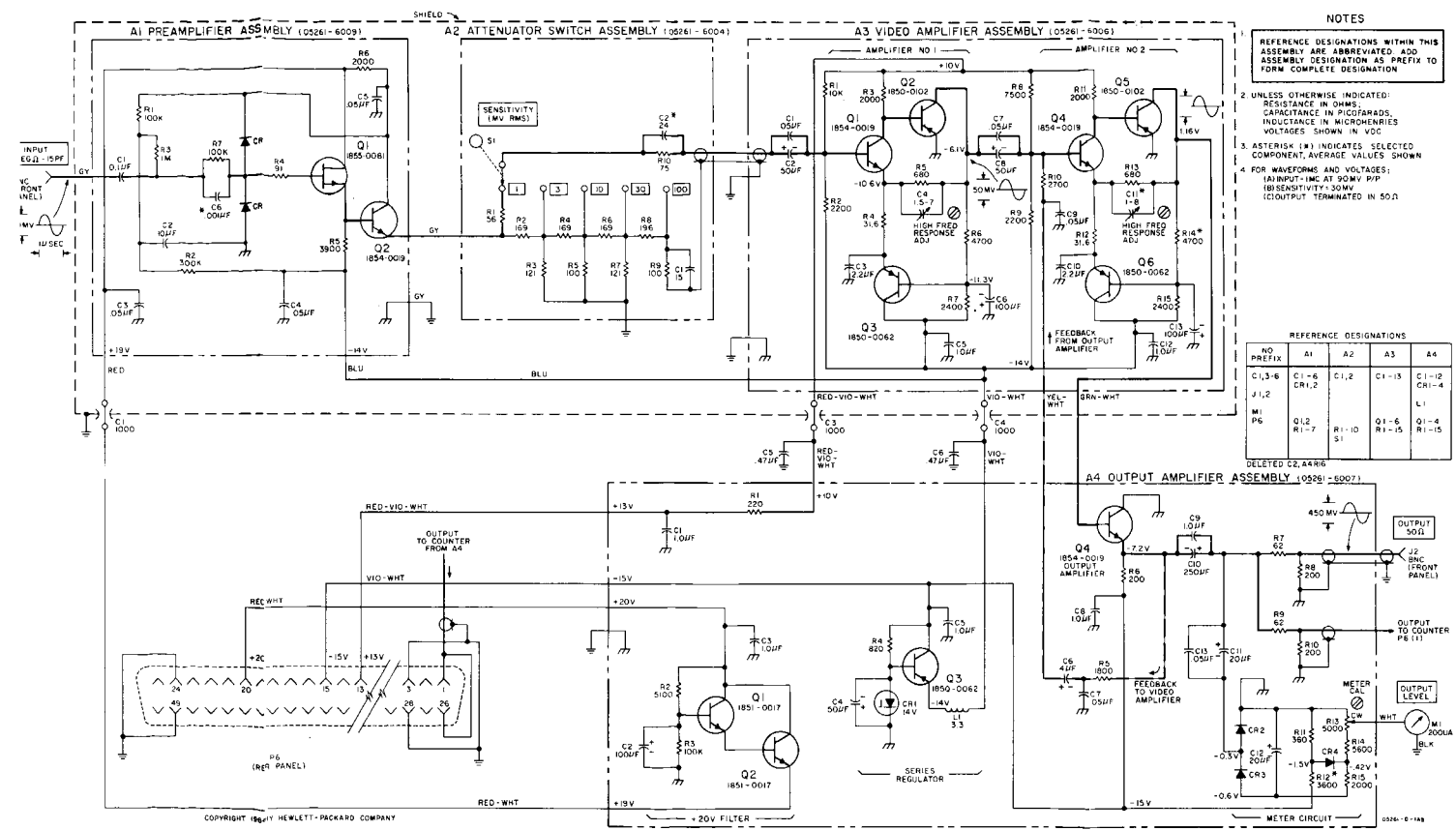


Figure 5-4. Video Amplifier Schematic
5-7/5-8

FIGURE 5-4. Video Amplifier Schematic.

SECTION VI

Model 5261A

TABLE 6-1.

6-1. Reference Designation Index (Cont'd)

Reference

Demgnaon	Stock No.	Description #	Nte
A3C7	;lot-C09u C:Fau Cpr '.b.BF IUCVuCt		
A3C6	(IG01-C£Ob C:O-. L.LC1 bLF 25bbCe		
AIC9	elbC-Oi,u9o LaFXu Cts u.uSF luvOCtW		
A3Co10	Olo-Clak C:FXD *.k .°.2 L 2,t 25VLtL		
A3CIII	1l -OG,*u CSIAN bUAS! .b-6.L *F 75tVC-o		
A3CXI	- FALTORY SELECTIL FARTITYP/LAL VALLt GIV-c,		
A35I2	UloO-CiA7 Clh>, CLh ItF et, L.VOCA		
A3C13	UO16-006 C:Fau tLCI 1SbUet +Auo-10 15VLW		
A3QI	1654-Cul TKAfhbbl 0RI aINC ,o		
A3Q2	le5G-0o02 TRA,elb. iORNha4L5j		
AQ03	185b-0u64 TNAN5ISI GR lftRhAlaci Wh		
ASuQ	145L-o1oT1n6,hIS4bl0 1l h. O		
A3wu5	le5C-CI,4 TRAN5I S1O:iiNL45		
A3Q6	15I-00C62? TnaNSI1,IF laEW(alAil		
A3SRI	oeb3-u103 RslFX C tF 10s COh*b !b II4		
A3R2	Ot63-2Z2b nKFXU C'MF 2.kh h* DLt 1/4 .		
A3R3	0683-202o RtlFu CuFF kiO& OhM5 54 1/ A4		
A3F4q	0757-A180 kIFXu *,T FLM JI.6 H0M 1* l,eo*		
AR5S	1757-012A FRal-Xu LT FLM 6eu OHMS i. 1l/,		
A3R6	0683-4q7> RAIFASU PP 4700 utw15- 1/ Ae		
A3R7	U683-2425 RIFXu LCMP 4sUs uHt 5L 1/ 4'		
A3R8	0683-7525 R:FXA CuMP 7.5K ChM 5t l/qi		
A5R9	Ot63-k?25 RIFXu LUCF 2. auLi Uh 51 /4,.		
A3RIO	0603-272D RaFAu Cp.P 7"G uhmb 5b 1/4h		
A3RI	te3-2025 nIFXu CLhP kbot uHMb 51 1/4		
A3RI2	757-10ib RIFXO MST FL" h i.6 OhM I 1/ oes		
A3RI3	u757-C126 NIFXu M.T FLMh oU utHnS 2t i/ At		
A3RLI	068C3-7kf Rf:FXU Cn,MP 47tt' uHe S % 1/h		
A3R15	0683-24D RaIFkt CTMP 4 Qbu vHMS 5% 1/4w		
Aq	052el-bob7 ASSYHOUIPUT AMPLIFIK 6OA4Rb		
05061-20U5	bLANh P.ilhILO CIHCUIT BOARL		
A4C1	U100-0127 CIFXU LCR ILF L'a Lb5VD(
A4C2	J 180-0094CIFXL)O tLCT A1OUtr evCC5		
A4C3	1Uo0-0127 CIFXU Crk ILF Uba gb ¥DCA		
AqCq	0180-0105 CIFXL LtECT 5(,F 25vOC*		
A4C5	0163-0127 CIFXU Can IIF AL4a >wDCw		
A4C6	tldO--0110 CIFAU ELECI 4uF +/uO-O/C 25bbC*		
A4C7	ulbC-009b ClaXD CHn '.05UF 1IOVOCI		
4C8	vlu60-C127 C:FXu Cth ILF ",a 5VOCw		
A4C9	0160-0127 CIFXb CIR ILF G0j ebVOCI		
A4CI0	'lbO- C1ai CaFXus LLCi 25L KF 1eVUCs		
A4CII	(jlbo-O4a Cs:FXUs aECT 2(b UF bVOCd		
A4 CI2	UIbO-0045 C:FXa ELECI g40 iF SVODC		
A4CI3	u15-009bC:FXb CLt .0 be luOVGCC		
A4CRi	1902-004% SEMICON UEvICt 105u SILICui. JUNCTIhN		
A4CR2	1910-oua2 SEMICON LGEICLDIOu10 GE SOUMA 6 P1% ,3.5N		
A4CR3	1910-002e SEIICON OIE VICEILaOuE GE 100MA bPIV 3.5N5		
A4CR4	191L-0016 SEMICON OEVICLUI 1Cit GERpAlluk		
A4LI9140-0143	CUILFAXu RF 3.) uH		

See lit of bbreviations in introduction to this section

02058-2

Table 6-1 Reference Designation Index (Cont'd)

Reference Designation	Stock No.	Description	Note
401Q	1851-0017	TA\$hSIS1OR IIhN)4	
A402	1851-0017	TRhANbISSIO0IkN13C4	
A403	1t>0-C064	THANSI£1ORa~iLhhANJIU	
Q03	12Gi5-OC11	HEAT SINKIPCR .3	
A404	iP54-0019	TRAN5ISIOoR:2Nk,8	
A404	1205-001	HEAT SIIKI:FCFQi,	
A4R1	vo83-Z2215	RaFXU CuMP 220 OEHMS 5 1/4*	
A4R2	U6 83-5125	RIFXD CbMP blu, OHMS 5% 1/4n	
A4R3	0683-1045	HIFXU C%MP 1i0K OHMS 5% 1/4i	
A4R4	0683-8215	RIFXD C%MP e2U GPMb 5s 1/4s	
A£45	v683-1825	RrFXO CuMP 1801 OHMS 5% 1/4	
A4R6	u758-006z	Rr:FX MLT FLM awU OHMS 5t I/t%	
A4R7	U683-6205	RIFXO CAMF bti OMS 5s 1/4*	
A4RB	0683-2015	RIFXD CAMP 200 OMES 5 1/IW	
A4R9	U683-6kOb	RIFxo C,MP e2 OHMS I* I/nt	
A4RIO	0683-2015	RIFXD CQMP 200 CHMS 5% I/q4	
A4Ril	0683-3615	RIFXD CAMP 360 CHMS 5% li/4	
A4RI2	0683-3625	RIFxb CMPF 3600 OHM 5% 1/4*	
A4RI2	-	FACTORY SELECTLO PARTITYFICAL VALUL GIVES	
A4RI3	21oV-0331	R:VAN ta 5000 ChM 101 LIN i* MLTLI CAL.	
A4R14	O683-562S	RTFXU CMPF 5609 OHMS 53 1/4I	
AqR5	0U683-202>	RIFXU CIMP 2K ChM 5o 1/4I	
CI	0150-0005	CIFXO CR C100U PF 253 50S0VCw	
C3	015U-0005	CIFXo CLR 1 GOG IF -, * 5COVObc	
C4	0156- 0005	CIFXa CcH ItOb F- 45a DOuuuL*	
C5	0160-0174	CIFXU Can G.47UF 80U 25vLC*	
C6	0160-0174	CIFXO CcR C.47UF 80* 25Vbc*	
JI	1250-0171	CONNECTRA Aa6NC INPUT	
J2	1250-010o	CONNECTtRtahC CUTPUT 50 OHM	
MI	1120-0143	METERI2uO LA EDGE VILO	
	5040-0185	BEZEL: METER	
MPI	5261-600	ASSY SHIELC COVER,*ITH 8kAIL	
MP2	5261-0004	BRACKET:SHIELD MOUNTING	
nF)	05261-00 Q1	DIAL SENSITIVITY	
MP4	5265A- 83A	GUIDE:MOLDEC PLASTIC,4-1/2 IN.14-I/KIN	
MI'5	(1 -n20111	1PANEL FRONT STANDARD tMINT GRAY)	
MP	'2;l-i-i	PANEIFR)NT II)IS('()NTINLUER)p (LIGHT GRAY)	
NP7	05261-0005	SHIELOlaOX17 lhN. X -1/2 IN.	
MP8	5262A-47A	SPACERa KOUNL ,7-/41N/h. L6 X i/4IN.CIA	
MP9	05261- 0007	BRACKETrMETER MOuNTING	
P6	1251-0099	CONNLCT,R PALE b5 PIN	
*1	05261-6002	CABLLiOTPLT. 1 II. LONG	
2	05261-6003	CABLE RLAR,t lh. LONG	
3	5243A-160	CA8LE,(hOUNhCON P6 PIN 26 AND 49	

= See list of abbreviations in introduction to this section

6-4. Replaceable Parts

Stock No.	Description #	Mfr.	Mfr. Part No.	[TQRS
0121-0048	CIVAR GLASS .8-8.5 PF 750V	uca	73899 ¥C9GW	I il
0130-0011	C:VTR CER 1.5-7 PF		284010130-O011	[1 1
0140-C2C2	C:FXU MICA 15 FF 5% 5suvoc	C. 040	Obd OM1SCISOJ boOV	1 1
0150-O0uCS	C:FXU CER 10u0 PF 25*a g	OVdt*	0422eITYPE LFS-I	3 2
0150-0096	CrFXU CER 0o.5F i	OOVb ^{UCo}	VI4/1i-TA 8! 2	
0160-0127	CIFXU CER IUF esa 25V	DOf	562bv [C13 71	
0160-0128	CIFXU CEk 2.2 F 20C	x 25VC	; 56289 5C15 21 1	
0160-0174	CIFXO CER 0.47UF g	0o .5VUC.t56ab9	5CIIA 2 1	
0160-0196	CIFXo MICA 24P~ 5% 30V~	VCW O64	bod MISCc4OJ I 1	
0160-0975	C:FXD CER .001UF 20(;, 75V	DCW	12574 SSM-001-98 1 1	
0170-0055	C:FXD MY O.1UF 20%ri 200V	DCW	56289 192P(0402 1 [
0180-0045	CIFui ELECT 20 UF 25V	DOC	56269 03269t 2 1	
016i0-C00o	CIFXa ELECT IOOLF +IOUO-10a	1IS'Lk	56ct9 Usv17IAI 2 1	
110-0094	CIFXD ELECT t1UoF 25vsC		56289 3UL1U6AI 1 1	
0180-0105	C:FXD ELECT b0rF 25VDC.		56te9 597q41 3 1	
0180-0114	CIFXU ELECT 4UF +1L00-10	250DC.	562b9 3OU4005GO2uA4 I 1	
0180-2121	C:FXD EI,ECT 250 MF 12VDC	W	56289 30D257G012I)H4 11	
0180-0:37,4	C:FXD EI,ECT 10UF 20VI)C	W	56289 150D106X90202-I)YS 1 1	
0683-1035	k:FDU COKP 1OK CHMS 5* 1/4I		01121 Cd 1035 1 1	
0663-1045	RIFXU COMP 100N OHS 5- 1/4%	O0111,Cb 1045	3 1	
683-1825	RIFXU COMP 1h00- HrS 5- 1/4-	(il;i Cl6 I	i5 1 1	
06e3-2015	R:IFs CO.P 2oC OHMS 5t i/4* (, 11L		CB 2o15 2 1	
0683-2025	k:FXu COAP 2Roo. OHMS St 1/4.		,111i Cd 2.5 4 1	
0o83-2215	R:FXL COPP 2ec0 nHM 5 1/4		011121 Cb 2215 1 1	
0e83-?225	laFrO COMP 2.2& H0 5- 1/4I		1)121 Co 2225 2] 1	
0683-2425	H:FXD CoRp 24C OPHMS 5- 1/4.		(I114I C6 2S45 2 1	
0683-2725	R:FX COMP 2700 OHMS ' I1 4W	01121	CRB 271n 1	
0683-3045	R:FXD COMP 300K OHMS 5<S 1 4W	01121	CB 3045 1 1	
0683-3o015	aIFX COMP 360 OHMS 5a I/4I		U111ICb 3615 1	
0683-3625	RIFXU COMP 3ot OH ph5 5 1/4.		0112CB C 3625 1 1	
0683-3925	R:FXD COMP 3900 OHMS So		1'W 01121 CB 3925 d 1	
068:-47245	R:FXD COMP 4700 OHMS 5; 1 4W		01121 CB 4725	
0683-5125	R:FXD COMP 5100 OHMS 5 1 4W		0111 CB 125 1	
00683-5605	ar:l- Co60P 56 8M- 56 1/4w		calakl C 5t t	
0683-5625	aIFYD CCOP StCu 3*rs >- 1/4.		ull2I Cb 56,5 1	
(663-6205	ataFrU COME 62 Lhi'i bi //4I		Olil Co 62t O5t 2 1	
0683-7505	natFXs COKP 75 LhnS 5 1]4*		('111 Cb 7s55 1 1	
0683-7525	R:FXD COMP 1 MEGOHM 5'e 1/4W		01121 CB 7525 1 1	
0683-8215	R:FXD COMP 820 OHMS 5'r 1/4W		01121 CB 8215 1i	
0683-9IC5	a:F>D COPP 91 OhMS 5% 1/41W		o(li Ce 91g5 1 1	
0757-0069	RIFXO MET FLM 121 OhM 1i 1/4%		197ul rF6C 1-0 2 I	
0757-1i26	! R:FrU 'IFT FLM o80 CiMS 2* 1/2*		7115 C cC 2]	
0757-C176	k:Fra MET FL 1Se9 CnM It I-w		75012 CEb T-U 3 1	
0757-C178	NIFLa r'ET FLr 14L OhM 1I I/h		7521, CEoT-C2 1	
10757-0179	naFXL MET FLM i9* OHM I* II'		75c4e CErT-L 11	
0757-0180	R:F ^{XLE} MET FLM u1.6 ChM I* I6bt		75042 CLAT- 2 1	
0757-0344	R:FXD MET FLM 1 MEGOHM 1' 1/4W		01121 CB 0344 1	
U758-C062	krFXi MET FLm 2C OChMS 5* 1,2		C7115 C 20 I 1	
I12-CM113	PETE*Ci,(aiA EI6e VIES		60741 liv 1	
1200-01-e6	SOCpET::tuUVIsETCHk 3 PIN		717b7 t3)-6-11--26 1	
1205-0011	HEAT Sl:rFck *.3		9B7o. TXrF-t32-OZ5P I 1	

= See list of abbreviaions in introduction to this section

Table 6-2.	Replaceable Parts (Cont'd)							
Stock No.	Description	Mfr.	Mfr.	Part No.	TQ	RS		
1205-0012	hEAT SIKIrFOI Q4	05ai	HMODEL	NF-UI1 a		I		
1250-0102	CONNLC TOSHINC CUTPUT >O OHM			91737 7011			1	1
1250-0171	CONIECTOR:BNC INPUT			91737 11246	1	1		
1251-0099	CONNECTOR:MALE 50 PIN	o0266	57	10500	1	1		
18b0-0062	TPANSISTORsGERMANIUM			2840, 1850-C062	3;	3		
ISSriH--1N11	TKANSIST()R-FET	01295	2N5245		1			
1850-0102	TRANSISTOR 2N2455		28480	1850-0101	2	2		
1851-0017	TRANhISTOR32N1304	01295	2NI304	2	2			
1854-0019	TRANSISTORI2N2 ³⁶⁸	07263	5-5781		4	4		
I.)114LV761	SEMIC'ON I)DEVICE-I)IOI)E SILICON		28480	1901-0376	'	2	1	
1()2-S()-I(I	SEMICO I)EVICE.I)IOD)ESI,IC(ON JTNCTION		28480	1902-0)40	1!			
1910-)1I)()11	SEMI('ON I)EVICE T)IOI)E GERMANIUM 933:2 I)2:61				1;			
1910-0022	SEMICCN DEVICEIDIOCE GE 100A 6FIV 3.5NS		284eoi	1910-0022	2		2	
1921-0015	ELECTRON TUBES 8U56 NUVISTOK TRIODT	86684	8056		1	1		
2100-0331	RIVAR ** 5000 OHM 105 LIN IW METER CAL.	28460	2100--C331		I		1	
3100-0404	SWITCh-ROTARY 2 SECT S POS	2848U	0310G-CG40		I4			1
5040-0185	BEZEL: NMETER	28480	5040-0185		1			
5261-0004	BhRACKET: SHIELD M3OUNTING	28480	5261-0004		1			
5261-6008	ASSY SHIELD COVER,*ITH BRAID	28e80	5261-0008		1			
9140-0183	COILIFXO RF 3,3 UH	2848U	9140-CI43		I	ii		
05261-0001	DIAL SENSITIVIY	28480	05261-0001		1			
0526 10005	SHIELDS60X.7 IhN. 3-1/2 IN.		28480	05261-0005	1			
05261-0007	BRACKETMETER MOUNTING	28480	05261-0007		1			
021-2I1_)4	BLANK PRI ^(NTEI) CIRCLUIT BOARD	28480	05261-2004					
05261-2059	B.LANK PRINTED CIRCUITIT BOARI)	28480	05261--009		1			
115261-2)11	PANELFRONT STANI)AR/) (MINT GRAY)	28480	(5261-2011		1	1		
05261-6001	CABLE ATTENUAToR	28480	05261-6001		1			
o5261-6002	CABLEKOUTPUT. 10 IN. LONG	28460	05261-6002		1		1	
05261-6003	CABLE REAR-4 IN. LONG	28480 ⁰⁵²⁶¹⁻⁶⁰⁰³			1			
05261-6004	ASSYSATTENUATOR SWITCH	28460105261-6004I						
05261i-6(6	ASSY:VIDEO AMPLIFIER BOARD	28480	052614006		I			
(026-IC	ASSY.OPUTPUT AMPLIFIER BOARD	284180	02614007		1			
05261-t609	ASSY PREAMPLIFIER BOARD	28480	052614009		1			
5243A-160	CABLETGROUND	2848U	5243A-160		1	aj		
5243A-160	CABLLtGROUNDeON P6 PIN 26 AND49	284680	5243A-16D				1;	
5262A-47A	SPACEPIROUND.7 I/8IN. LG X 8/4lh.DIA	2884u	5262A-47A		4			
5262A-83A	GUIDE MOLDED PLASTIC 4-1/2 IN X4-1/2 IN	28*80	5262A-83A		1			

See list of abbrevitions in introduction to this section

TABLE 6-3. Manufacturer's Code List

Code No.	Manufacturer	Address
01121	Allen Bradley Co.....	Milwaukee, Wis.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas
02660	Amphenol-Borg Electronics Corp	Chicago, Ill.
04062	Elmenco Products Co.....	New York, N.Y.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S.C.
05820	Wakefield Engineering Inc.	Wakefield, Mass.
07115	Corning Glass Works Electronic Components Dept.	Bradford, Pa.
07263	Fairchild Semiconductor Corp.....	Mountain View, Calif.
12574	Gulton Ind., Inc., Data System Div	Albuquerque, N.M.
19701	Electra Manufacturing Co.	Kansas City, Mo.
28480	Hewlett-Packard Co.	Palo Alto, Calif.
56289	Sprague Electric Co.	North Adams, Mass.
60741	Tripplett Electrical Inc.....	Bluffton, Ohio
71785	Cinch Mfg. Corp.	Chicago, Ill.
73899	JFI) Electronics Corp.....	Brooklyn, N.Y.
75042	International Resistance Co.	Philadelphia, Pa.
86684	Radio Corp. of America, RCA Electron Tube Div.....	Harrison, N.J.
91418	Radio Materials Co.....	Chicago, Ill
91737	Gremer Mfg. Co., Inc.	Wakefield, Mass.
93332	Sylvania Electric Prod. Inc., Semiconductor Div.	Woburn, Mass.
98978	International Electronic Research Corp.....	Burbank, Calif.

PART NUMBER	FSCM	NATIONAL STOCK NUMBER	PART NUMBER	FSCM	NATIONAL STOCK NUMBER
D2361	93332	5961-00-954-9182	0757-0069	28480	5905-00-917-0567
D32696	56289	5910-00-080-1890	0757-0126	28480	5905-00-971-1650
S97441	56289	5910-00-809-3431	0757-0176	28480	5905-00-972-4901
VC9GW	73899	5910-00-683-7157	0757-0178	28480	5905-00-763-5243
0121R0048	28480	5910-00-683-7157	0757-0179	28480	5905-00-972-4905
0130-0011	28480	5910-00-780-7577	0757-0180	28480	5905-00-972-4907
0140-0202	28480	5910-00-852-2655	0757-0344	28480	5905-00-269-2629
0150-0005	28480	5910-00-839-3156	1120-0143	28480	6625-00-974-6089
0150-0096	28480	5910-00-247-7226	1200-0086	28480	5935-00-782-8388
0160 0127	28480	5910-00-809-5484	1205-0011	28480	5999-00-789-3794
0160-0128	28480	5910-00-057-3934	1250-0102	28480	5935-00-988-7758
0160-0174	28480	5910-00-234-9817	1251-0099	28480	5935-00-777-6395
0160-0196	28480	5910-00-920-0475	133-65-11-026	71785	5935-00-945-9824
0170-0055	28480	5910-00-797-9742	1850-0062	28480	5961-00-988-7630
0180-0045	28480	5910-00-080-1890	1850-0101	28480	5961-00-774-7318
0180-0061	28480	5910-00-916-8071	1850-0102	28480	5961-00-764-3164
0180-0094	28480	5910-00-082-5119	1851-0017	28480	5961-00-826-0799
0180-0105	28480	5910-00-809-3431	1855-0081	28480	5961-00-350-8299
0180-0114	28480	5910-00-9711652	1901-0376	28480	5961-00-790-7834
0180-0212	28480	5910-00-971-1653	1902-0040	28480	5961-00-059-1215
0180-0374	28480	5910-00-931-7050	1910-0016	28480	5961-00-954-9182
05261-6001	28480	5995-00-503-7441	1910-0022	28480	5961-00-690-9341
05261-6004	28480	5930-00-020-5162	192P10402	56289	5910-00-437-7645
05261-6007	28480	6625-00-971-1651	2N1304	01295	5961-00-826-0799
05261-6009	28480	6625-00-971-1646	2N5245	01295	5961-00-350-8299
0683-1035	28480	5905-00-998-1929	2100-0331	28480	5905-00-971-1656
0683-2015	28480	5905-00-683-2239	30D188A1	56289	5910-00-827-1209
0683-2025	28480	5905-00-686-3370	30D257G012DH4	56289	5910-00-814-4955
0683-2725	28480	5905-00-882-2723	3100-0404	28480	5930-00-974-6090
0683-5125	28480	5905-00-139-1642	5C11A	56289	5910-00-883-0838
0683-5625	28480	5905-00-691R0195	5C15	56289	5910-00-057-3934
0683-7525	28480	5905-00-056-0520	7011	91737	5935-00-089-3572
			9140-0143	28480	5950-00-716-4085

APPENDIX A

REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins Supply Manuals (Types 7, 8 and 9), Supply Bulletins and Lubrication Orders.
DA Pam 310-7	US Army Equipment Index of Modification Work Orders.
TB 43-180	Calibration Requirements for the Maintenance of Army Materiel.
TM 11-6625-57?2-J4	Operator's and Organizational Maintenance Manual: for Generator, Signal AN/GRH-50
TM 11-6625-602-12	Operator's Organizational, Direct Support and General Support Maintenance Manual, Including Repair Parts and Special Tools List for Test Set Telephone, AN/USM-181/U (HP-3550)
TM 11-6625-2953-14	Operator's Organizational, Direct Support and General Support Maintenance Manual: Multimeter AN/USM-451.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).
TM 11-6625-1614-15	Organizational, DS and GS, and Depot Maintenance Manual, Hewlett-Packard Electronics Voltmeter, Model 410C.

APPENDIX B
COMPONENTS OF END ITEM LIST

SECTION I. INTRODUCTION

B-1. SCOPE

This appendix identifies integral components of and basic issue items for the Video Amplifier AM4-4380/U to help you inventory items required for safe and efficient operation.

B-2. GENERAL

The components of the end item are depicted in figure 1-1 on page 1-0. These items comprise the AM-4380/U and must be packed together whenever it is transferred or turned in.

B-1

APPENDIX C

Additional Authorization List

(Not Applicable)

C-1

APPENDIX D

MAINTENANCE ALLOCATION

SECTION I. INTRODUCTION

D-1. General

This appendix provides a summary of the maintenance operations for the AYL-4380/U. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

D-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating conditions, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the species' parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections, to be made or to be adjusted on instruments or test measuring and diagnostic equipments used

in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system

j. Overhaul. That maintenance effort (service/ action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e. DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/ components.

D-3. Column Entries

a. *Column 1, Group Number.* Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. *Column 2, Component/Assembly.* Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. *Column 3, Maintenance Functions.* Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. *Column 4, Maintenance Category.* Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of task-hours specified by the "worktime" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

- C Operator/Crew
- O Organizational
- F Direct Support
- H General Support
- D Depot

e. *Column 5, Tools and Equipment.* Column specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. *Column 6, Remarks.* Column 6 contains alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

D-4. Tool and Test Equipment Requirement (sect III)

a. *Tool or Test Equipment Reference Code.* The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. *Maintenance Category.* The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. *Nomenclature.* This column lists the noun name and nomenclature of the tools and the equipment required to perform the maintenance functions.

d. *National/NATO Stock Number.* This column lists the National/NATO stock number of the specified tool or test equipment.

e. *Tool Number.* This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

D-5. Remarks (sect IV)

a. *Reference Code.* This code refers to the appropriate item in section II, column 6.

b. *Remarks.* This column provides the required explanatory information necessary to clarify items appearing in section II.

SECTION II. MAINTENANCE ALLOCATION CHART
FOR
VIDEO AMPLIFIER, AM-4380/U

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
00	AM-4380/U	Inspect		.5				13	A
		Service		.25				13	B
		Test				2.0		1, 3, 5, 7, 10	C
		Adjust				2.0			
		Test				2.0			C
01	Preamplifier Assembly A1	Repair				3.0		1, 3, 5, 7, 10	C
		Calibrate *				3.0			
		Overhaul					4.0		
		Inspect		.25				1, 3, 5, 7, 10	A
		Test				.5			
Adjust				.5					
02	Attenuator Switch Assembly A2	Repair				1.0			
		Inspect		.25				3	A
		Test				.5			
03	Video Amplifier Assembly A3	Repair				1.0		4, 5, 9, 10	A
		Inspect		.25					
		Test				.5			
04	Output Amplifier Assembly A4	Test				.5		4, 7	A
		Repair		.25			1.0		
		Inspect							
05	50 Ohm Cable	Test		.1					A
		Inspect							

*Calibrate per In-Cabinet Performance
Check this technical manual, paragraph
5-7. There is no formal calibration
procedure.

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
VIDEO AMPLIFIER, AM-4380/U

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H, D	Frequency .Counter AN/USM-451, or HP8640B	4931-00-545-2344	
2	H, D	DC Voltmeter JF 887AB,3AN,HP 3490A	4931-00-407-26L2 6625-00-557-8305	
3	H, D	AC Voltmeter JF 887ABAN. HP 403B/35503	6625-00-727-4695	
4	H, D	RF Millivoltmeter HP 410C	6625-00-969-4105	
5	H, D	Oscillator HP 200CD, HP 652A HP-606A (AN/GRM-50)	6625-00-575-7737 4931-00-113-2943 6625-00-819-0472	
6	H, D	HF Signal Generator HP 8614A, 8640B	6625-00-495-4851 4931-00-545-2344	
7	H, D	Oscilloscope HP 180D, 1805A, 1825A	6625-00-022-8228	
8	H, D	Coaxial Cable HP 10507A	6625-00-518-2899	
9	H, D	Extender Cable HP 105063B CX-11487/U (length 1 ft. 7 in.)	6625-00-868-6931	
10	H, D	Feed-through Termination HP 10100A (2 required)	6625-00-880-3947	
11	H, D	DC Power Supply Kepco HB 525M20480	6130-01-033-3936	
12	H, D	Tool Kit TK-101/U	5180-00-064-5178	
13	H, D	Tools and test equipment as authorized to the repair mission user to complete the assigned mission.		

SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	VISUALS.
B	REPLACE FUSES, KNOBS, ETC.
C	PERFORMANCE TESTS ONLY.
	D-5

APPENDIX E

This manual applies directly, to the .5261A Video Amplifier having serial number prefix 1124A. This manual with the following changes also applies to 5261A having serial number prefix :301, 311, 510, 960, and 1104.

FOR SERIAL PREFIX	PERFORM CHANGE
301, 311	1, 2, 4
510	2, 4
960	3, 4
1104	4

CHANGE 1:

Figure 1 of Appendix E

Change A4R16 to a chassis part and designate R1.

Tables 6 1, 6-2

Change: MP5 Front Panel to HP Part No 05261-2003.

Change: MP9 Meter Mounting Bracket to HP Part No. 05261-006.

Delete. A4R16

Add: R1 HP Part No. 0760-0012, R fxd, metal film 51 ohm 2% 1W

CHANGE 2:

Page 6-2, Table 6-1

Delete items A1 through A1R7

Add the following

A1	05261-6005 05261-2002	ASSY:PREAMPLIFIER BOARD BLANK PRINTED CIRCUIT BOARD
A1C1	0170-0055	C:FXD MY 0.1UF 20% 200VDCW
A1C2	0160-0127	C:FXD CER 1UF 20% 25VDCW
A1C3	0150-0096	C:FXD CER 0.05UF 100VDCW
A1C4	0150-0096	C:FXD 0.05UF 100VDCW
A1C5	0150-0096	C:FXD CER 0 05UF 100VDCW
A1CR1	1910-0016	SEMICON DEVICE DIODE GERMANIUM
A1CR2	1910-0016	SEMICON DEVICE DIODE GERMANIUM
A1Q1	1854-0019	TRANSISTOR:2N2368
A1R1	0683-8245	R:FXD COMP 820)K OHMS 5% 1/4W
A1R2	0683-1545	R:FXD COMP 150K OHMS 5% 1/4W
A1R3	0757-0344	R:FXD MET FLM 1 MEGOHM 1% 1/4W
A1R4	0683-9105	R:FXD COMP 91 OHMS 5% 1/4W
A1R5	0683-3625	R:FXD COMP 3600 OHMS 5% 1/4W
A1R6	068:3-9115	R:FXD COMP 910 OHMS 5Ar' 1D4W
A1V1	1921-0015	ELECTRON TUBE: 8056 NUVISTOR TRIODE
A1XV1	1200-0086	SOCKET:NUVISTOR 5 PIN

CHANGE 2:

Continued)

Page 6 4, Table 6-1	Add A4R16 0760-0012 R:FXD MET FLM 51 OHM 2% 1W Add C2 0150-0005 C:FXD CER 1000 PF' 500VDCW Add MP6 05261-2001 PLT MTG FOR A1
Page 6-5. Table 6-2	Change Table 6-2 to reflect above part changes.
Page 5-6, Figure 5-2	Replace Figure 5-2 with Figure 1 of Appendix 1
Page 5-7, Figure 5-3	Replace Figure 5-3 with Figure 2 of Appendix 1
Page 5-7, Figure 5-4	Replace Figure 5-4 Video Amplifier Schematic with Figure 3 of Appendix 1

CHANGE 3

Page 6-2, Table 6-1	Delete A1C 0160-0975 .001UF 20% 75VDCW Delete A1R7 0683-1045 100K OHM 5% 1/4W
Page 6-5, Table 6-2	Change Table 6-2 to reflect above part changes
Page 5-7, Figure 5-3	Replace A1 portion of component locator with Figure 4 of Appendix 1
Page 5-7, Figure 5-4	Replace Figure 5-4 Video Amplifier Schematic with Figure 5 of Appendix 1

CHANGE 4

Page 6-4, Table 6-1	Delete from MP5 description "OPTION A85 (LIGHT GRAY)" Delete from "MP5 05261-2011 PANEL: FRONT STANDARD (MINT GRAY)"
---------------------	---

FIGURE A-1. Top View, Component Location

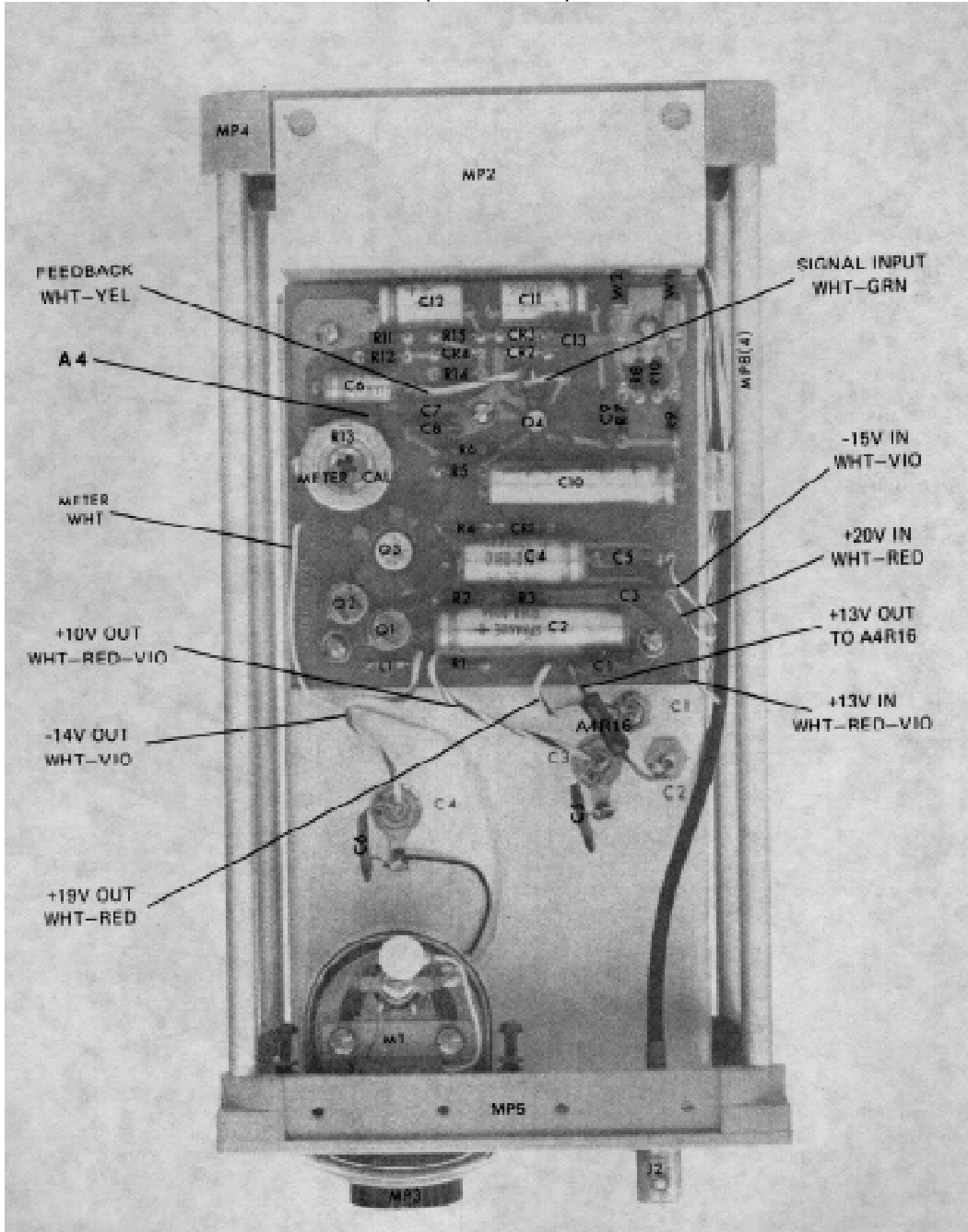
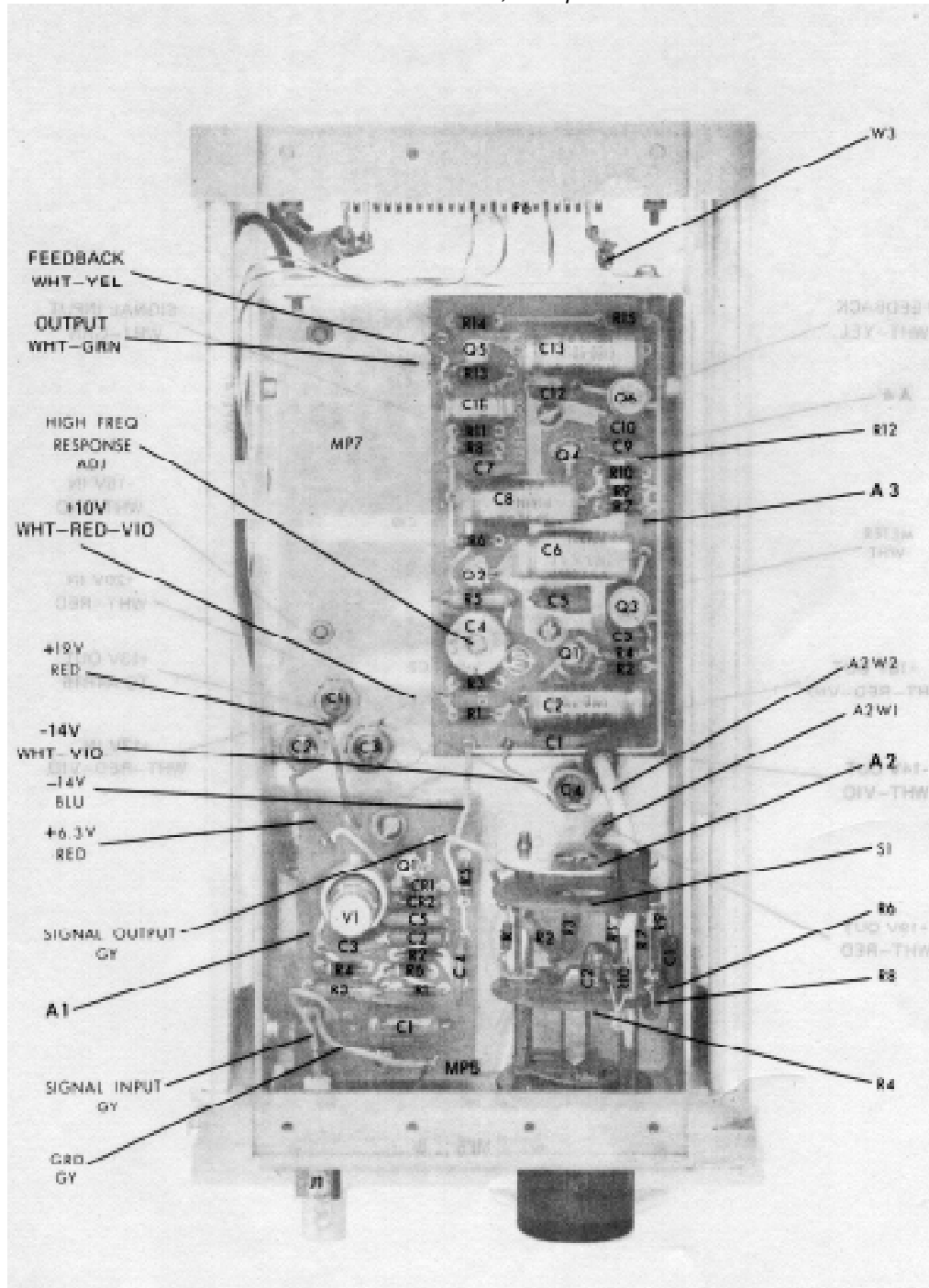
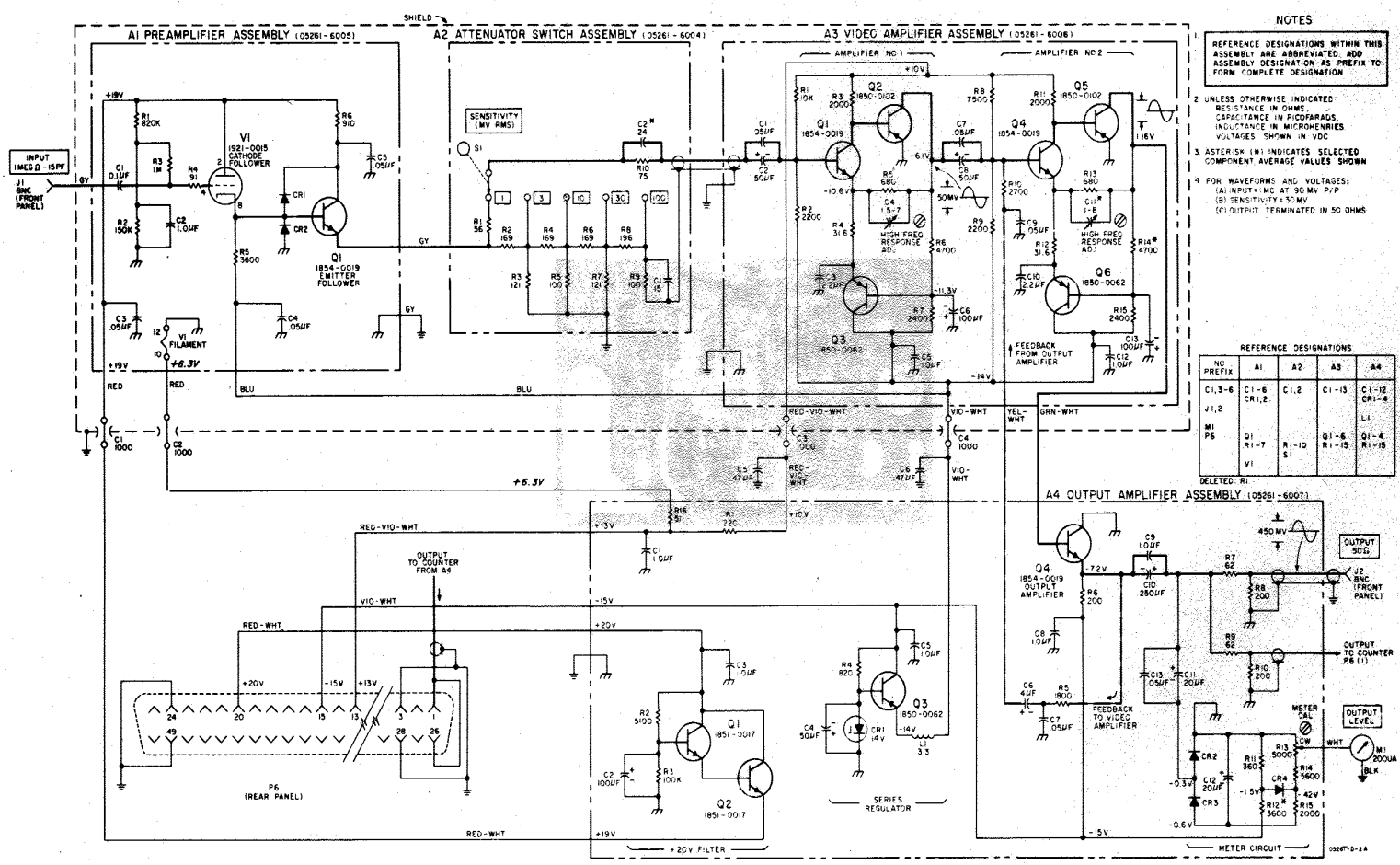


FIGURE A-2. Bottom View, Component Location



E-5



NOTES
 REFERENCE DESIGNATIONS WITHIN THIS ASSEMBLY ARE ABBREVIATED. ADD ASSEMBLY DESIGNATION AS PREFIX TO FORM COMPLETE DESIGNATION

- UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS; CAPACITANCE IN PICOFARADS; INDUCTANCE IN MICROHENRIES. VOLTAGES SHOWN IN VDC.
- ASTERISK (*) INDICATES SELECTED COMPONENT AVERAGE VALUES SHOWN.
- FOR WAVEFORMS AND VOLTAGES: (A) INPUT = 1 MC AT 90 MV P/P; (B) SENSITIVITY = 50 MV; (C) OUTPUT TERMINATED IN 50 OHMS.

REFERENCE DESIGNATIONS

NO. PREFIX	A1	A2	A3	A4
C1, 3-6	C1-6	C1, 2	C1-13	C1-12, C1-14
V1, 2	CR1, 2			L1
M1, P6	Q1, R1-7, VI	R1-10, S1	Q1-6, Q1-15	Q1-4, Q1-13, R1-13
				DELETED: R1

FIGURE A-3. Video Amplifier Schematic

FIGURE A-4. A1 Preamplifier, Component Location

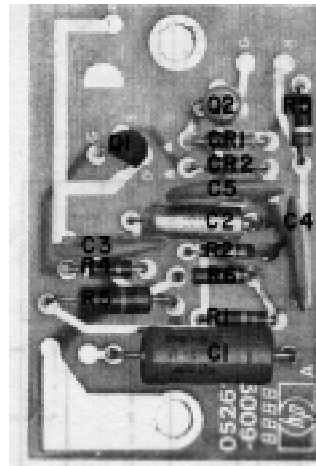
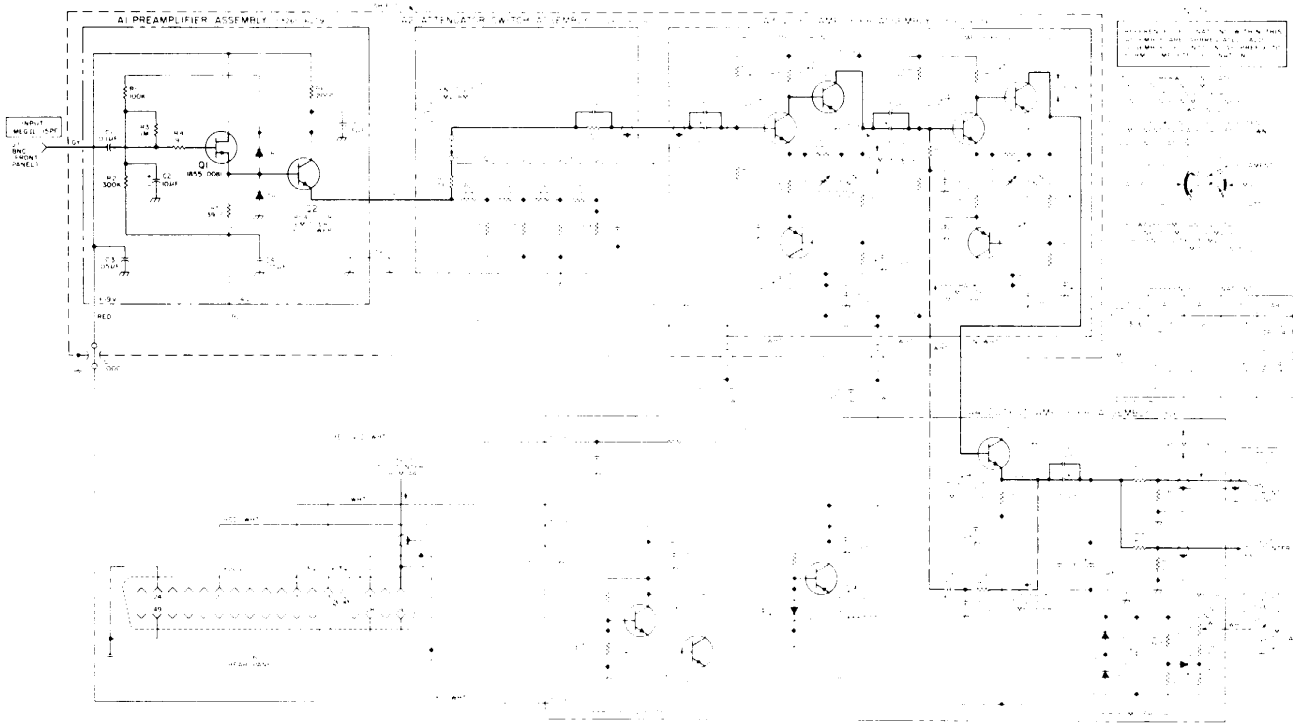


FIGURE A-5. Video Amplifier Schematic



HEWLETT-PACKARD ELECTRONIC INSTRUMENTATION SALES AND SERVICE UNITED STATES, CENTRAL AND SOUTH AMERICA, CANADA

UNITED STATES

ALABAMA
4701 Whitehurst Drive SE
P.O. Box 11317
Huntsville 35891
Tel: 205-881-4561
TWX: 810-728-2274

ARIZONA
2300 E. McDowell St.
Phoenix 85012
Tel: 602-254-1331
TWX: 401-851-1330

5707 East McDowell
Tucson 85712
Tel: 602-248-2411
TWX: 402-442-1150

890 N. W. Ave. 15-1073
1202 East Alhambra Rd.
Tucson 85718
Tel: 401-844-2660

CALIFORNIA
1347 East Orangeville Ave.
Fullerton 92641
Tel: 714-470-1100
TWX: 401-511-1204

1445 Sankerst Pl.
North Hollywood 91601
Tel: 213-477-5200
TWX: 402-574-2151

4045 Avenida Elca
Los Angeles 90027
Tel: 213-479-2571
TWX: 401-348-0248

1200 Los Angeles Blvd.
Los Angeles 90026
Tel: 213-479-2571
TWX: 401-348-0248

2101 Los Angeles Blvd.
Pico Alto 90061
Tel: 213-377-4541
TWX: 401-374-1220

1220 West Ave.
Sacramento 95811
Tel: 916-542-1341
TWX: 916-361-2092

5000 Aero Drive
P.O. Box 243443
San Diego 92124
Tel: 619-274-3100
TWX: 914-335-2000

COLORADO
7845 East Front Ave.
Englewood 80121
Tel: 303-750-3241
TWX: 401-449-1500

CONNECTICUT
22 John Drive
New Haven 06511
Tel: 203-340-9581
TWX: 310-345-2124

FLORIDA
P.O. Box 10111
7426 W. Oakland Park Blvd.
Ft. Lauderdale 33307
Tel: 305-730-2100
TWX: 510-555-4094

P.O. Box 13941
1277 Lake Elyria Dr.
Orlando 32816
Tel: 407-844-2941
TWX: 810-451-1114

GEORGIA
P.O. Box 28234
450 Interstate North
Atlanta 30326
Tel: 404-436-6181
TWX: 810-756-4840

HAWAII
7675 S. King Street
Honolulu 96811
Tel: 808-948-1100
TWX: 401-723-1800

ILLINOIS
2510 Howard Street
Joliet 60432
Tel: 312-741-1400
TWX: 401-723-1800

INDIANA
1944 Lakes Drive
Indianapolis 46205
Tel: 317-548-4891
TWX: 401-841-3760

LOUISIANA
P.O. Box 441
3339 Williams Boulevard
Kenner 70122
Tel: 504-721-6211
TWX: 810-555-5524

MARYLAND
470 Whitehurst Road
Baltimore 21202
Tel: 301-928-5400
TWX: 710-461-0251

2100 Centre Valley Blvd.
Germantown 21047
Tel: 301-308-1100

P.O. Box 3524
2 Dunbar Circle, Ridge
Rockville 20841
Tel: 301-254-9370
TWX: 710-828-9880

MASSACHUSETTS
22 Market Ave.
Lexington 02173
Tel: 617-461-8661
TWX: 510-265-9800

MICHIGAN
12455 Woodward Drive
Farmington 48124
Tel: 517-476-4200
TWX: 810-242-2000

MINNESOTA
2545 Minneapolis Avenue
St. Paul 55112
Tel: 512-445-9481
TWX: 510-563-3734

MISSOURI
11141 W. Sprague Ave.
Kansas City 64131
Tel: 816-763-8500
TWX: 401-701-2761

24 West Parkway
Maryland Heights 63043
Tel: 314-986-1051
TWX: 914-742-0831

***NEVADA**
Las Vegas
Tel: 702-382-5777

NEW JERSEY
P.O. Box 112
Cherry Hill 08012
Tel: 609-487-4000
TWX: 710-892-4348

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