Errata

Title & Document Type: **183C and 183D Oscilloscope Operating and Service Manual**

Manual Part Number: **00183-90903**

Revision Date: **January 1971**

About this Manual

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

HP References in this Manual

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

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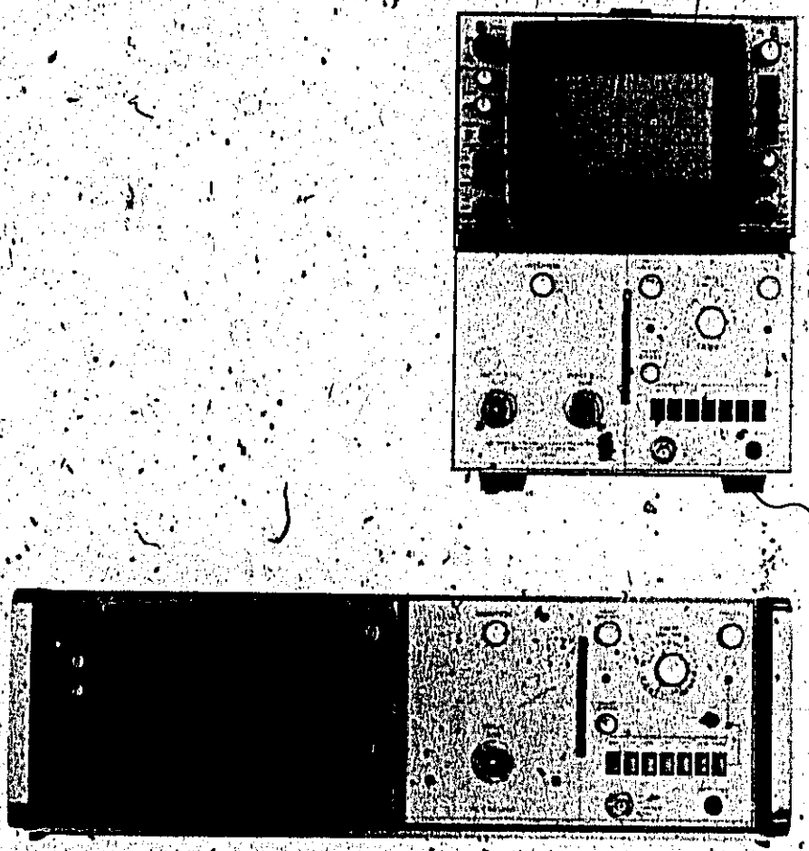
Agilent Technologies

HP183C/D

OPERATING AND SERVICE MANUAL

OSCILLOSCOPE

183C/D



HEWLETT hp PACKARD

HP183C/D

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.

WARRANTY AND ASSISTANCE

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

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

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

OPERATING AND SERVICE MANUAL

MODEL 183C/D OSCILLOSCOPE

SERIALS PREFIXED: 992–

Refer to Section VII for instruments with the following standard options: **011,020.**

HEWLETT-PACKARD COMPANY/COLORADO SPRINGS DIVISION
1900 GARDEN OF THE GODS ROAD, COLORADO SPRINGS, COLORADO, U.S.A.

Manual Part Number 00183-90903
Microfiche Part Number 00183-90803

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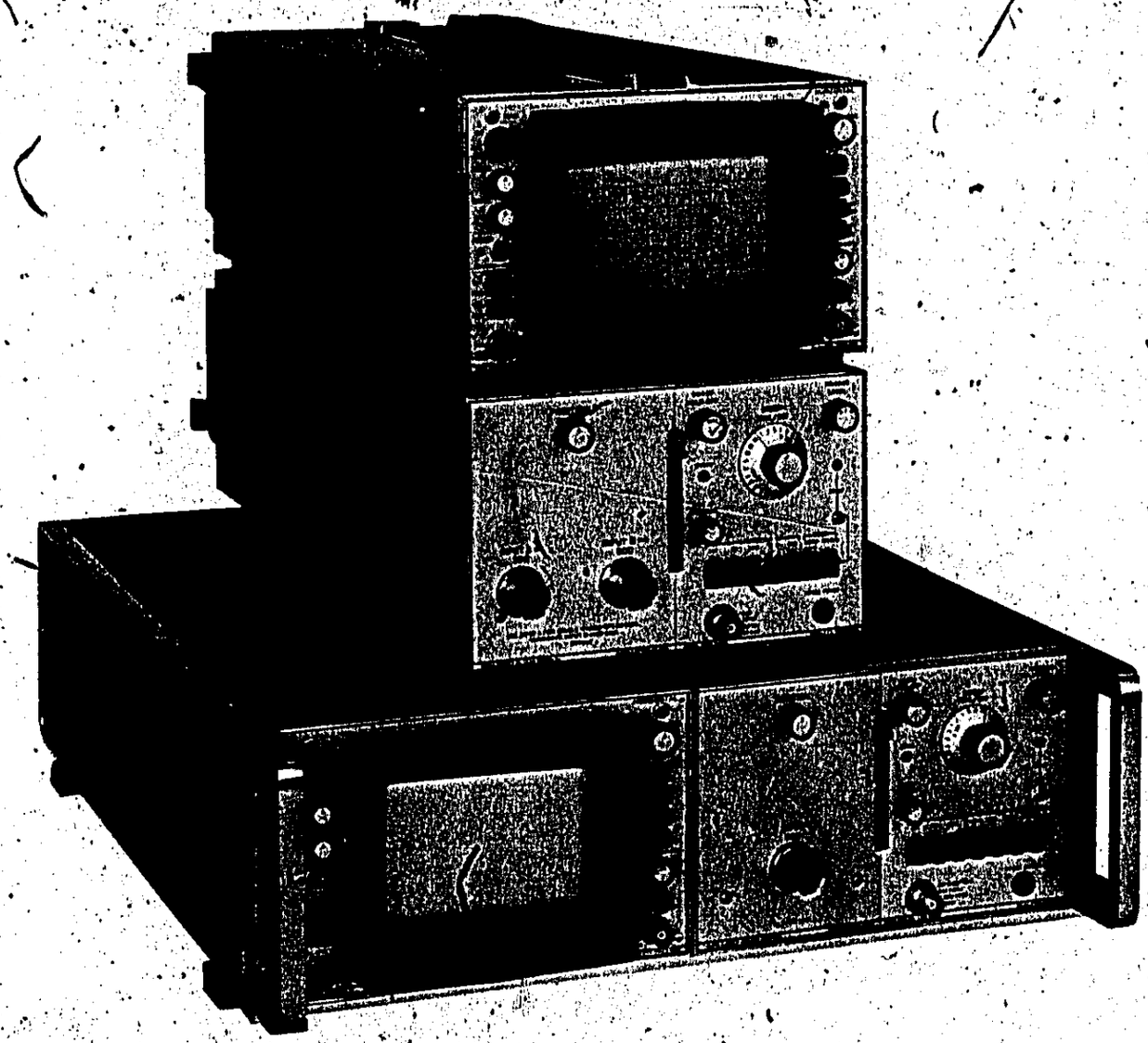


Figure 1-1. Model 183C and 183D Oscilloscope

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This manual provides operating and servicing information for the Hewlett-Packard Models 183C and 183D Oscilloscopes (Figure 1-1). The manual is divided into eight sections, each covering a specific topic or aspect of the instrument. All schematics are located at the rear of the manual and can be unfolded and used for reference while reading any part of the manual.

NOTE

Throughout the text of this manual the Hewlett-Packard Models 183C and 183D Oscilloscopes shall be called Model 183C/D.

1-3. This section contains a description of the Model 183C/D. The instrument specifications are listed in Table 1-1. Table 1-2 lists and describes the abbreviations used in this manual except Section VI. The parts list is a computer read out and uses computer abbreviations. Warranty information, data for manual and instrument identification and special accessories available for this instrument are described in this section.

1-4. DESCRIPTION.

1-5. The Model 183C/D is a laboratory oscilloscope that uses plug-ins. Both models are intended for bench use, but the Model 183D may be rack mounted as described in Section II.

1-6. The Model 183C/D has a calibrator and power supplies built-in. The basic Model 183C/D is designed for operation from dc to beyond 600 MHz with real-time display. Various plug-in time bases, vertical amplifiers, sampling plug-ins and time-domain reflectometers provide increased versatility. Provision has been made for a reduced scanning feature that increases writing speed.

1-7. All active components in the Model 183C/D are solid state, except the cathode-ray tube. The instrument and plug-ins are cooled by a built-in blower.

1-8. BNC connectors are used for external connections. Outputs include main and delayed gate signals and calibrator. Inputs for horizontal signal, external calibrator drive signals, intensity modulation (Z-axis input) and external sweep reset are provided.

1-9. The Model 183C/D is equipped for high-speed photography (camera available separately). The internal graticule illumination includes a pulsed floodgun mode to light the CRT phosphor and greatly increase the effective sensitivity of high-speed, self-developing films.

1-10. A calibrator provides signals with a risetime of less than 1 nanosecond and less than ±3% overshoot and ringing. The 1 MHz and 2 kHz calibrator signals have controlled amplitude and pulse width to provide calibration for both the mainframe and plug-ins units. The calibrator may be used as a pulse shaper with less than 1 nanosecond risetime and with the period and pulse width controlled by external input signals.

1-11. CATHODE-RAY TUBE.

1-12. The standard CRT used in the Model 183C/D has aluminized P31 phosphor, an internal graticule to eliminate parallax, and a non-glare safety faceplate. The post accelerator has been divided into two segments, each with it's own terminal, to permit reduced scanning. The center five centimeters (vertical and horizontal) have been divided into 1/2 centimeter sections. This permits voltage per division and time per division to be the same in full or reduced scanning even though the size of the divisions are different.

1-13. WARRANTY.

1-14. This instrument is warranted as stated on the inside front cover of this manual. The CRT is covered by a warranty separate from the rest of the instrument. The CRT warranty and warranty claim forms are located at the rear of this manual. Should the CRT fail within the time specified on the warranty, return the CRT with the warranty form completed. All correspondence with a Hewlett-Packard Sales/Service Office concerning an instrument should reference the complete serial number, model number and name of the instrument.

1-15. ACCESSORIES.

1-16. The Model 183C/D is equipped with a mesh-contrast filter and a reduced scan mask. The filter and mask snap into place under the light shield. The contrast filter provides greater contrast in high ambient light. The mask blanks out the unused outer areas of the CRT when operating in the reduced scan mode. A detachable power cord is supplied with each instrument. The Model 183D is supplied with all parts and hardware for rack mounting.

1-17. AVAILABLE ACCESSORIES.

1-18. A series of mobile test stands are available for both models. The Model 1118A is a portable, tripod testmobile

intended for use with the cabinet model and provides adjustable height, tilt, and rotation. Model 1119A/B Testmobiles with Model 10479A Tilt Tray are intended for use with the rack model. The Model 1119C/D Testmobiles are intended for use with the cabinet model.

1-19. HP Model 10166A is a fiberglass cover that provides front-panel protection for the cabinet model. HP Part No. 5060-0437 provides front-panel protection for the rack model. Cameras, probes, viewing hoods, dust covers, and other accessories are available for specialized requirements. Refer to the latest Hewlett-Packard Catalog for more information on accessories.

1-20. INSTRUMENT AND MANUAL IDENTIFICATION.

1-21. This manual applies directly to Model 183C/D instruments with a serial prefix number as listed on the title page. The serial prefix number is the first group of digits in the instrument serial number (Figure 1-2). The instrument serial number is on a tag located on the rear panel.

1-22. Check the serial prefix number of the instrument. If the serial prefix number is different from that listed on the title page of this manual, refer to Section VII for coverage.

1-23. Corrections to errors in the manual are listed under errata on an enclosed MANUAL CHANGES sheet (if any).

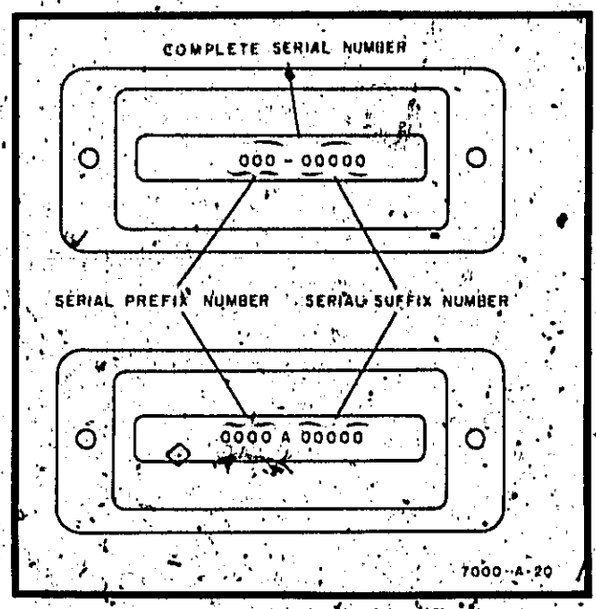


Figure 1-2. Serial Prefix Identification

1-24. INQUIRIES.

1-25. Refer any questions regarding the manual, the change sheet, or the instrument to the nearest HP Sales/Service Office. Always identify the instrument by model number, complete name, and complete serial number in all correspondence. Refer to the inside rear cover of this manual for a world-wide listing of HP Sales/Service Offices.

Table 1-1. Specifications

HORIZONTAL AMPLIFIER

EXTERNAL INPUT

Bandwidth: dc-coupled, dc to 8 MHz; ac-coupled, 2 Hz to 8 MHz.

Deflection Factor: 1 V/div. X1; 100 mV/div, X10; accuracy, ±5%. Vernier provides continuous adjustment between ranges and extends deflection factor to at least 10 V/div.

Dynamic Range: ±20V.

Maximum Input: ±350V (dc + peak ac).

Input RC: approx 1 megohm shunted by approx 20 pF.

INTERNAL SWEEP

Magnifier: X10; accuracy, ±5%.

Outputs: two rear panel emitter follower outputs for main or delayed gates (vertical or horizontal outputs when used with sampling plug-ins). Output amplitude is approx 0.75V with 1840A time base plug-in. Will drive impedances > 1000 ohms without distortion.

CALIBRATOR

PULSE TIMING

Mode 1: 2 kHz rep-rate (0.5 ms period), pulse width 50 usec.

Mode 2: 1 MHz rep-rate (1 usec period), pulse width 100 ns.

Accuracy (mode 1 and mode 2): ±0.5%, +10°C to +40°C; ±1%, 0°C to 55°C.

AMPLITUDE: selectable 50 mV or 500 mV, ±1% into 50 ohms ±0.5%.

SOURCE: 50 ohms, nominal.

PULSE SHAPE (Measured with 1 GHz bandwidth sampler.)

Risetime (neg): < 1 ns.

Overshoot and Ringing: ±3% max.

Flatness: ±0.5% after 5 ns with pulse top and base line perturbations averaged.

Table 1-1. Specifications (Cont'd)

EXTERNAL CALIBRATOR INPUT: calibrator shaping network shapes an external negative input that exceeds –0.5V peak. Rep-rate extends to > 10 MHz. Input R, approx 10k ohms. Rear panel input selected with rear panel switch and front panel light indicates when switched to external position.

CATHODE-RAY TUBE AND CONTROLS

TYPE: Post-accelerator 20 kV accelerating potential; aluminized P31 phosphor (refer to options for other phosphors); safety glass faceplate.

WRITING SPEED: (with 10,000 ASA film, P31 phosphor, f/1.3 lens, 1:0.5 object-to-image ratio, and pulsed flood gun fogging) normal scan, > 4 cm/ns; reduced scan, > 8 cm/ns.

GRATICULE: normal scan, 6 x 10 division internal graticule; 0.2 subdivisions on major horizontal and vertical axes, 1 div = 1 cm; reduced scan, 6 x 10 division internal graticule (1 div = 0.6 cm) superimposed in center of normal scan graticule.

FLOOD GUN: illuminates CRT phosphor. Normal or pulsed mode of operation selected with rear panel switch. Scale control adjusts graticule illumination and pulsed mode which increases photographic writing speed.

BEAM FINDER: returns trace to CRT screen regardless of setting of horizontal or vertical controls.

INTENSITY MODULATION: approx +2V, 50 ns pulse width (≤ 15 MHz CW) blanks trace of normal intensity. Input R, 4700 ohms. +15V blanks trace of any intensity.

GENERAL

WEIGHT (without plug-ins)
Model 183C (cabinet): net, 33 lb (15,0 kg); shipping, 46 lb (20,9 kg).
Model 183D (rack): net, 35 lb (15,9 kg); shipping, 48 lb (21,8 kg).

ENVIRONMENT: Mainframe operates within specifications over the following ranges.
Temperature: 0°C to 55°C.
Humidity: 95% relative humidity to 40°C.
Altitude: To 15,000 ft.
Vibration: vibrated in three planes for 15 minutes each with 0.010 inch excursion, 10 to 55 Hz.

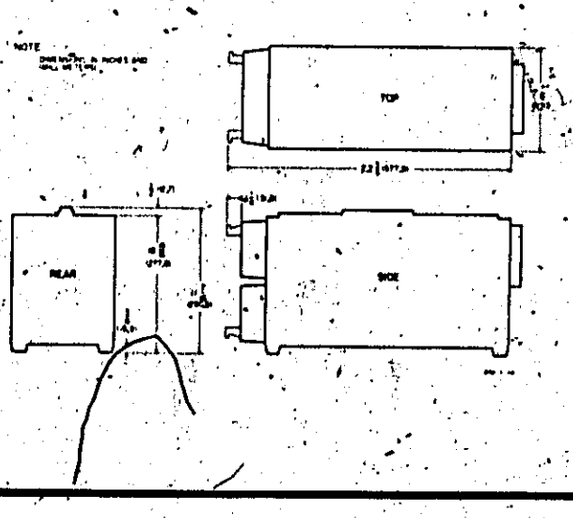
POWER: 115 or 230V ±10%, 48 to 440 Hz. Approx 115 watts with 1830A and 1840A plug-ins at 115V and 60 Hz. Maximum mainframe power at normal line, 155 watts.

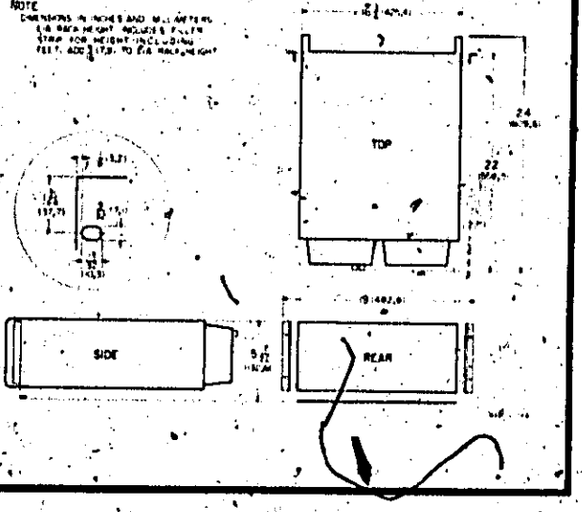
ACCESSORIES FURNISHED: Model 10179A mesh contrast filter. Rack mounting hardware and two probe holders (HP Part No. 5050-0464) are also supplied with the 183D.

OPTIONS (order by option number).

011: R11 aluminized phosphor in lieu of P31.

DIMENSIONS: cabinet (Model 183C), 7-7/8" wide, 11-3/8" high, 22-3/4" deep behind front panel (200 x 298 x 578 mm); rack (Model 183D), see outline drawing.





REFERENCE DESIGNATORS

A	= assembly	E	= misc. electrical part	P	= plug	U	= integrated circuit (unrepairable)
AT	= attenuator, resistive termination	F	= fuse	PS	= power supply	V	= vacuum tube, neon bulb, photocell, etc.
B	= motor, fan	FL	= filter	Q	= transistor	VR	= voltage regulator (diode)
BT	= battery	H	= hardware	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	Z	= network
DL	= delay line	LS	= speaker	TB	= terminal board		
DS	= device signaling (lamp)	M	= meter	TP	= test point		

ABBREVIATIONS

A	= ampere(s)	FET	= field-effect transistor(s)	n	= nano (10^{-9})	rfi	= radio frequency interference
ampl	= amplifier(s)			nc	= normally closed	rms	= root mean square
Assy	= assembly			no.	= normally open	rwv	= reverse working voltage
amplitd	= amplitude			npn	= negative-positive-negative		
		G	= giga (10^{9})			SCR	= silicon controlled rectifier
bd	= board(s)	gnd	= ground(ed)	ns	= nanosecond	sec	= second(s)
bp	= bandpass					std	= standard
		H	= henry(ies)	p	= pico (10^{-12})		
c	= centi (10^{-2})	hr	= hour(s)	pc	= printed (etched) circuit(s)	trmr	= trimmer
C	= carbon	HP	= Hewlett-Packard				
ccw	= counterclockwise	Hz	= hertz	pk	= peak	u	= micro (10^{-6})
coax.	= coaxial			pnp	= positive-negative-positive	usec	= microsecond
coef	= coefficient	If.	= intermediate freq.	p/o	= part of		
com	= common	intl	= internal	p-p	= peak-to-peak	V	= volts
CRT	= cathode-ray tube			prgm	= program	var	= variable
cw	= clockwise	k	= kilo (10^{3})	prv	= peak inverse voltage(s)		
						w/	= with
d	= deci (10^{-1})	lb	= pound(s)	ps	= picosecond	w/o	= without
dB	= decibel	lpf	= low-pass filter(s)			wiv	= working inverse voltage
				pwv	= peak working voltage		
ext	= external	m	= milli (10^{-3})				
		M	= mega (10^{6})	rf	= radio frequency		
F	= farad(s)	ms	= millisecond				

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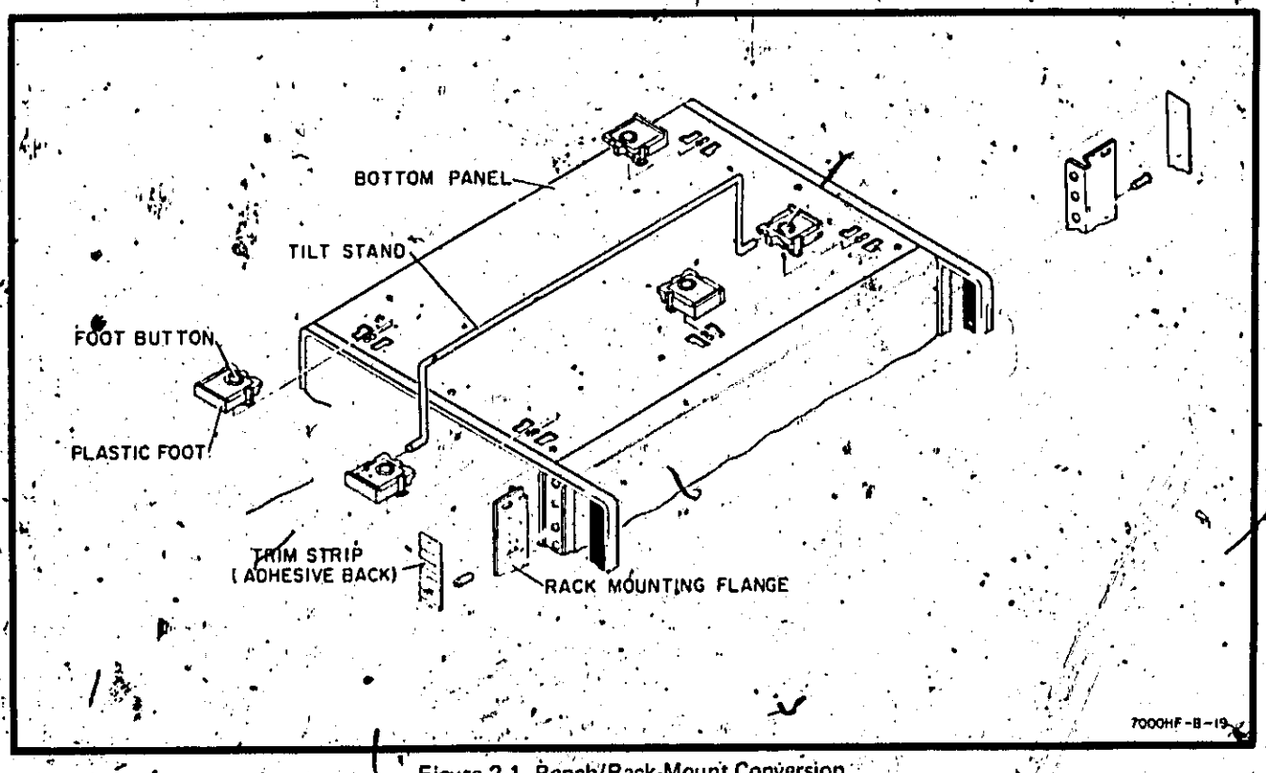


Figure 2-1. Bench/Rack-Mount Conversion.

INSTALLATION

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains instructions for performing an initial inspection of the Model 183C/D. Installation procedures and precautions are presented in step-by-step order. The procedures for making a claim for warranty repairs and for repacking the instrument for shipment are also described in this section.

2-3. INITIAL INSPECTION.

2-4. The instrument was inspected mechanically and electrically before shipment. Upon receipt, inspect it for damage that may have occurred in transit. Check for broken knobs, bent or broken connectors, and dents or scratches. If damage is found, refer to the claims paragraph in this section. Retain the packing material for possible future use.

2-5. Check the electrical performance of the instrument immediately after receipt. Refer to Section V for the performance check procedure. The performance check will determine whether or not the instrument is operating within the specifications listed in Table 1-1. Initial performance and accuracy of the instrument are certified as stated on the inside front cover of this manual. If the instrument does not operate as specified, refer to the claims paragraph in this section.

2-6. PREPARATION FOR USE.

2-7. POWER REQUIREMENTS.

2-8. As shipped, the Model 183C/D operates on either a 115-volt or a 230-volt, 10%, single phase, 50 to 400 Hz power source capable of delivering 155 watts. The instrument can also be operated on two other voltage ranges of two voltages each: 100 volts and 200 volts, or 125 volts and 250 volts, 10%. To operate on these ranges the power transformer must be rewired as shown on schematic 7.

CAUTION

Before applying power, check the rear-panel VOLTS AC switch for proper position (115 or 230).

2-9. 115V OPERATION. This instrument is shipped from the factory for 115-Vac operation. Refer to the following paragraph for 230-Vac operation.

2-10. 230V OPERATION. To operate the instrument on 230 Vac, set the rear-panel VOLTS AC switch to 230. It is not necessary to change the 1.15V fuse. The VOLTS AC switch selects the proper fuse for the desired voltage.

2-11 THREE-CONDUCTOR POWER CABLE.

2-12. For the protection of operating personnel, Hewlett-Packard Company recommends that the instrument panel and cabinet be grounded. This instrument is equipped with a three-conductor power cable that, when connected to an appropriate receptacle, grounds the instrument through the offset pin. To preserve this protection feature when operating from a two-contact outlet, use a three-conductor adapter, and connect the adapter wire to ground at the power outlet.

2-13. INSTRUMENT MOUNTING.

2-14. BENCH USE. As shipped, both the Model 183C and the Model 183D are intended for bench use. The Model 183D may be rack mounted as described in Paragraph 2-15.

2-15. RACK MOUNTING. A kit for converting the Model 183D to a rack mount configuration is supplied with each instrument. Instructions for making the conversion are given below. See Figure 2-1 for parts identification.

a. Detach tilt stand by pressing it away from the front feet.

b. Remove all plastic feet by pressing metal button and sliding feet free.

c. Remove aluminum trim strip from each side of instrument with a thin-blade tool.

d. Attach rack-mounting flange in space where trim strip was removed (use screws provided with kit). Large notch of flange should be positioned at bottom of instrument.

2-16. INSTRUMENT COOLING.

2-17. The Model 183C/D is cooled by a built-in blower system. A filter is located on the rear of the power supply and should be cleaned periodically (refer to Section VIII). When in use, place the oscilloscope so the air intake is not obstructed. The instrument is designed to operate at temperatures from 0° C to +55° C.

2-18. CONTRAST FILTER, REDUCED AND LIGHT SCAN MASK, SHIELD.

2-19. To remove the light shield, grasp it as shown in Figure 2-2A. Gently apply a downward pressure with the index fingers until the light shield's upper ear is free from its slot. Pull forward slightly and release. Next, grasp the light shield as shown in Figure 2-2B. Apply an upward pressure with the thumbs until the light shield's lower ear clears its slot, pull forward, and remove the light shield. Be certain to apply pressure to the inner edge of the light shield when releasing the ears in both steps above. Pressure applied to the outer edge, results in a swivel action, which may damage the ears.

2-20. A contrast filter, which also acts as an RFI shield, is located behind the light shield. Use of the filter is recommended because it provides comfortable viewing and RFI shielding. In specific cases, such as when a camera is attached, removal of the filter may be desirable. To accomplish this, remove the light shield as explained in Paragraph 2-19, slip the filter out, and replace the light shield.

2-21. A reduced scan mask is supplied and can be installed between the contrast filter and the light shield. To install, remove the light shield as explained in Paragraph 2-19, slip the mask in place and replace the light shield.

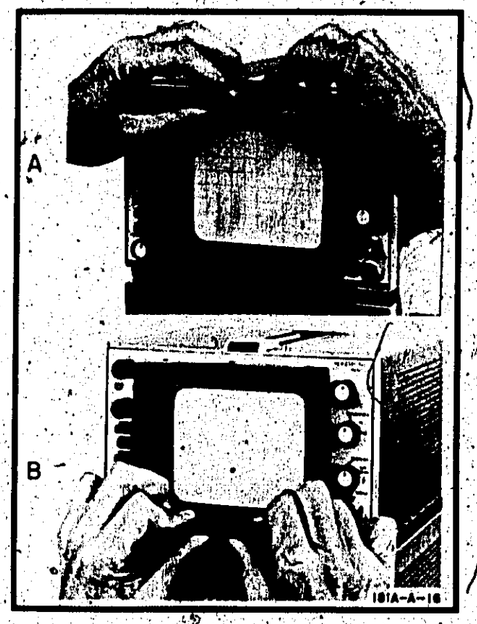


Figure 2-2. Bezel Removal

2-22. POST ACCELERATOR CONNECTIONS.

WARNING

The HVPS (high voltage power supply) and the two post accelerators can retain a dangerous charge, even when disconnected. Always use an insulated tool, such as a fuse puller, to remove post accelerator plugs from quintupler jacks. Ground the HVPS outputs and the post accelerators before touching any part or connection.

2-23. Selection of scan mode is made by connecting the rear post-accelerator lead to 17 kV for full scan or to 3.6 kV for reduced scan. The outputs from the quintupler terminate in three jacks (See Figure 2-3). J1 and J2 are side-by-side, both being 17 kV jacks. J3, the 3.6 kV jack, is located a short distance away at the apex of a triangle formed by the three jacks. The front post accelerator is always connected to J1. The rear post-accelerator connector is connected to J2 for full scan and to J3 for reduced scan.

2-24. As shipped, the 183C/D is connected for full scan. To change modes, remove the cover (left-front cover on Model 183C and bottom cover on 183D). See Figure 8-2 for location of quintupler output jacks. Grasp plug on end of lead from rear post accelerator with fuse puller. Pull plug from J2 and insert in J3. Replace cover.

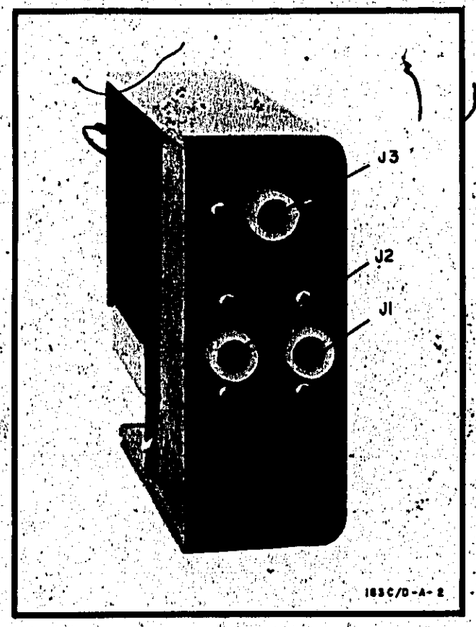


Figure 2-3. High Voltage Output Jacks.

2-25. INSTRUMENT COMPATIBILITY.

2-26. The Model 183C/D is designed to operate with any 1800-series plug-ins that have been modified or built to specifications. The following 1800-series plug-ins have been modified to meet specifications:

a. Model 1801A, serial prefixed 936– or above (for this model refer to applicable manual for interconnection).

b. Model 1802A, serial prefixed 925– or above, has been factory modified.

c. Model 1803A, serial prefixed 934– or above (for this model refer to applicable change sheet for interconnection).

d. Model 1804A, serial prefixed 936– or above (for this model refer to applicable change sheet for interconnection).

e. Model 1806A, all serial prefixes, was designed to meet specifications.

f. Model 1810A, all serial prefixes, was designed to meet specifications.

g. Model 1815A, serial prefixed 979– or above, has been factory modified.

h. The 1820 series, all serial prefixes, were designed to meet specifications.

i. The 1830 series, all serial prefixes, were designed to meet specifications.

NOTE

The 1830 series vertical amplifier were not designed to operate with the 1820 series Time Bases.

j. The 1840 series, all serial prefixes, were designed to meet specifications.

2-27. For 1800-series plug-ins with serial prefixes below those listed above, contact the nearest Hewlett-Packard Sales/Service Office for instructions. Any plug-in unit used with the Model 183C/D should be adjusted according to instructions in the applicable operating and service manual.

2-28. CLAIMS.

2-29. The warranty statement applicable to this instrument is printed inside the front cover of this manual. Refer to the rear of this manual for the CRT warranty statement. If physical damage is found, or if operation is not as specified when the instrument is received, notify the carrier and nearest Hewlett-Packard Sales/Service Office immediately (refer to the list in back of this manual for addresses). The HP Sales/Service Office will arrange for repair or replacement without waiting for settlement of the claim with the carrier.

2-30. REPACKING FOR SHIPMENT.

2-31. If the Model 183C/D is to be shipped to a Hewlett-Packard Sales/Service Office for service or repair, attach a tag showing owner (with address), complete instrument serial number, and a description of the service required.

2-32. Use the original shipping carton and packing material. If the original packing material is not available, HP Sales/Service Office will provide information and recommendations on materials to be used. Materials used for shipping an instrument normally include the following:

a. A double-walled carton; refer to Table 2-1 for test strength required.

b. Heavy paper or sheets of cardboard to protect all instrument surfaces; use a nonabrasive material such as polyurethane or cushioned paper such as Kimpak around all projecting parts.

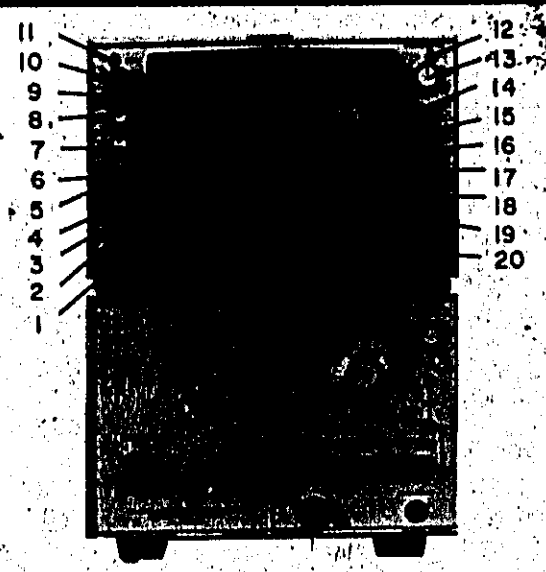
c. At least 4 inches if tightly-packed, industry-approved, shock-absorbing material such as extra-firm polyerethane foam.

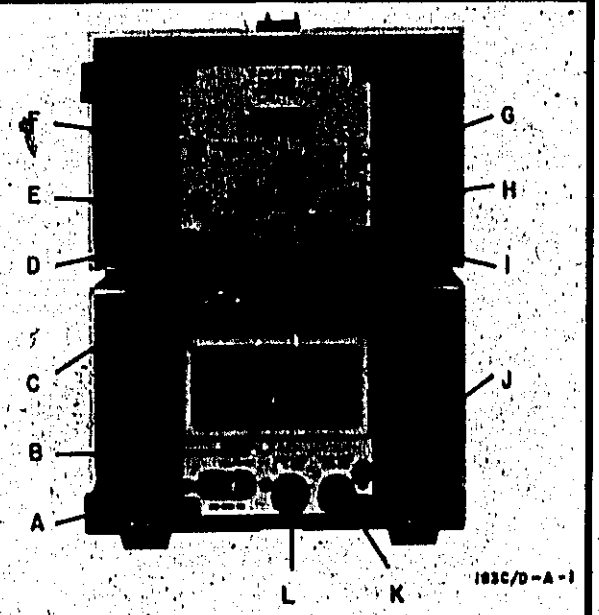
d. Heavy-duty shipping tape for securing outside of carton.

Table 2-1. Shipping Carton Test Strength

Gross Weight (lb)	Carton Test Strength (lb)
up to 10	200
10 to 30	275
30 to 120	350
120 to 140	500
140 to 160	600

OPERATION





1. CALIBRATOR OUT: Output jack for calibrator signals.
2. CALIBRATOR AMPL: Selects amplitude of calibrator output (−0.5V or −50 mV into 50-ohm Load)
3. CALIBRATOR EXT: Indicator lights when CALIBRATOR MODE switch on rear panel is in EXT position.
4. CALIBRATOR FREQ: Selects frequency of internal calibrator signal (2 kHz or 1 MHz).
5. POWER: Line power switch for turning oscilloscope on or off.
6. Power Indicator: Lights when power is on.
7. SCALE: Adjusts illumination of phosphor for contrast between graticule and background.
8. FOCUS: Controls sharpness of trace.
9. INT: Controls brightness of trace.
10. FIND BEAM: Returns display to face of CRT.
11. ASTIG: Adjusts shape of spot formed by CRT electron beam.
12. HORIZONTAL CAL: Adjusts gain of horizontal amplifier.
13. HORIZONTAL POS: Adjusts horizontal position of display.
14. HORIZONTAL X1: Selects X1 horizontal magnification.
15. HORIZONTAL X10. Selects X10 horizontal magnification.
16. HORIZONTAL INT/EXT: Horizontal display switch allows selection of internal signal, or external signal supplied to front-panel jack.
17. HORIZONTAL AC/DC: Horizontal coupling switch for ac or dc signal input.
18. HORIZONTAL EXT VERNIER: Allows vernier adjustment of external horizontal input deflection factor.
19. Ground jack connection for grounding to oscilloscope.
20. HORIZONTAL EXT INPUT: Input jack for external horizontal signals.

A. 48-440 Hz: 3-wire ac power cord input jack.
B. VOLTS AC: Input power switch for selection of 115 or 230-Vac operation.
C. EXT RESET: BNC jack for connection of external signal to reset time base trigger.
D. DEL'D GATE OUT: BNC jack provides delayed gate signal output for triggering external equipment.
E. CALIBRATOR EXT INPUT: BNC jack for input of external calibrator drive signal.
F. CALIBRATOR MODE: Selector switch for internal or external calibrator operation.
G. FLOODGUN MODE: Selects either continuous or pulsed phosphor illumination.
H. Z AXIS INPUT: BNC jack for external input to provide sweep intensification or blanking.
I. MAIN GATE OUT: BNC jack for output of main gate signal.
J. ⏚ Ground jack connection for ground to oscilloscope.
K. 230V LINE 1.5A S. B.: Line fuse for 230-Vac operation.
L. 115V LINE 3A S. B.: Line fuse for 115-Vac operation.

Figure 3-1. Front and Rear Panel Controls and Connectors.

SECTION III
OPERATION

3-1. INTRODUCTION.

3-2. This section contains an explanation of instrument operating controls, available modes of operation, triggering considerations (frequencies, amplitudes, modes), operator's checks and adjustments, and step-by-step operating instructions for most applications.

3-3. CONTROLS AND CONNECTORS.

3-4. Figure 3-1 shows the instrument front and rear panels and provides functional descriptions of the operating controls, indicators, and connectors. The following paragraphs provide detailed descriptions of controls with multiple or complex functions.

3-5. FRONT PANEL.

3-6. CALIBRATOR. Two switches and a BNC-type output jack are located on the front panel of the instrument for calibrator operation. The switches are color coded to identify positions. When the switches are out, a blue band is exposed on the pushbutton; this position corresponds to the blue lettering on the front panel of the instrument. When the switch is locked in, only the black portion of the pushbutton is visible, and the switch position corresponds to the black lettering. The CALIBRATOR FREQ switch controls the frequency (either 2 kHz or 1 MHz) of the internal multivibrators that generate the calibration signal. The CALIBRATOR AMPL switch controls the amplitude (−0.5V or −50 mV) of the calibration signal. The panel markings for the CALIBRATOR AMPL switch represent the amplitude of the calibrator output signal when it is terminated into a 50-ohm ±0.5% load. If the calibrator output is terminated into a high impedance, the amplitude is double (−1.0 or −0.1 volt) the 50-ohm load output. An indicator light labeled EXT lights when the CALIBRATOR MODE switch is in the EXT position. When the lamp is lit, the internal multivibrators are disabled.

3-7. SCALE. The SCALE control performs different functions, depending on the position of the FLOODGUN MODE switch (rear panel). With the FLOODGUN MODE switch in NORM position, the SCALE control is used to adjust the overall intensity contrast between the CRT background and the graticule. With the FLOODGUN MODE switch in PULSED position, the floodgun is turned on at the termination of each sweep. The duration of the floodgun pulse is determined by the SCALE control in this mode. In the OFF position of the SCALE control the floodgun is turned off regardless of FLOODGUN MODE switch setting.

3-8. FOCUS AND ASTIG. These controls are used to obtain the sharpest display. Once set, the ASTIG normally will not need to be readjusted. If the vertical amplifier plug-in is changed, readjust the ASTIG for optimum display.

3-9. FIND BEAM. Input signals with large dc components may deflect the trace off the face of the CRT. Pressing the FIND BEAM switch will return the trace to the viewing area. By noting the position of the trace when the FIND BEAM switch is pressed, the operator can adjust the horizontal and vertical position controls to compensate for the offsetting voltage. The FIND BEAM switch unblanks the CRT and reduces the gain of the horizontal and vertical amplifiers to allow the presentation to appear on screen. (FIND BEAM unblanking may be disconnected on sensitive phosphors). Refer to Section VIII.

3-10. INT. The intensity control adjusts the brightness of the trace. Normal usage is the position that gives the most comfortable viewing. The intensity has a degrading effect on the sharpness of the display if turned up too high.

CAUTION

To avoid burning CRT phosphor, use only enough intensity to provide comfortable viewing. When the instrument is not in use, rotate the INT control maximum counterclockwise.

3-11. HORIZONTAL X1 AND X10. These switches select either X1 or X10 sweep magnification by inserting a precision 10:1 attenuator in, or removing it from, the horizontal amplifier input.

3-12. HORIZONTAL INT/EXT. This switch selects the input signal that is applied to the horizontal amplifier. In the INT position, the input signal to the horizontal amplifier is taken from the time base plug-in. In the EXT position, the input from the time base plug-in is disabled and the input to the horizontal amplifier is provided through the HORIZONTAL EXT INPUT jack on the front panel. The impedance at the jack is determined by the internal NORM/CAL switch.

3-13. HORIZONTAL AC/DC. This coupling switch is used to select either ac coupling (capacitive coupled) between the HORIZONTAL EXT INPUT jack and the horizontal amplifier for alternating voltages or dc coupling for direct-current voltage. The switch is color coded to correspond to the front-panel markings.

3-14. HORIZONTAL EXT VERNIER. The HORIZONTAL EXT VERNIER control is used for continuous adjustment of the external horizontal input signal deflection factor. When the vernier is in the maximum clockwise position (detent), the horizontal amplifier is calibrated to provide 1.0 V/div horizontal deflection in the X1 range and 0.1 V/div in the X10 range.

3-15. REAR PANEL.

3-16. MAIN GATE OUT/DEL'D GATE OUT. The main and delayed gate signals generated by the time-base plug-in are accessible at the rear panel through BNC connectors. Both outputs are isolated by emitter follower circuits to prevent external loading. The MAIN GATE OUT jack is also used to provide X-axis recorder output when a sampling plug-in is installed. The DEL'D GATE OUT jack provides Y-axis recorder output when a sampling plug-in is used. The plug-ins used in the Model 183C/D and the control settings employed determine what output signals are available.

3-17. Z AXIS INPUT/CALIBRATOR EXT INPUT/EXT RESET. The Z AXIS INPUT jack is used to apply external intensity modulation. The input impedance is 4700 ohms, and +2 volts will blank a trace of normal intensity. The input signals may vary in frequency from dc to 15 MHz. The CALIBRATOR EXT INPUT is used to apply external signals to the calibrator circuit when the CALIBRATOR MODE switch is in the EXT position. The input signal may be any waveform that presents a −0.5-volt peak signal with a repetition rate of up to approximately 10 MHz. The external input impedance is approximately 10 kilohms for negative signals less than −12 volts. The EXT RESET jack is used to electrically reset the time base when the time base mode switch is in single sweep. External trigger arming input requires a positive 2-volt peak input with a repetition rate of ≤10 kHz and pulse width >100 nanoseconds. Other external trigger voltages must be calculated. The input resistor (located in the plug-in) is 51.1 ohm 1/8W.

3-18. INTERNAL SWITCHES.

3-19. Two switches are located on the horizontal amplifier circuit board. They are in the circuit only when the HORIZONTAL INT/EXT switch is in the EXT position. They are the bw/phase and norm/cal switches. Access to the switches is obtained by removing the upper right-hand side cover on Model 183C or the plug-ins on Model 183D.

3-20. BW/PHASE. The normal operating position of this switch is the bw position. In the phase position, when X-Y phase measurements are being made, the bandwidth of the horizontal amplifier is reduced to compensate for the signal delay in the vertical plug-in amplifier and increases the accuracy of the phase measurement. Setting the switch to the bw position restores full bandwidth.

3-21. NORM/CAL. In the cal position, the input impedance at the HORIZONTAL EXT INPUT jack J1 is 50 ohms. The calibrator output may be fed into the HORIZONTAL EXT INPUT jack to provide a calibrating signal with proper termination. The norm position places an impedance converter in the circuit that converts the input impedance of the external horizontal input to 1 megohm shunted by 25 pF to prevent loading the external signal source.

3-22. REDUCED SCAN OPERATION.

3-23. The Model 183C/D is shipped connected for full scan operation. An internal connection change is required to change to reduce scan mode. Refer to paragraphs 2-22 through 2-24 for instructions on changing scan mode.

3-24. USING THE 183C/D AS A SIGNAL SOURCE.

3-25. The CALIBRATOR OUT, MAIN GATE OUT, and DELAYED GATE OUT can be used as signal sources. The plug-ins used in the Model 183C/D and the control settings employed determine the output signals available. The following paragraphs describe the signals obtainable from these outputs.

3-26. CALIBRATOR OUT.

3-27. The calibrator in the Model 183C/D can be used as a pulse generator that provides an output pulse with less than 1 nanosecond risetime with ±3% or less overshoot and ringing. The output pulse amplitude is −0.5 or −0.05 volt into a 50-ohm load, or −1.0 or 0.1 volt into a high impedance. To use the main gate output signal as a pulse source (with time-base plug-in installed), connect a short cable from MAIN GATE OUT to the CALIBRATOR EXT INPUT, and set the CALIBRATOR MODE switch to the EXT position. The period of the pulse is set with the time/div selector of the time base and adjusted between ranges with time base sweep hold off control. The pulse width is adjusted with the time base sweep vernier control.

3-28. Keep the output cable length as short as possible to preserve the pulse characteristics. Check the pulse by feeding the signal into the vertical plug-in input. If the pulse characteristics are impaired, use a better type of coaxial cable (RG 214/u).

3-29. MAIN GATE OUT/DELAYED GATE OUT.

3-30. The MAIN GATE OUT and DELAYED GATE OUT can be used as pulse generators (with time-base plug-in installed). Either output will provide a −0.7-volt pulse with a risetime of about 25 nanoseconds. Pulse periods can be adjusted with the time base TIME/DIV selector and adjusted between ranges with the time base SWEEP HOLD OFF control. Pulse widths can be adjusted with the time base sweep vernier control.

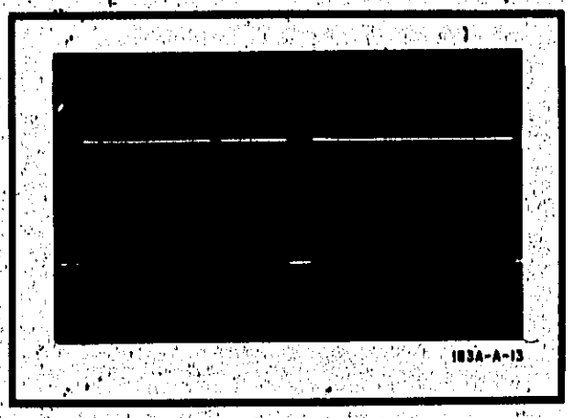


Figure 3-2. Scale Illumination, Normal Floodgun Mode.

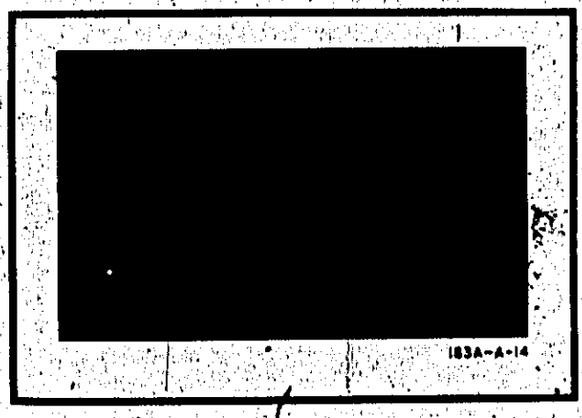


Figure 3-3. Scale Illumination, Pulsed Floodgun Mode (Transient Photography)

3-31. FLOODGUN OPERATION.

3-32. The phosphor on the 183C/D can be illuminated by an internal CRT floodgun. The floodgun has two modes of operation: normal and pulsed. Operation is selected by the FLOODGUN MODE switch. In the normal mode, scale illumination is continuous. This mode is recommended for phosphor illumination in low ambient-light viewing conditions. The normal mode may also be used for photographing repetitive signals when a graticule exposure is desired on the photograph.

3-33. The pulsed mode is used for photographing transient signals in single-sweep operation. The floodgun flash occurs during the decay period of the phosphor (at the end of the sweep). Writing speed is significantly increased by the combined effect of film post fogging and phosphor excitation. The time period for the CRT floodgun is determined by the SCALE control setting.

3-34. NORMAL FLOODGUN OPERATION (Repetitive Sweeps).

a. Set FLOODGUN MODE switch on rear panel to NORM.

b. Adjust Model 183C/D and plug-in controls for desired trace display.

c. Adjust INT and FOCUS controls for sharpest trace.

d. Adjust SCALE control for desired graticule contrast.

e. For photography, adjust trace brightness slightly above background level. Expose film using normal procedures for camera used. Shutter time and aperture should be set for a gray background as shown in Figure 3-2.

NOTE

This method exposes the graticule and displayed trace simultaneously. The internal floodgun provides scale illumination. Ultraviolet scale illumination provided by some cameras is not required and should be turned off. Slight readjustment of the INT and SCALE controls can be made to obtain the best contrast.

3-35. PULSED FLOODGUN OPERATION (Single Transient).

a. Set FLOODGUN MODE switch on rear panel to PULSED.

b. Adjust Model 183C/D and plug-in controls for desired trace display using a test signal to establish vertical sensitivity, trigger control and sweep time settings.

c. Adjust INT and FOCUS controls for sharpest trace. For best results, set these controls using a low repetition rate signal or single-shot display obtained in single-sweep while repeatedly pressing the RESET pushbutton. Trigger the time base with a repetitive signal.

d. Adjust SCALE control. Setting depends on the type of CRT phosphor, camera light-gathering characteristics, and the type of film used. A typical setting for P31 phosphor, the Model 195A Camera operated at f/1.3, and ASA 10,000 Speed Polaroid film is between 12:00 and 2:00 o'clock on the SCALE control pointer.

e. Check floodgun operation by allowing the time base to trigger in single sweep while observing the CRT screen through the camera. A brief flash should be visible.

f. Set camera controls for desired operation, usually time or bulb.

g. Open camera shutter and allow sweep to trigger. Close camera shutter and develop film.

h. Check the fog level on the film for a medium grey background as illustrated in Figure 3-3. If necessary, readjust the scale control for proper post fogging on the film. Counterclockwise rotation gives a darker background.

NOTE

The above procedure eliminates the need for separate film presensitizing, often used to improve writing speed and/or expose the CRT graticule. When using high-speed film such as ASA 10,000 Speed Polaroid type 410, allow the phosphor to decay for 1 to 2 minutes after the camera viewing hood is closed before the photograph is taken. Otherwise, residual light from the phosphor (from phosphor excitation by ambient light) will cause film over exposure with long shutter times. When photographing with large aperture openings, focus the camera carefully on the CRT phosphor plane. Consult camera operating instructions for focusing procedure.

THEORY

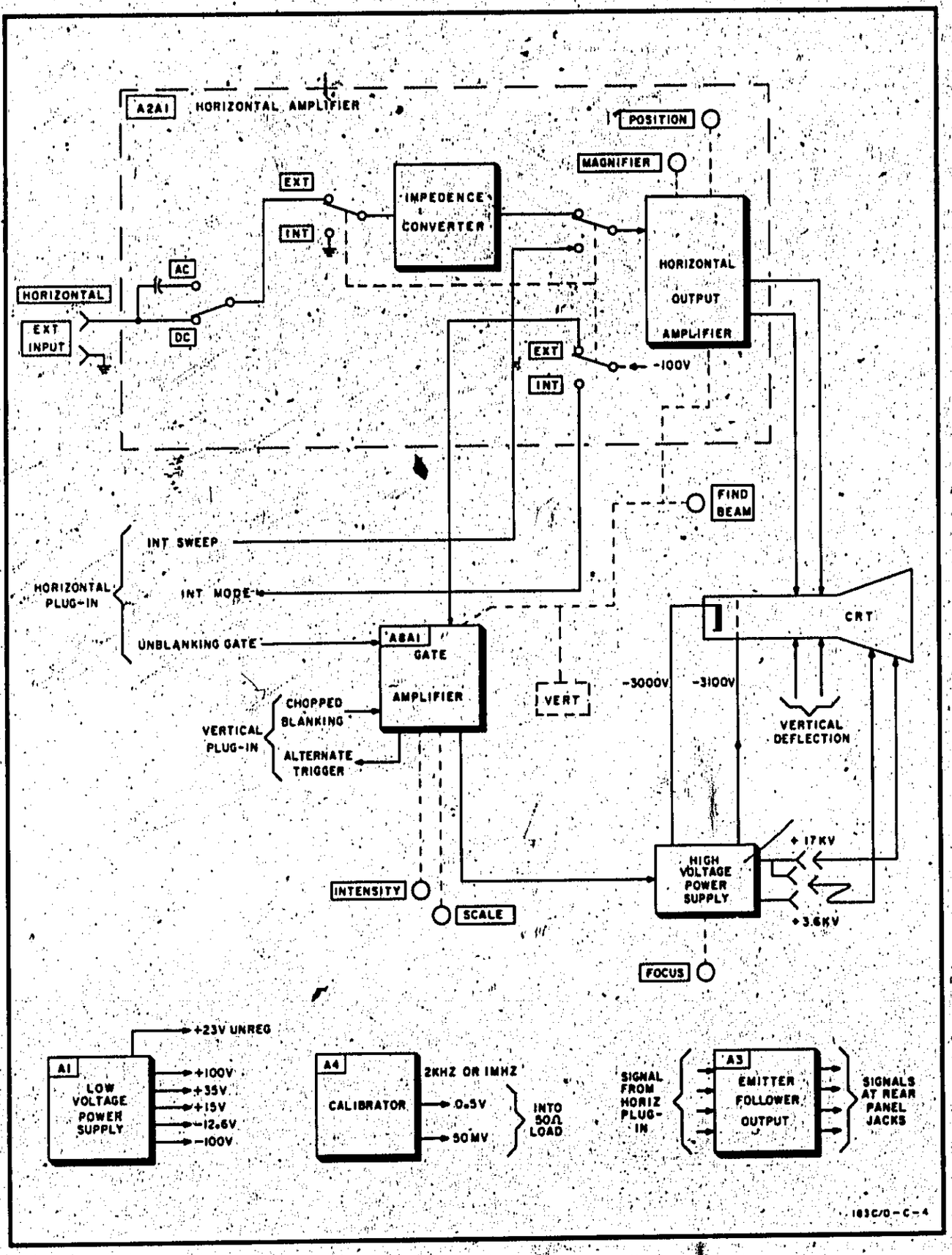


Figure 4-1. Overall Block Diagram

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. This section contains functional descriptions keyed to an overall block diagram of the Model 183C/D, and simplified block diagrams of circuit groups. A detailed explanation of circuit functions, keyed to the schematics, is provided after the block diagram discussion. The schematics are located in Section VIII.

4-3. OVERALL DESCRIPTION.

4-4. The Model 183C/D is a basic X-Y axis display oscilloscope with self-contained power supplies and calibrator. Two signal processing circuits are employed to amplify the horizontal output signals from the time-base plug-in and to intensify the trace during the sweep period. A low voltage power supply powers the horizontal signal amplifier, calibrator, gate-signal amplifier, hv regulator, and the plug-in modules. A high voltage power supply generates the potential for the CRT. Figure 4-1 is a block diagram of the overall instrument showing the various circuits of the Model 183C/D.

4-5. To obtain an X-Y display on the CRT, three signals must be supplied. The signal required for vertical deflection (Y-axis) on the CRT must be supplied from an external source, normally a plug-in vertical amplifier. The vertical deflection voltage is connected to the vertical deflection plates of the CRT and no signal processing or amplification takes place in the Model 183C/D. The horizontal (X-axis) signal is processed and amplified by the horizontal amplifier in the mainframe. The third signal (unblanking gate signal) must coincide with the horizontal signal to turn on the CRT intensity as the horizontal signal sweeps the beam across the CRT. The unblanking gate signal is processed and amplified by the gate amplifier and applied as a modulating voltage to the intensity grid of the CRT. The horizontal and gate signals may be applied to the mainframe through external input jacks from sources other than the plug-in modules.

4-6. CIRCUIT DETAILS.

4-7. LOW VOLTAGE POWER SUPPLY (LVPS).

4-8. The LVPS contains five power supplies in a module that is removable for servicing. The LVPS provides all voltages required for the Model 183C/D except the high voltages required for the CRT. A cooling blower and associated circuit are also enclosed within the module. The LVPS module is located in the bottom rear portion of the Model 183C and right rear of Model 183D.

4-9. The line power transformer has taps on the primary winding that allow operation from 100/200, 115/230 or 125/250 volts ac (all values ±10%). The transformer must be reconnected as shown on Schematic 7 if other than 115/230-volt ac operation is desired. The VOLTS AC switch connects the two primary windings of the transformer in series or parallel. The power supply will operate on ac voltages of 48 to 440 Hz.

4-10. The LVPS provides regulated outputs of +100, −100, +35, +15 and −12.6 volts dc. A separate zener-regulated output of 12.6 volts dc operates the cooling blower. The LVPS provides ac voltages of 6.3 volts for the CRT filament and 3 volts for pilot lamps and plug-in sync voltage. The block diagram (Figure 4-2) shows the interconnections between the five dc supplies. Each supply is referenced to the +100-volt supply for a constant voltage comparison. The +100-volt supply is referenced

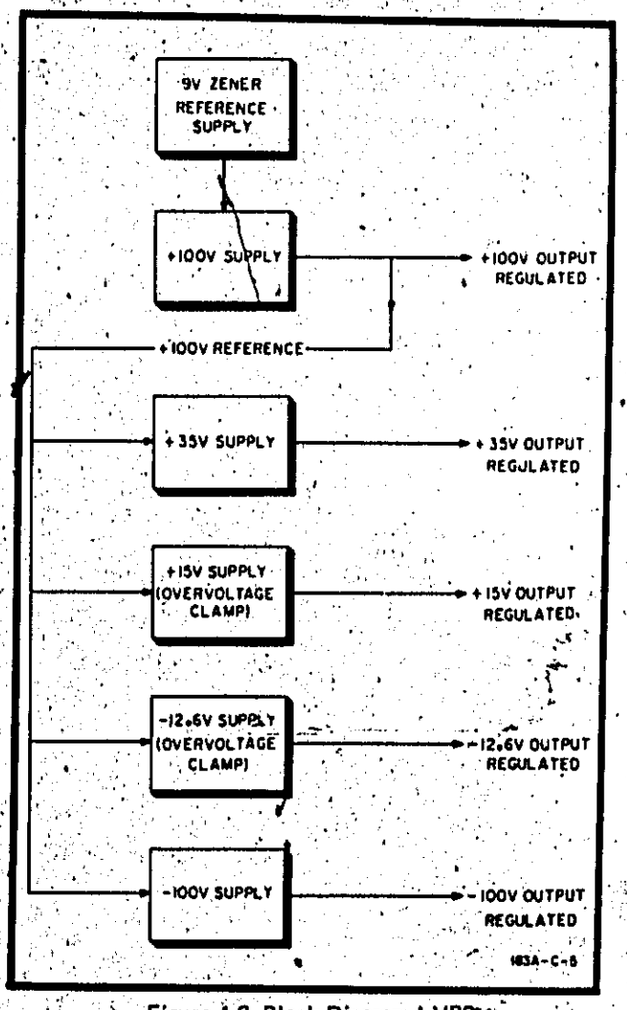


Figure 4-2. Block Diagram-LVPS.

to a temperature-compensated 9-volt zener diode. All supplies are similar to each other in regulator and current-limiting circuits.

4-11. Integrated circuits (consisting of five transistors each) are used for the differential-amplifier-comparator circuits, driver-amplifier circuits and current limiting. The +15-volt and −12.6-volt supplies use only four of the transistors in the five-transistor array and use a separate transistor to control the higher current of the series regulator.

4-12. THEORY OF OPERATION (LVPS). (See Schematic 7).

4-13. A typical low voltage power supply is shown in block diagram form in Figure 4-3. Unregulated voltage is supplied by the transformer and bridge rectifier and applied to the series regulator. The series regulator is biased on by the direct-coupled driver circuit. Voltage is supplied from the series regulator, through the current sensing circuit, to the output of the supply. Voltage at the output of the supply is compared by the differential amplifier to a voltage supplied by the +100-volt supply. The different voltage is applied to the driver circuit which controls the series regulator. Excessive current will also cause the driver transistor to limit the series regulator output. Figure 4-4 is a simplified schematic of a control circuit. Series regulator Q1 supplies all current to the output. The driver circuit, Q2 and Q3, is a Darlington amplifier that supplies the base current to Q1. The differential comparator circuit, Q4 and Q5, compares the voltage supplied from the +100-volt supply and the output voltage from voltage divider R4 and R5. Potentiometer R5 adjusts the supply output voltage. Current sensing transistor Q6 is biased by the voltage drop across R1 and voltage divider R2 and R3.

4-14. VOLTAGE REGULATION. In operation, Q1 is biased on by Q2 and Q3, and voltage is developed across R4 and R5. Base bias for Q4 is determined by the setting of R5. When the voltage at the base of Q4 increases above the voltage at the base of Q5, the collector current of Q4 increases, reducing the bias at the bases of Q2, Q3 and Q1. When the base voltage of Q1 is reduced, the

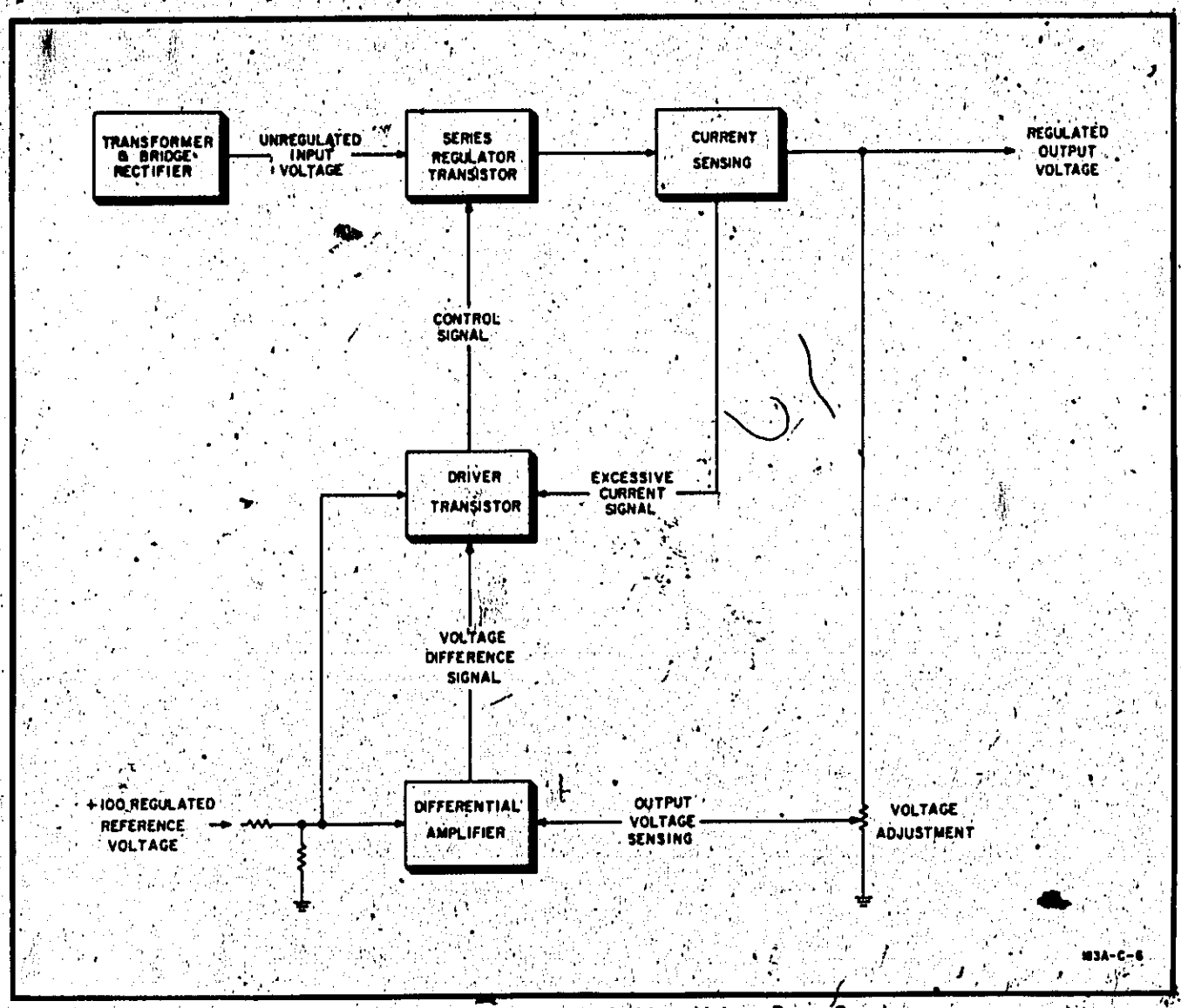


Figure 4-3. Block Diagram-Typical Low Voltage Power Supply

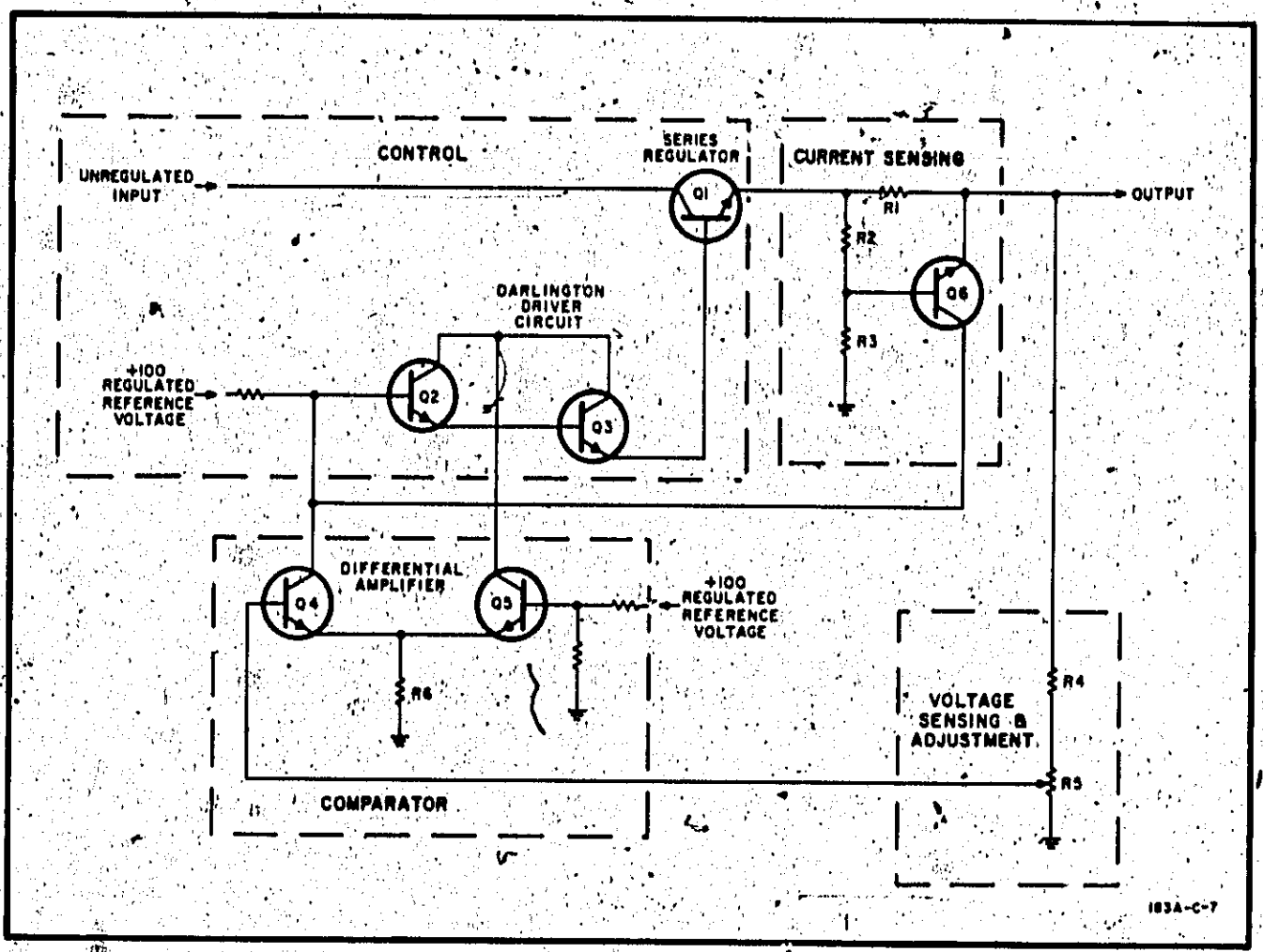


Figure 4-4. Simplified Power Supply Control Circuit

voltage output at the emitter is reduced. Lower voltage supplied to the base of Q4 will reverse the operation.

4-15. CURRENT LIMITING. Current flowing through R1 creates a voltage drop that opposes the voltage across resistor R2. When the output current increases to a level that the base-to-emitter junction of Q6 is forward biased, current limiting starts. If the load on the supply is increased after limiting has started, the voltage drop across R2 will decrease. The current required through R1 to keep Q6 turned on will be less, resulting in the current through Q1 to be folded back below the allowable power dissipation level of Q1.

4-16. CONSTANT CURRENT SOURCE (+100-volt supply). A field-effect transistor is used in the +100-volt supply to provide a constant current at the base of the Darlington driver amplifier. The field-effect transistor supplies a constant current of approximately 0.5 mA.

4-17. OVERVOLTAGE CLAMP CIRCUIT (+15-volt and −12.6-volt supplies). The +15-volt and −12.6-volt supplies have an overvoltage protection circuit incorporating a silicon controlled rectifier. The SCR is connected across the supply output to ground and, when triggered into conduction by a transient or overvoltage condition, it shorts the supply output. Gate bias and triggering voltage for the SCR are developed across a breakdown diode and resistor. When the voltage (or a transient) exceeds the avalanche voltage of the breakdown diode, the SCR is turned on and the output of the supply is shorted to ground. The SCR will keep the supply shorted until the instrument is turned off, allowing the SCR to return to the off condition.

4-18. BLOWER MOTOR CIRCUIT. The cooling blower is located in the LVPS module. The fan is driven by a permanent magnet, brushless dc motor. The motor is communtated by switching transistors instead of the conventional brush and armature system.

4-19. Hall-effect generators installed inside the motor assembly are positioned to provide sine and cosine signals. Output from the generators turns on the transistors in sequence to create a rotating flux field to drive the permanent magnet armature. Back emf developed in the motor windings is rectified and fed back for constant-speed regulation.

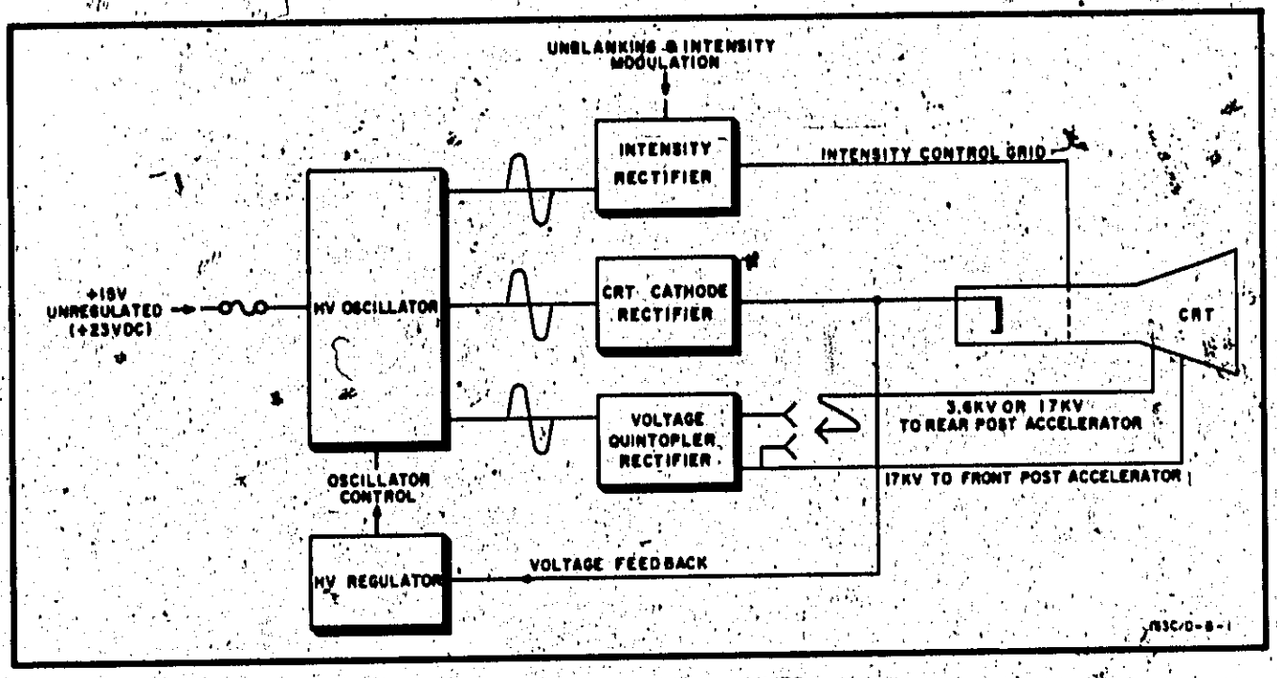


Figure 4-5. Block Diagram-HVPS

4-20. HIGH VOLTAGE POWER SUPPLY (HVPS).

4-21. Figure 4-5 is a block diagram of the HVPS which produces operating potentials for the CRT. In full scan operation, the CRT requires a 20 kv potential between anode and cathode. This requirement is satisfied when the +17 kv output of the HVPS is supplied to the post accelerators and the −3 kv output is supplied to the cathode. When the Model 183C/D is operated in the reduced scan mode, reduced acceleration of the CRT electron beam is required. This is accomplished by supplying the +17 kv output of the HVPS to the front post accelerator, the +3.6 kv output of the rear post accelerator and the −3 kv output to the cathode. In both modes, the −3.1 kv output (modulated by the output of the gate amplifier) is supplied to the CRT intensity grid.

4-22. THEORY OF OPERATION (HVPS). (See Schematic 5).

4-23. A blocking oscillator is used to generate the high voltage required for electron acceleration in the CRT. Two windings of the high voltage transformer are used for the oscillator and provide a natural frequency of 25 kHz. Voltage generated in Q2 collector winding of the transformer steps up in the secondaries and is rectified to provide the CRT voltages. The voltage in the collector winding is also coupled to the base winding as a regenerative voltage. Capacitors A7C2 and A7C3 are blocking capacitors that are charged by current source transistor A7Q1. Field-effect transistor (FET) A7Q3 senses voltage from a 30:1 voltage divider across the cathode supply output.

4-24. When power is applied to the instrument, A7Q3 is biased on by voltage supplied from the +100-volt source to the voltage divider. Current through the FET increases the base currents of A7Q2 and A7Q1, saturating them. As the collector current through A7Q1 increases, A7C2 and A7C3 begin charging. As the capacitors charge, the base of Q2 draws current and conducts heavily. As Q2 draws collector current through the transformer winding, voltage is induced back to the base of Q2, causing regeneration and a more pronounced turn on. When the current through the collector winding becomes constant, the voltage across the base winding goes to zero and Q2 turns off, causing the collector current to get to zero. Since the current is changing through the winding, the voltage reverses direction. The remainder of the cycle is completed by the emf of the transformer. Amplitude of the oscillators applied to the secondary circuit is controlled by the voltage divider and regulator which vary the dc bias applied to base of Q2.

4-25. Operating power for the HVPS is supplied from the unregulated portion of the +15-volt supply in the LVPS. The unregulated voltage is approximately +23 volts and fused with an 0.8 ampere slow-blow fuse.

4-26. A quintupler (voltage multiplier) is used to produce the +17-kilovolt output. A tap from the first multiplier section of the quintupler produces the +3.6-kilovolt output. Each capacitor stage of the quintupler stores energy during the first half-cycle of the input voltage and adds the energy to the next stage during the following half-cycle. The quintupler output is a filtered, half-wave rectified CRT voltage. Half-wave rectifier circuits are used to produce the −3000-volts for the CRT cathode and the −3100-volts for the CRT intensity grid.

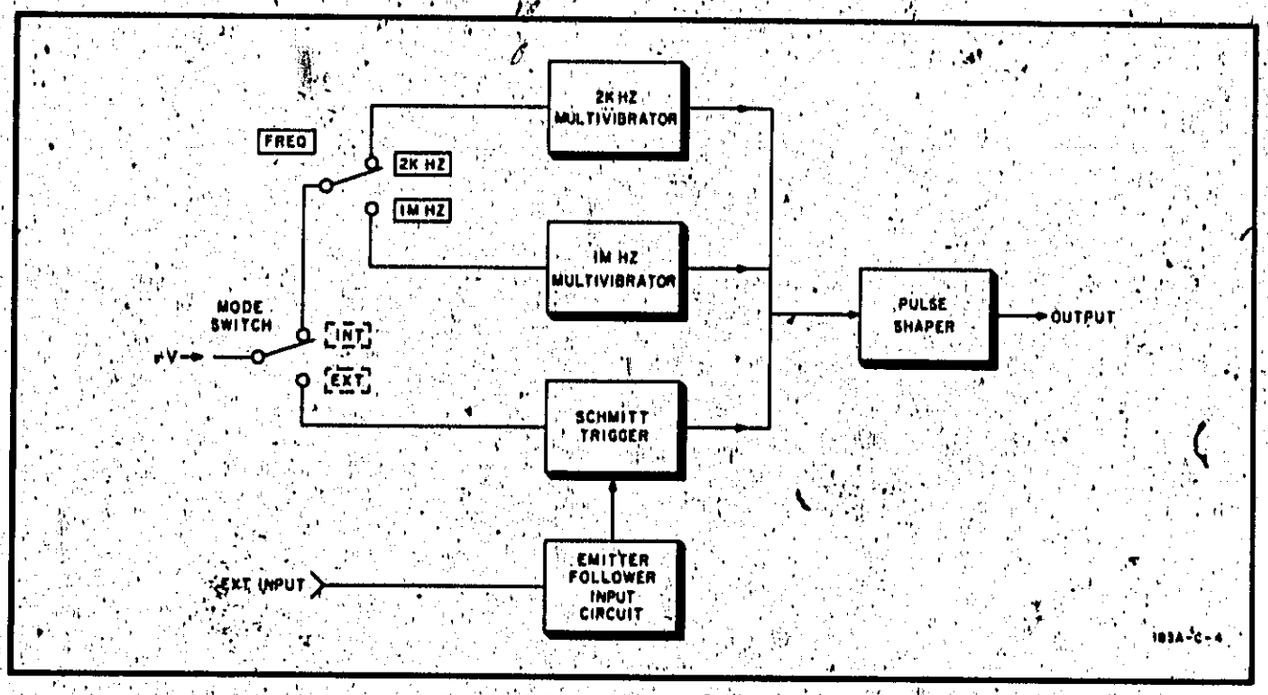


Figure 4-6. Block Diagram-Calibrator

4-27. The CRT retrace blanking and trace intensification signals are supplied from the gate amplifier and are applied in series with the intensity grid dc voltage. The intensity grid voltage, modulated by the gate amplifier signals, controls the CRT from cut-off to on condition. When extra intensity is required for special purposes, such as delayed time-base operation, the CRT is driven further into conduction.

4-28. CALIBRATOR SECTION.

4-29. The calibrator section (Figure 4-6) provides two modes of operation: internal and external. These modes of operation are selected by the CALIBRATOR MODE switch. In both modes, calibration signals are shaped to provide a clean pulse output of predetermined risetime and amplitude.

4-30. INTERNAL CALIBRATORS. The internal calibration signals are generated by two emitter-coupled multivibrators operating at frequencies of 2 kHz and 1 MHz. The multivibrators are selected for operation by the CALIBRATOR FREQ switch. The period and pulse width of each multivibrator is accurately controlled by temperature compensating components. Both oscillators produce negative pulse signals that drive a pulse-shaping circuit.

4-31. PULSE-SHAPING CIRCUIT. The pulse-shaping circuit consists of four current switches contained in an integrated circuit. All current switches transistors (eight) are on a common, thin-film substrate. This provides uniform temperature characteristics to maintain pulse performance. Output pulses of the shaper circuit are negative pulses of less than 1 nanosecond risetime. The output is fed through a switched X1 or X10 attenuator to a front-panel BNC jack. The X1 or X10 attenuator switch selects an output of either 500 mV or 50 mV (into 50-ohm load). All signals for calibration, whether generated internally or externally, pass through the pulse-shaper circuit.

4-32. EXTERNAL CALIBRATION MODE. Switching the CALIBRATOR MODE switch to EXT removes enabling voltage from the internal multivibrators and applies it to the Schmitt trigger circuit. Impedance conversion and amplitude limiting of the external input signal is accomplished by an emitter-follower circuit. Signals from the emitter-follower are applied to the Schmitt trigger.

NOTE

An external signal of negative polarity must be used to operate the calibrator.

4-33. EMITTER-FOLLOWER AND LIMITER CIRCUIT. An emitter-follower input circuit provides a high impedance for external input signals and a low impedance output. The input to the emitter-follower is amplitude and current limited to prevent overload damage. The output is limited in amplitude to approximately 0.8 volt.

4-34. SCHMITT TRIGGER CIRCUIT. The Schmitt trigger is an input switching circuit that is turned on by negative pulses from the emitter-follower. The circuit turns on and remains on for the duration of the external pulse. The trigger output pulse has a risetime of about 3 to 4 nanoseconds and an amplitude of about 0.5 volt.

4-35. THEORY OF OPERATION, CALIBRATOR. (See Schematic 1).

4-36. EXTERNAL MODE. In the external mode, both internal multivibrators of the calibrator are disabled. As shown in Figure 4-6, the external mode signal path is through the emitter-follower, Schmitt trigger and pulse shaper to the output BNC jack.

4-37. The base of A3Q3 presents an impedance of approximately 10 kilohms for negative signals of less than 12 volts. Positive signals greater than 0.5 volt and negative signals exceeding 12 volts are clamped by A3CR3 and A3CR4. Negative pulses, with an amplitude of approximately 0.5 volt, bias A3Q3 into greater conduction. A3Q3 is an impedance converter and transfers a negative pulse through a coaxial cable to the base of Schmitt trigger transistor A4Q1. A4Q1 is normally conducting in the absence of a signal. When a negative signal is applied to the base of A4Q1, the change in dc level turns off A4Q1 and turns on A4Q2. A4Q2 remains in a conducting state until the negative signal at the base of A4Q1 is removed. Zener diode, A4VR1, allows the base of A4Q2 to be maintained at the proper dc level in the off state and transfers the signal from the collector of A4Q1 without loss of amplitude or phase shift.

4-38. Pulse shaper A4U1 is composed of current switches that determine the pulse shape. Pulse response is adjusted by A4C19 and A4R32. The amplitude of the output pulse is adjusted with A4R34. The output of the pulse shaper is attenuated by a 50-ohm divider network selected by the CALIBRATOR switch. The output of the calibrator provides negative pulses with either 0.5 volt or 50 mV amplitude when connected to a 50-ohm load. Open circuit voltages (measured with a high-impedance instrument) are twice the 50-ohm loaded voltages or 1.0 volt and 100 mV.

4-39. INTERNAL MODE. When the calibrator switch on the rear panel is in the INT. position, the Schmitt trigger circuit is disabled and voltage is applied to the calibrator multivibrator selected (2 kHz or 1 MHz). The multivibrators operate in the astable mode and are identical except for frequency controlling components. Refer to the 1 MHz multivibrator on Schematic. When power is applied, one of the transistors will begin to turn on. If A4Q3 turns on first, the current will flow through A4R3, A3Q3 and A4R12, charging A4C9 through A4R13 and A4R14. When A4Q4 attains a negative potential at the emitter it begins to turn on and A4Q3 turns off. The switching interval between the two transistors is controlled by adjusting the ratio of the emitter currents. Potentiometer A4R14 permits changing the ratio of the emitter currents to adjust the duty cycle. The period of oscillation is controlled by base bias adjustment potentiometer A4R16. The multivibrator output is coupled to the pulse shaper through A4VR2. The pulse shaper and output divider operations are the same for internal and external mode signals.

4-40. GATE SIGNAL AMPLIFIER.

4-41. In the Model 183C/D, the intensity of the CRT trace is controlled by the gate amplifier output. The gate amplifier output modulates the high voltage applied to the CRT intensity grid. The modulation turns on or blanks out the trace on the CRT. Signals are supplied to the gate amplifier from the plug-in modules and the Z-AXIS INPUT jack. The beam-finder circuit is also a signal source for the gate amplifier, increasing the CRT beam intensity when operated. The intensifying section of the FIND BEAM switch is disconnected when using sensitive phosphors in the CRT. Figure 4-7 is a block diagram showing functions and signal paths for the gate amplifier, alternate trigger circuit and CRT floodgun control.

4-42. UNBLANKING GATE (Main Gate). The unblanking gate signal from the horizontal time base is synchronous with the sweep. The intensity grid of the CRT is normally biased to cutoff. The unblanking gate together with the intensity control provide enough positive drive at the intensity grid to turn the beam on. Retrace blanking occurs when the unblanking gate is turned off.

4-43. CHOP BLANKING. When multiple channels are displayed in a chopped mode, the gate amplifier supplies switched intensity control determined by the vertical plug-in signals. High frequency vertical plug-in units such as the Model 1830A do not require intensity modulation for chop blanking as the speed of switching between channels is fast enough to prevent the phosphor from emitting light. Lower frequency plug-in units require an intensity blanking in the chop mode. The vertical plug-in unit supplies the proper blanking signal for the gate amplifier to cutoff the CRT during channel switching. Chop blanking will also operate the pulsed floodgun curcuits.

4-44. When using an 1801A, 1802A or 1804A an alternate trigger signal is supplied from the gate amplifier at the end of a sweep to synchronize channel switching with CRT blanking. There is one switching pulse per sweep when the sweep period (time for one complete sweep cycle) is longer than 30 usec. For the sweep periods shorter than 30 usec, a countdown circuit limits the pulses to intervals of 30 usec. This time limit allows the multivibrator in the vertical amplifier to reset before the next pulse is applied. When using an 1830A, an alternate trigger signal is supplied from the horizontal time base.

4-45. DELAYED GATE. Signals for intensification of the delayed portion of a trace are supplied to the gate amplifier from the time base delay generator. A delayed-gate output signal is available at the DEL'D GATE OUT connector. The delayed-gate output is isolated by an emitter-follower amplifier so external loading will not affect the internal operation of the CRT intensification grid signal.

4-46. Z AXIS INPUT. A BNC connector is located on the rear panel of the instrument for external control of the

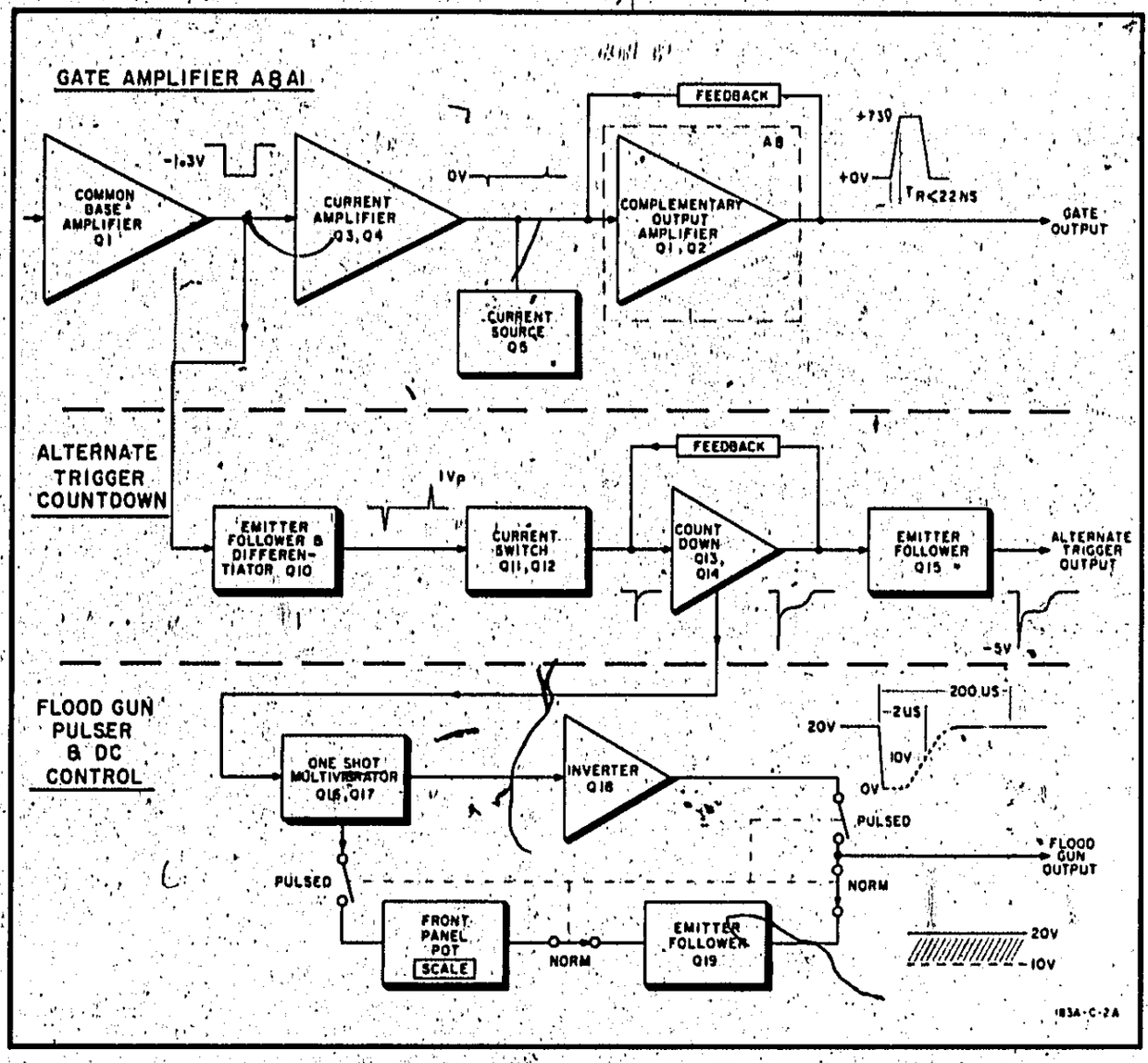


Figure 4-7. Block Diagram-Gate Amplifier

CRT intensity. The Z AXIS INPUT can be used as the gate control for special applications such as marking portions of the trace for identification. The impedance of the Z AXIS INPUT is 4700 ohms. A +15-volt input will completely blank any intensity. The Z AXIS INPUT will provide control with signals from dc to approximately 15 MHz.

4-47. THEORY OF OPERATION, GATE AMPLIFIER. (See Schematic 4).

4-48. The horizontal amplifier plug-in supplies a negative, 2-mA signal that terminates into 100 ohms at the gate amplifier input. To convert the current input to a voltage pulse, common-base amplifier A8A1Q1 is used. The common-base configuration presents a low impedance to the input current and a voltage output of about −1.3 volt.

To prevent capacitive loading of the collector of A8A1Q1, two emitter-followers (A8A1Q2 and A8A1Q3) are used for the impedance matching. The output of A8A1Q3 drives a common-base amplifier and a voltage-clamp circuit. The voltage clamp at the emitter of A8A1Q3 is a fast switching, hot-carrier diode, A8A1CR3. The clamp determines the amplitude of the gate pulse and is set by the back bias voltage applied from INT control R1. As the negative pulse is applied, the diode is forward biased, shunting the current through A8A1Q3.

4-49. Emitter-followers A8A1Q6 and A8A1Q7 drive complementary pair A8Q1 and A8Q2. A feedback path from the gate amplifier output to the input of A8A1Q6 and A8A1Q7 establishes the gain of the output section and provides compensation adjustment. The maximum output signal voltage is approximately 73 volts peak-to-peak to drive the CRT intensity grid.

4-50. ALTERNATE TRIGGER CIRCUIT. When the current switch and countdown circuit are in their quiescent state, A8A1Q11 and A8A1Q13 are off and A8A1Q12 and A8A1Q14 are conducting. The collector current of A8A1Q14 flowing through A8A1R37 and A8A1R41 does not cause enough voltage drop to turn on A8A1Q13. A8A1CR12 clamps the base of A8A1Q13 at +700 mV.

4-51. The alternate trigger input circuit is driven by the emitter of A8A1Q2 and is isolated from the gate amplifier circuit by isolation amplifier A8A1Q10. The signal at the emitter of A8A1Q10 is approximately a 1.3V negative pulse. The negative pulse is differentiated by A8A1C12 and A8A1R35. The positive spike from the differentiator coincides with the trailing edges of the gate pulse and is used to turn on the current switch at the base of A8A1Q11. The signal at the collector of A8A1Q10 is a positive pulse and is differentiated by A8A1C30 and A8A1R68. The negative spike from the differentiator is used to turn off A8A1Q12.

4-52. When A8A1Q11 turns on the current through A8A1Q11 and A8A1Q14 combines and flows through A8A1R37. The voltage drop across A8A1R37 is not sufficient to turn on A8A1Q13. When A8A1Q13 turns on its collector potential will go toward ground and A8A1Q14 conducts heavier. The emitter potential of A8A1Q14 goes toward ground and A8A1C14 discharges through A8A1Q14 and A8A1Q41. A8A1Q13 does not turn off until A8A1C4 is discharged. When A8A1Q13 turns off the collector voltage of A8A1Q13 goes to −12.6V and turns off A8A1Q14. A8A1Q14 will remain off until its emitter is −13.3V as determined by the RC time constant of A8A1C14 and A8A1R43 (approximately 30 usec). If another positive spike turns on A8A1Q11 before A8A1Q14 turns on, the base voltage of A8A1Q13 will not drop below +700 mV and will not turn on.

4-53. FLOODGUN (Scale Illumination). The CRT phosphor is illuminated by the operation of a separate floodgun mounted within the CRT. The scale intensity is controlled by the SCALE control and the FLOODGUN MODE switch. The FLOODGUN MODE switch allows selection of either a pulse or normal dc-controlled operation of the floodgun. A voltage difference between the cathode and control grid of the floodgun controls the intensity of the CRT phosphor light output. This method of scale illumination provides the advantage of increasing the effective photographic writing speed of the 183C/D camera-film combination. All components required for the floodgun circuit, with the exception of the SCALE control and FLOODGUN MODE switch, are on the gate amplifier board.

4-54. NORMAL FLOODGUN MODE (dc operation). When the rear-panel FLOODGUN MODE switch is placed in the NORM position, the phosphor illumination is continuous and controlled by the SCALE potentiometer. A8A1Q19 drives the CRT floodgun and is biased on in the normal mode. The bias at A8A1Q19 base is controlled by the setting of SCALE potentiometer R2 to provide a low-impedance to drive the CRT floodgun. The floodgun is controlled by the dc bias applied between its cathode and control grid.

4-55. PULSED FLOODGUN MODE. In the pulsed mode of operation, a one shot multivibrator (A8A1Q16 and A8A1Q17) is activated by the FLOODGUN MODE switch.

A positive pulse from the countdown circuit triggers the multivibrator. The output pulse from the multivibrator is inverted by A8A1Q18 to provide a low-impedance negative output pulse to the CRT floodgun. The width of the output pulse is determined by the RC time constant (A8A1C16, A8A1R53 and R2) at the base of transistor A8A1Q17. The pulse amplitude is constant.

4-56. CATHODE RAY TUBE (CRT).

4-57. The CRT used in the Model 183C/D is designed to provide a nominal 3-volt per division low frequency deflection factor. The total transit time for one electron through the deflection structure is about 2 nanosecond. Vertical deflection plates provide an electrical field that propagates axially along the helical-shaped deflection plates at the same velocity as the electron beam to be deflected.

4-58. The portions of the helixes that are closest to the electron beam act as the deflecting plates with the remainder of the helix providing a delay that corresponds to the time required for the electron beam to proceed to the next plate. The effective transit time is reduced to the length of time required for the electron beam to traverse a single pair of plates, about 100 picoseconds. Multiple pairs of plates are combined into one structure, driven as a constant impedance transmission line of 2 nanosecond total delay.

4-59. The post-accelerator region of the CRT has been split into two segments to provide for reduced scan operation. Reduced scan is achieved when 8.6 kV is applied to the rear segment while 17 kV is applied to the front segment. For full scan operation, 17 kV is applied to both segments.

4-60. The deflection structure matches the impedance of the plug-in vertical amplifier and interconnecting transmission line.

4-61. CRT TERMINATION.

4-62. Lower frequency plug-in vertical amplifiers currently available for the HP 180-series oscilloscopes require a CRT vertical plate termination that operates as a capacitive load. Higher frequency plug-in vertical amplifiers designed to operate with the Model 183A/B/C/D Oscilloscope require the CRT vertical deflection system to appear as a transmission line. Both modes are accomplished automatically by a diode switching matrix in the Model 183C/D that is controlled by voltage supplied from the plug-in being used.

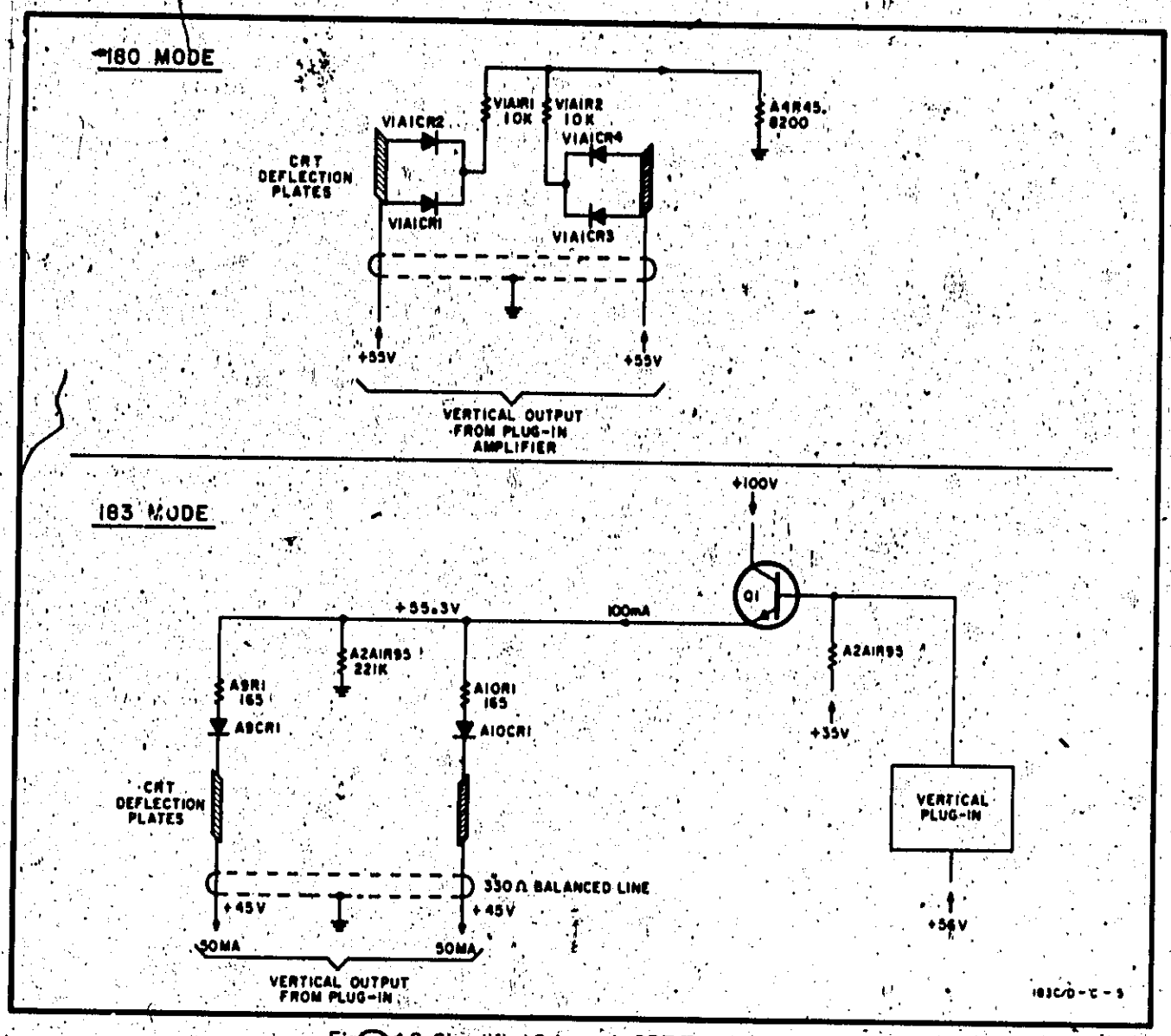


Figure 4-8. Simplified Schematic-CRT Termination Circuit

4-63. THEORY OF OPERATION. CRT TERMINATION CIRCUIT.

4-64. Figure 4-8 is a simplified Schematic of the CRT termination circuit. Two modes of operation are shown in the figure: the 180-series mode (capacitive loading) and the 183 mode (transmission line termination). Refer to Schematic 5. The following paragraphs describe the operation of each mode.

4-65. CRT TERMINATION-180 MODE. As shown in the 180 mode of Figure 4-8, the output of the vertical plug-in unit applies approximately 2.1 mA to each vertical deflection plate in the CRT. The current flows through V1A1CR1 and V1V1CR2 at one plate and V1A1CR3 and V1A1CR4 at the other. With the diodes forward biased, the deflection plates within the CRT are effectively shunted and appear as a capacitive load to the vertical output amplifier. High impedence resistors V1A1R1 and V1A1R2 provide a dc current path for the diodes.

4-66. CRT TERMINATION-183 MODE. When the termination circuit is operating in the 183 mode shown in Figure 4-8, a current of approximately 100 mA is supplied from CRT bias-control transistor Q1. The current flows through resistors A9R1, A10R1 and diodes A9CR1, A10CR1 and through each deflection plate to the output of the vertical amplifier. Resistors A9R1 and A10R1 form a balanced load that terminates the vertical amplifier into 330 ohms.

4-67. HORIZONTAL AMPLIFIER.

4-68. Figure 4-9 is a block diagram of the horizontal amplifier. The horizontal amplifier is used with internal or external signal source. Internal signals are obtained from

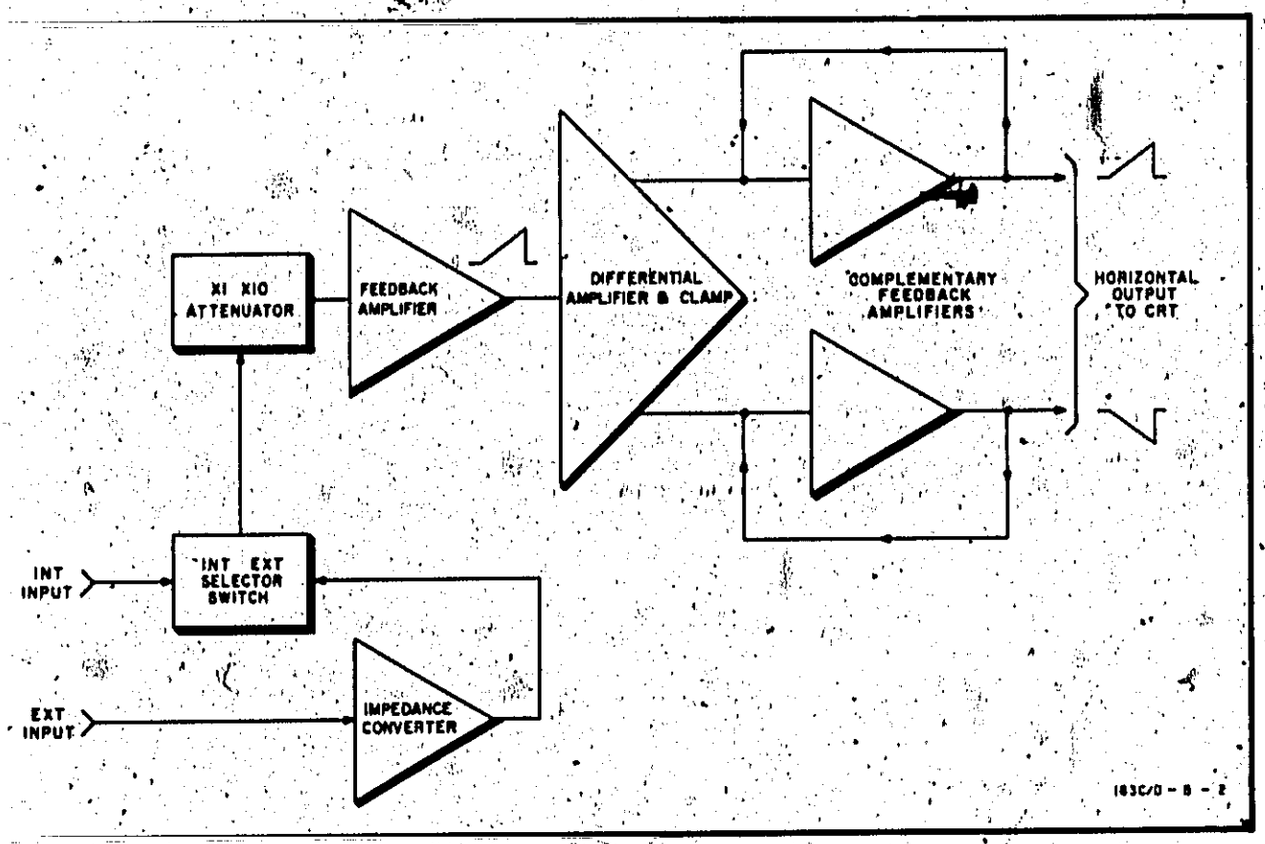


Figure 4-9. Block Diagram, Horizontal Amplifier

time-base plug-in unit. External signals are applied to impedance converter through a front-panel jack. ernal signal input impedance is 1 megohm shunted by roximately 25 pF. The input to the impedance conver- is a source-follower field-effect transistor. The FET vides a high input impedance to prevent signal loading.

9. HORIZONTAL X1 and X10 switches control a cision attenuator for both internal or external modes operation. The switches select either X1 or X10 signal nuation. The norm-cal switch and the bw-phase switch mounted on the horizontal amplifier circuit board. en the norm-cal switch is in norm position, external als are connected through the impedance converter to horizontal amplifier. With the switch in cal position, ernal signals by pass the impedance converter and con- t directly to the horizontal amplifier. The calibrator al can be applied to HORIZONTAL EXT INPUT for brating the horizontal amplifier. The impedance of the ernal input to the horizontal amplifier is 50 ohms in the mode, providing the proper loading for the calibrator put. The bw-phase switch, when in phase position reases the bandwidth of the impedance converter and uces the phase shift between the X and Y amplifiers, wing more accurate phase measurements.

0. THEORY OF OPERATION, HORIZONTAL AM- FIER. (See Schematic 2).

1. External signals are applied to the high impedance ut of FET A2A1Q17. The input coupling may be either ac (through capacitor A2A1C18) or direct for dc. The output of the FET is amplified by emitter-follower A2A1Q18. External-balance potentiometer A2A1R20 is adjusted for 0 volt dc across the external vernier control to eliminate dc shift as the vernier control is rotated through its range. The dc current from potentiometers R5A and R5B, combined with the signal, provides horizontal positioning.

4-72. The attenuator output is coupled to the complementary feedback amplifier composed of A2A1Q1, A2A1Q2 and two transistors of integrated circuit A2A1U1. The bias on feedback amplifier A2A1U1Q5 is adjusted with dc-balance potentiometer A2A1R17 to avoid dc shift when the attenuator is switched. The output of the feedback amplifier drives differential amplifiers A2A1U1Q4 and A2A1U1Q3. The signal applied to A2A1U1Q3 is adjusted by A2A1R24 to control the gain of the differential pair for horizontal calibration.

4-73. The output of the differential amplifier is coupled through zener diodes A2A1VR1 and A2A1VR2, providing a dc level shift. The output from differential amplifiers A2A1Q3 and A2A1Q4 is amplified by emitter-followers A1A1Q5 and A2A1Q6, providing a low impedance to drive the final differential current switch stages.

4-74. The output amplifiers are complementary-feedback amplifiers that convert the current signals to an amplified voltage output. The current-limiting action of differential

pair A2A1Q7 and A2A1Q8 and resistors A2A1R46 and A2A1R47 limit the output voltage to the horizontal deflection plates to between +10 and +85 volts, regardless of the input signal. When the FIND BEAM switch is pressed, the current to differential pair A2A1Q7 and A2A1Q8 is reduced, limiting the output to between +10 and +40 volts. The reduced voltage prevents the trace from being driven off the CRT face.

PERFORMANCE CHECK

Table 5-1. Recommended Test Equipment

Instrument		Required Characteristics	Required For
Type	Model		
Sampling Oscilloscope	HP 140A 1410A 1424A	1 GHz Bandwidth	Calibrator Response Check Calibrator Response Adjust
Pulse Generator	HP 222A	100 kHz squarewave at 1V, variable pulse delay	Calibrator Response Check Calibrator Response Adjust
Digital Voltmeter	HP 3440A 3443A plug-in	0.05% accuracy	Calibrator Amplitude Check Calibrator Duty Cycle Check Low Voltage Adjust High Voltage Adjust Calibrator Amplitude Adjust Calibrator Duty Cycle Adjust
Electronic Counter	HP 5245L	1 MHz, accuracy 3 parts in 10^9	Calibrator Frequency Check Calibrator Frequency Adjust
Constant Amplitude Signal Generator	Tektronix Type 191	8 MHz Bandwidth	Horizontal Bandwidth Check Horizontal Bandwidth Adjust
Monitor Oscilloscope	HP 180A 1801A 1820B	20 MHz bandwidth, 50V pk capability	Intensity Adj
50:1 Divider Probe	HP 10002C	Use with monitor oscilloscope	Performance Check and Adjustments
Time-mark Generator	Tektronix 184	500 MHz	Horizontal Linearity Adjust
50-ohm TEE Connector	HP 10221A		Performance Checks and Adjustments
50-ohm Connector	GR 874-QBPA		Performance Checks and Adjustments
50-ohm Termination	HP 0950-0090		Performance Checks and Adjustments
DC Power Supply	HP 6213A	−1.0V	Calibrator Amplitude Check Calibrator Amplitude Adjust
High Voltage Probe		1000:1 divider probe Use with Digital Voltmeter	High Voltage Power Supply Adjust
Filter	Telonic Eng. TBP500-50-4AA1	500 MHz Bandpass	Horizontal Linearity Adjust
Vertical Plug-in	HP 1831A	Display 600 MHz	Horizontal Linearity Adjust
Horizontal Plug-in	HP 1840A	10 ns sweep time	Horizontal Linearity Adjust

7000-A-19

SECTION V

PERFORMANCE CHECK AND ADJUSTMENTS

5-1. INTRODUCTION.

5-2. This section contains step-by-step procedures for checking the instrument specifications as given in Table 1-1 of this manual. A table (performance check record) is provided at the end of the performance check for recording measurements obtained when the instrument is initially checked. This record may be used to compare measurements taken at later dates with the original. The procedures for making all internal adjustments are covered in Paragraphs 5-21 through 5-39. Photographs showing the locations of all internal adjustment controls are presented in Figure 5-4.

5-3. The performance checks and adjustments in this section apply to the Model 183C/D in both full scan and reduced scan modes. In full scan, the volts per division and time per division refer to the 1 centimeter divisions. In reduced scan, the 1/2 centimeter divisions are used. The calibrate adjustment on the front-panel of the plug-ins and X and Y align, astigmatism and pattern adjust on the mainframe must be re-adjusted when scan mode is changed. Refer to the Operating and Service Manual for the plug-ins being used.

5-4. TEST EQUIPMENT.

5-5. Test equipment required for procedures in this section is listed in Table 5-1. Test equipment equivalent to that recommended may be substituted, provided it meets the required characteristics listed in the table. For best results, use recently calibrated test equipment.

5-6. PERFORMANCE CHECK.

5-7. The following subparagraphs describe procedures to determine whether or not the instrument is operating within the specifications of Table 1-1. This check can be used as part of an incoming inspection, as a periodic operational test, or to check calibration after repairs or adjustments have been made.

5-8. The first time the performance check is made, enter the results on the Performance Check Record at the end of the procedure. Remove the record from the manual and file it for future reference. Be sure to include the instrument serial number on the record for identification.

5-9. Do the performance check in the sequence listed. Successive steps are dependent upon control settings and results of previous steps.

5-10. WARM-UP

5-11. Set the line voltage selector switch located on the rear panel to the appropriate setting (115 or 230 Vac). Install plug-ins and apply power by turning on the front-panel POWER switch and allow at least 15 minutes for warm-up.

5-12. CALIBRATOR RESPONSE CHECK.

5-13. This check requires a pulse generator and a sampling oscilloscope with accessories. See Figure 5-1 for interconnection of equipment.

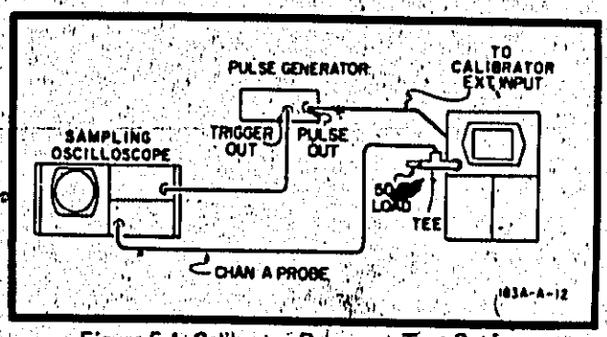


Figure 5-1. Calibrator Response Test Set-up

a. Connect 50-ohm tee directly to CALIBRATOR output. Terminate tee into 50-ohm load. Connect sampling oscilloscope channel A probe to tee.

b. Connect pulse generator trigger output to sampling time base for external triggering. Set pulse generator output controls for −1.0-volt squarewave at approximately 100 kHz.

c. Set CALIBRATOR MODE switch (rear panel) to EXT.

d. Connect pulse generator output to CALIBRATOR EXT INPUT.

e. Set CALIBRATOR AMPL switch for 50 mV output.

f. While observing sampling oscilloscope, adjust pulse generator and sampling time base trigger controls until negative pulse is observed.

g. Set vertical sensitivity of sampling oscilloscope to 10 mV/div and adjust vernier to obtain exactly 10 divisions vertical deflection.

h. Measure risetime of pulse. Risetime between 10% and 90% amplitude of pulse should be less than 1 ns.

i. Change vertical sensitivity of sampling oscilloscope to 1 mV/div. Do not adjust vernier. Sensitivity scale now represents 1% of total pulse amplitude per division.

j. Observe top of pulse (magnify time scale). Pulse top, with all perturbations averaged, should be flat within ±0.5% after 5 ns. Overshoot should be less than ±3%.

k. Change vertical sensitivity of sampling oscilloscope to 100 mV/div.

l. Set CALIBRATOR AMPL switch to 0.5V.

m. Recheck risetime as in step h. Risetime should be less than 1 ns.

n. Change vertical sensitivity of sampling oscilloscope to 10 mV/div. Observe overshoot of less than ±3%. Pulse top should be flat ±0.5% after 5 ns.

o. Disconnect equipment.

5-14. CALIBRATOR AMPLITUDE CHECK.

5-15. The amplitude check requires a digital voltmeter and a dc power supply.

a. Connect digital voltmeter to CALIBRATOR OUT.

b. Set CALIBRATOR MODE switch (rear panel) to EXT. Set CALIBRATOR AMPL to 0.5V. Output of calibrator should be 0 ±.001V.

c. Apply −1.0 Vdc to CALIBRATOR EXT INPUT on rear panel.

d. Set CALIBRATOR AMPL switch to 50 mV. Digital voltmeter should indicate from −0.0990 to −0.1010V. Using digital voltmeter (high impedance), calibrator output is effectively open circuited and output amplitude is twice panel markings.

e. Change CALIBRATOR AMPL switch setting to 0.5V position. Output should be from −0.990 to −1.010V.

5-16. CALIBRATOR DUTY CYCLE AND FREQUENCY CHECK.

5-17. The duty cycle check requires a digital voltmeter. The frequency check requires an electronic counter.

a. Set CALIBRATOR MODE switch on rear panel to INT.

b. Set CALIBRATOR AMPL switch to 0.5V.

c. Set CALIBRATOR FREQ switch to 2 kHz.

d. Connect digital voltmeter to CALIBRATOR OUT. Output amplitude should be −0.995 to −1005V.

e. Repeat step d with CALIBRATOR FREQ switch in 1 MHz position.

f. Disconnect voltmeter and connect electronic counter to CALIBRATOR OUT.

g. Set CALIBRATOR FREQ switch to 2 kHz. Frequency should be between 1990 and 2010 Hz on counter.

h. Change CALIBRATOR FREQ switch to 1 MHz.

i. Disconnect test equipment.

5-18. HORIZONTAL AMPLIFIER BANDWIDTH CHECK.

5-19. The bandwidth check requires a constant amplitude signal generator.

a. On Model 183C/D, set HORIZONTAL INT/EXT switch to EXT.

b. Set EXT VERNIER to CAL detent.

c. Set horizontal magnifier switch to X1.

d. Connect constant amplitude signal generator output to HORIZONTAL EXT INPUT.

e. Set constant amplitude signal generator frequency to approximately 750 kHz and adjust amplitude for exactly 10 divisions horizontal deflection on Model 183C/D.

f. Increase constant amplitude signal generator frequency to 8 MHz. Horizontal deflection on CRT should be at least 7.1 divisions.

g. Disconnect signal generator.

5-20. HORIZONTAL MAGNIFIER CHECK.

a. Connect short cable from CALIBRATOR OUT to HORIZONTAL EXT INPUT on Model 183C/D.

b. Set Model 183C/D controls:

CALIBRATOR AMPL	50 mV
CALIBRATOR FREQ	2 kHz
HORIZONTAL INT/EXT	EXT
horizontal magnifier	X1
EXT VERNIER	CAL (detent)
norm-cal	cal (Figure 5-4)

c. Increase display INT and adjust HORIZONTAL POS to observe two bright dots on Model 183C/D CRT. Dots should be 1 division apart.

d. Set magnifier pushbutton to X10.

e. Readjust HORIZONTAL POS to observe two bright dots. The bright dots should be 10 ±0.5 divisions apart.

f. Disconnect cable and return norm-cal switch to norm. Return HORIZONTAL INT/EXT to INT.

5-21. This completes the performance checks of the Model 183C/D Oscilloscope. Record the information obtained from the preceding steps on the Performance Check Record included in this section. Retain the record for future reference.

PERFORMANCE CHECK RECORD
183C/D

Instrument Serial Number _____ Date _____

Check		Specification	Measured
CALIBRATOR RESPONSE 50 mV:	Risetime	< 1 ns	
	Flat top (after 5 ns)	0.5%	
	Overshoot	< 3%	
CALIBRATOR RESPONSE 0.5V:	Risetime	< 1 ns	
	Flat top (after 5 ns)	0.5%	
	Overshoot	< 3%	
CALIBRATOR AMPLITUDE:	50 mV	±1%	
	0.5V	±1%	
CALIBRATOR DUTY CYCLE:	2 kHz	−0.0995 - −0.1005V	
	1 MHz	−0.0995 - −0.1005V	
CALIBRATOR FREQUENCY:	2 kHz	1990 - 2010 Hz	
	1 MHz	995 - 1005 kHz	
HORIZONTAL BANDWIDTH:		> 7.1 div	
HORIZONTAL MAGNIFIER:		10 ±0.5 div	

5-22. ADJUSTMENT PROCEDURE.

5-23. Procedures for adjusting the Model 183C/D Oscilloscope are given in the following paragraphs. Perform the adjustments in the sequence presented. Succeeding step are dependent on settings and adjustments of previous steps.

WARNING

When the instrument is operating with the covers removed, dangerous voltages are exposed.

5-24. Remove the covers on the Model 183C/D by removing the attaching screws and lifting the cover free. Install plug-in units in the mainframe. Turn power on and allow 15 minutes for instrument warm-up.

5-25. LOW VOLTAGE POWER SUPPLY ADJUSTMENT.

5-26. Connect the digital voltmeter to each test point listed below and make the adjustments indicated. See Figure 5-4 at the end of this section to identify potentiometers.

Test point	Voltage	Adjust	Tolerance
A1A1 TP1	+100V	A1A1R11	±0.2V
A1A1 TP2	+35V	A1A1R24	±0.1V
A1A1 TP3	+15V	A1A1R38	±0.1V
A1A1 TP4	−12.6V	A1A1R53	±0.1V
A1A1 TP5	−100V	A1A1R66	±0.2V

5-27. HIGH VOLTAGE POWER SUPPLY ADJUSTMENT.

WARNING

This voltage (approximately 3 kV) is dangerous to life.

a. Power should be off when removing or replacing the heat sink.

b. Remove heat sink on rear of display portion of instrument by removing four screws. Set heat sink on top of Model 183C, and let the heat sink hang down on the Model 183D.

c. Measure cathode supply voltage at TP1-3000V (Figure 5-4) with digital voltmeter and high voltage probe.

d. Adjust A7R10 for −3000 ±3V.

5-28. INTENSITY ADJUSTMENTS.

a. Set horizontal INT/EXT switch to EXT.

b. Set display INT control fully counterclockwise.

c. Connect Monitor Oscilloscope to gate output test point (Figure 5-4). Using 50:1 divider probe.

d. Adjust A8A1R21 for 0 ±0.5V.

e. Set HORIZONTAL INT/EXT switch to INT.

f. Set display INT control approximately 10 degrees from fully counterclockwise.

g. Adjust A8A1R9 for gate pulse amplitude of 0.5V.

h. Set HORIZONTAL switch to EXT.

i. Adjust display INT control for exactly +5.0V on monitor oscilloscope.

j. Adjust intensity limit A7R13 clockwise until focused spot is just barely visible on CRT.

k. Set HORIZONTAL INT/EXT switch to INT.

l. Set time base plug-in horizontal sensitivity for 0.05 usec/div.

m. Adjust display INT control for a 40-volt gate pulse.

n. Adjust A8A1C7 and A8A1C8 for minimum overshoot and undershoot.

o. Remove power from instrument.

p. Reinstall heat sink.

5-29. ASTIGMATISM ADJUSTMENT.

a. Set HORIZONTAL INT/EXT switch to EXT.

b. Center spot with horizontal and vertical position controls.

c. Adjust FOCUS and ASTIG controls for smallest round spot.

5-30. TRACE ALIGNMENT ADJUSTMENT (X-AXIS).

a. Set horizontal time base plug-in mode switch to auto.

b. On Model 183C/D, press HORIZONTAL INT/EXT switch to INT.

c. Adjust FOCUS for optimum display of free-running baseline.

d. Adjust A4R49 so horizontal trace is parallel with middle horizontal graticule line on CRT.

5-31. TRACE ALIGNMENT ADJUSTMENT (Y-AXIS).

a. Set HORIZONTAL INT/EXT switch to EXT.

b. Connect constant amplitude signal generator to channel A input of vertical plug-in and set for approximately 50 MHz and exactly 6 divisions of amplitude on Model 183C/D CRT.

c. Increase display INT as required to observe vertical trace on CRT.

d. Adjust A4R47 and HORIZONTAL POS until trace is exactly parallel with middle vertical graticule line on CRT.

5-32. PATTERN ADJUSTMENT.

a. Set HORIZONTAL INT/EXT selector switch to INT.

b. Set horizontal time base plug-in for .1 usec/div and internal triggering.

c. Connect constant amplitude signal generator to channel A input of vertical plug-in and set for approximately 50 MHz and exactly 6 divisions of amplitude on Model 183C/D CRT.

d. Adjust A4R51 for straightest possible edges on the rectangular pattern.

e. Disconnect signal generator.

5-33. CALIBRATOR AMPLITUDE ADJUSTMENT.

a. Connect digital voltmeter to CALIBRATOR OUT connector.

b. Set CALIBRATOR MODE switch (rear panel) to EXT.

c. Set CALIBRATOR AMPL switch to 0.5V. Output should be 0 ±.001V.

d. Apply −1.0 Vdc to CALIBRATOR EXT INPUT (rear panel).

e. Set CALIBRATOR AMPL switch to 50 mV.

f. Adjust A4R34 amplitude adj. for digital voltmeter indication of −0.1 ±.001V.

g. Set CALIBRATOR AMPL switch to 0.5V. Voltmeter should indicate −0.990 to −1.010V. If voltage measured is not as specified, readjust A4R34 according to step f.

h. Disconnect digital voltmeter.

5-34. CALIBRATOR RESPONSE ADJUSTMENT.

a. Connect 50-ohm tee directly to CALIBRATOR connector.

b. Terminate tee with a 50-ohm load.

c. Connect channel A probe of sampling oscilloscope to tee connector (Figure 5-1).

d. Set CALIBRATOR MODE switch (rear panel) to EXT.

e. Connect pulse generator output to CALIBRATOR EXT INPUT. Set pulse generator to approximately 100 kHz at −1.0V.

f. Connect pulse generator trigger output to external trigger of sampling time base.

g. Set CALIBRATOR AMPL switch to 0.5V.

h. While observing sampling oscilloscope, adjust pulse delay of generator and trigger controls of sampling time base until negative pulse is observed.

i. Set vertical sensitivity of sampling oscilloscope to 100 mV/div and adjust vernier to obtain exactly 10 divisions vertical deflection.

j. Measure risetime of pulse. Risetime between 10% and 90% amplitude of pulse should be less than 1 ns.

k. Change vertical sensitivity of sampling oscilloscope to 10 mV/div. Do not adjust vernier. Sensitivity scale now represents 1% of pulse amplitude per division.

l. Observe top of pulse and adjust A4R32 and A4C19 pulse shape for optimum risetime and minimum overshoot. Overshoot tolerance is ±3%.

m. Check pulse with calibrator output at 50 mV and readjust both ranges if necessary.

n. Disconnect test equipment.

5-35. CALIBRATOR DUTY CYCLE AND FREQUENCY ADJUSTMENT.

a. Verify calibrator amplitude is correct.

b. Connect digital voltmeter to CALIBRATOR OUT.

c. Set CALIBRATOR MODE switch to INT.

d. Set CALIBRATOR FREQ switch to 2 kHz and allow 1 minute for stabilization.

e. Set CALIBRATOR AMPL switch to 0.5V.

f. Adjust A4R20 for digital voltmeter indication of −99.5 to −100.5 mV.

g. Disconnect digital voltmeter and connect electronic counter to CALIBRATOR OUT.

h. Adjust A4R21 until frequency is between 1990 and 2010 Hz.

i. Repeat steps c through g for optimum results.

j. Change CALIBRATOR FREQ switch to 1 MHz and allow 1 minute for stabilization.

k. Connect digital voltmeter to CALIBRATOR OUT.

l. Adjust A4R14 for digital voltmeter indication of −99.5 to −100.5 mV.

m. Disconnect digital voltmeter and connect electronic counter to CALIBRATOR OUT.

n. Adjust A4R16 until frequency is between 995 and 1005 kHz.

o. Repeat steps j through m for optimum results.

p. Disconnect electronic counter.

5-36. HORIZONTAL AMPLIFIER BALANCE ADJUSTMENT.

a. Set Model 183C/D controls:

HORIZONTAL INT/EXT	EXT
norm-cal	norm (Figure 5-4)

b. Disconnect vernier coaxial cable (Figure 5-4) from horizontal amplifier board adjacent to bw-phase switch.

c. Adjust HORIZONTAL POS control for no horizontal movement of dot while switching magnifier between X1 and X10 (this may not necessarily occur at center of CRT).

d. Adjust A2A1R17 to position spot at center of CRT.

e. Reconnect vernier coaxial cable.

f. Set magnifier switch to X1.

g. Adjust A2A1R90 to position spot at center of CRT.

5-37. HORIZONTAL AMPLIFIER GAIN ADJUSTMENT.

a. Set Model 183C/D controls:

HORIZONTAL EXT VERNIER	CAL (detent)
HORIZONTAL INT/EXT	EXT
horizontal magnifier	X1
CALIBRATOR FREQ	2 kHz
CALIBRATOR AMPL	0.5V
norm-cal switch	cal

b. Connect CALIBRATOR OUT to HORIZONTAL EXT INPUT with short coaxial cable.

c. Increase display INT and adjust HORIZONTAL POS to observe two dots on CRT.

d. Adjust HORIZONTAL CAL (front-panel screwdriver adjustment) for exactly 10 divisions of horizontal deflection between dots.

5-38. HORIZONTAL AMPLIFIER FREQUENCY RESPONSE ADJUSTMENT.

a. Leave equipment connected as in Paragraph 5-37.

b. Set Model 183C/D controls:

Norm-cal switch	norm
horizontal magnifier	X10

c. Adjust display INT and HORIZONTAL POS controls to observe two dots on far left-hand and right-hand sides of CRT.

d. Adjust A2A1C21 for best dot shape (no tails).

5-39. HORIZONTAL AMPLIFIER HIGH-SPEED ACCURACY AND LINEARITY ADJUSTMENT.

a. Set Model 183C/D controls:

HORIZONTAL INT/EXT	INT
horizontal magnifier	X1

b. Set plug-in time base controls for external ac triggering and a sweep time of 10 ns/div.

c. Connect time-mark generator to both channel A input of vertical amplifier and external input of time-base. Set time-mark generator of 100 MHz.

d. Adjust TRIGGER LEVEL on time base for stable presentation.

e. Adjust HORIZONTAL POS control on Model 183C/D to align first marker with left edge of graticule.

f. The 11th marker should be within 1.5 minor divisions of right edge of graticule.

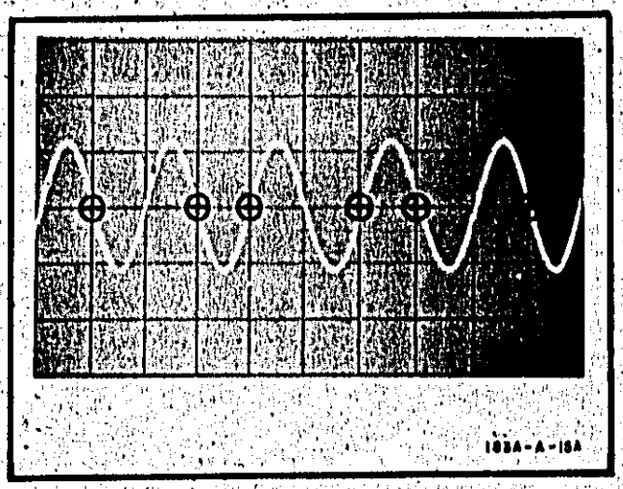


Figure 5-2. Horizontal Linearity Waveform

g. If 11th marker is not within 1.5 minor divisions of right edge of graticule, refer to appropriate time base manual for calibration of the 10 ns/div sweep range.

h. Set magnifier switch to X10.

i. Set time-mark generator to 500 MHz. 500 MHz output from Tek 184 must be filtered using a TELONIC ENG. TBP 500-50-4AA1 or equivalent.

j. Adjust trigger level on time base for stable presentation.

k. Adjust HORIZONTAL POS control on Model 183C/D until trace starts at left edge of graticule.

l. Note waveform that appears at right edge of graticule. With HORIZONTAL POS control, move waveform at right edge of graticule to left edge of graticule.

m. Obtain at least 2 divisions of vertical display and carefully adjust horizontal and vertical position of waveform to appear as shown in Figure 5-2.

n. Position first negative slope to intersect first-division graticule at center horizontal line. The negative slope of fourth marker after first-division graticule line should intersect ninth-division graticule line ±5%.

NOTE

Use the middle eight horizontal divisions when checking or adjusting timing on fastest two sweep speeds magnified.

o. Make horizontal measurement of waveform over any two division interval within center eight divisions. The two adjacent positive or two adjacent negative slopes of display should be 2 cm apart, ±5% of

$$10 + \frac{\text{(number of minor divisions of in step N)}}{4}$$

p. Accuracy and linearity should be checked between 10th and 100th division of magnified sweep. To locate desired point, use following procedure:

1. Press HORIZONTAL X1 pushbutton.

2. With HORIZONTAL POS control, position trace to start on first graticule line.

3. Select any point between second and eleventh graticule line to be viewed. With HORIZONTAL POS, move that point to center graticule line.

4. Press HORIZONTAL X10 pushbutton and point selected will remain at center screen.

q. If measurements indicate that the sweep is not within tolerance in steps n, o, and p, adjust A2A1C14 and A2A1C15 for maximum accuracy and minimum nonlinearity.

r. Change sweep time on horizontal time base to 20 ns/div and recheck accuracy and linearity. If readjustment of A2A1C14 and A2A1C15 is necessary for either sweep speed, recheck both speeds. It may be necessary to compromise the setting of A2A1C14 and A2A1C15 at 1 ns/div at 2 ns/div.

5-40. HORIZONTAL AMPLIFIER PHASE ADJUSTMENT.

a. Set Model 183C/D controls:

horizontal magnifier	X1
bw-phase switch	phase
norm-switch	norm
HORIZONTAL INT/EXT	EXT
HORIZONTAL EXT VERNIER	CAL (detent)

b. On vertical plug-in, turn off channel A display switch.

c. Connect constant amplitude signal generator to horizontal amplifier external input and channel A vertical input as shown in Figure 5-3.

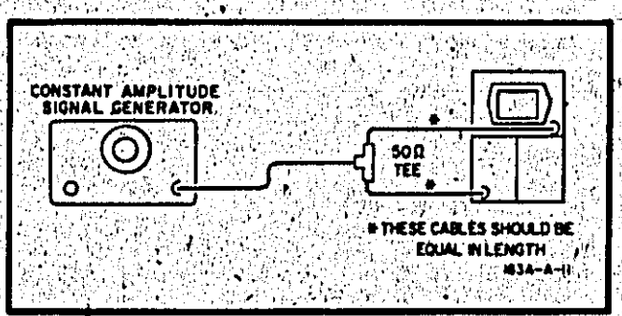


Figure 5-3. Horizontal Phase Adjustment Set-up

d. Set constant amplitude signal generator to approximately 1 MHz and adjust amplitude for exactly 5 divisions of horizontal deflection.

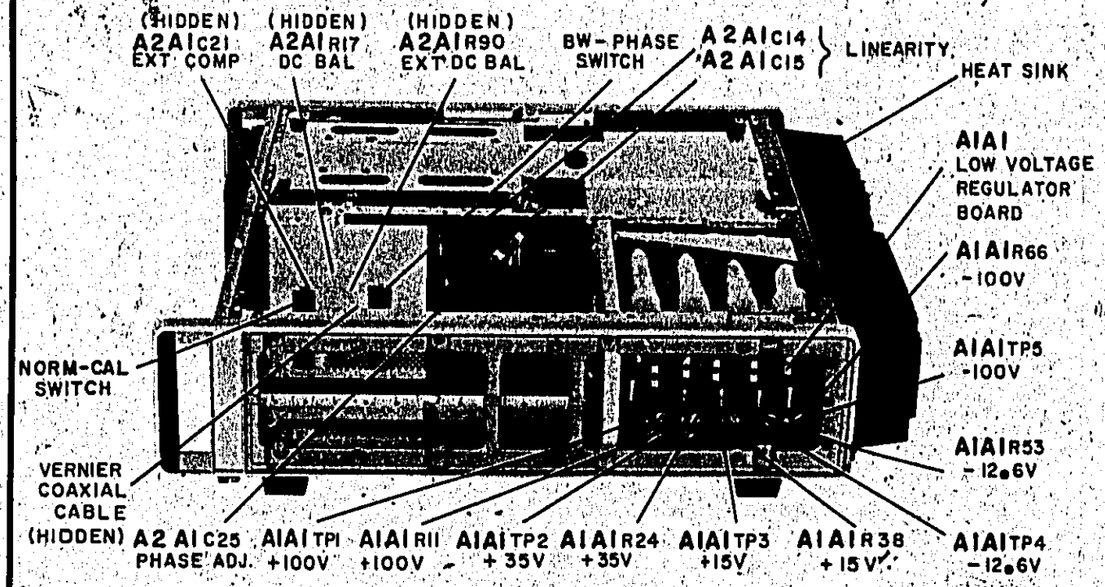
e. Set HORIZONTAL INT/EXT.

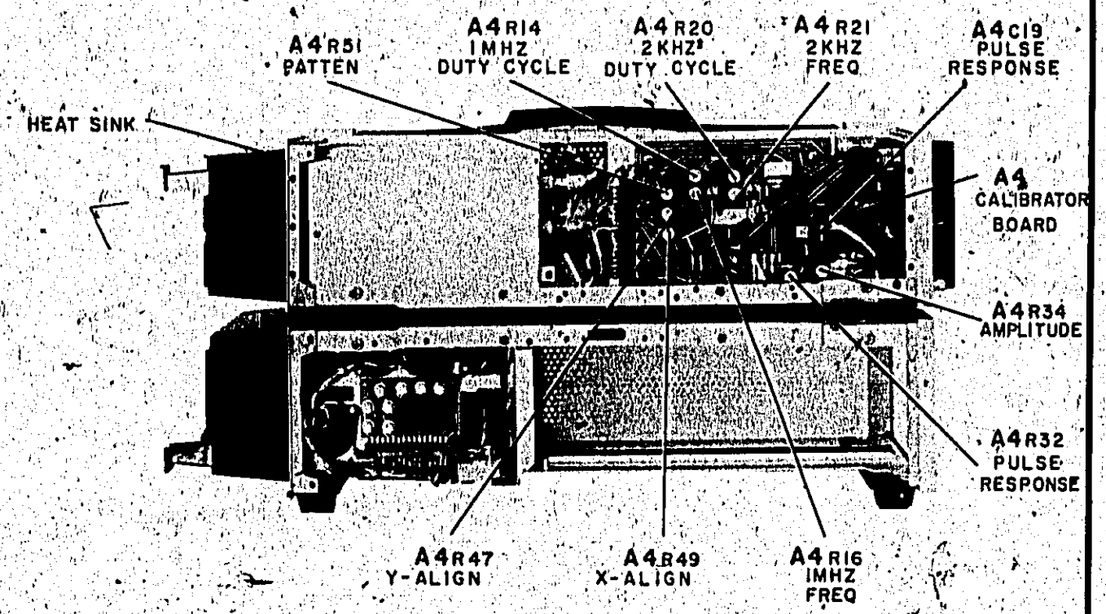
f. Set vertical channel A switch to on position and adjust vertical sensitivity for exactly 5 divisions deflection.

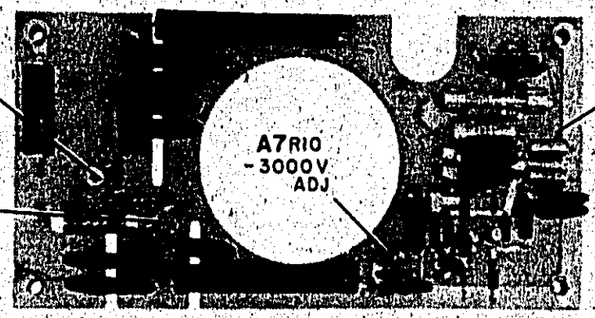
g. Set HORIZONTAL INT/EXT switch to EXT.

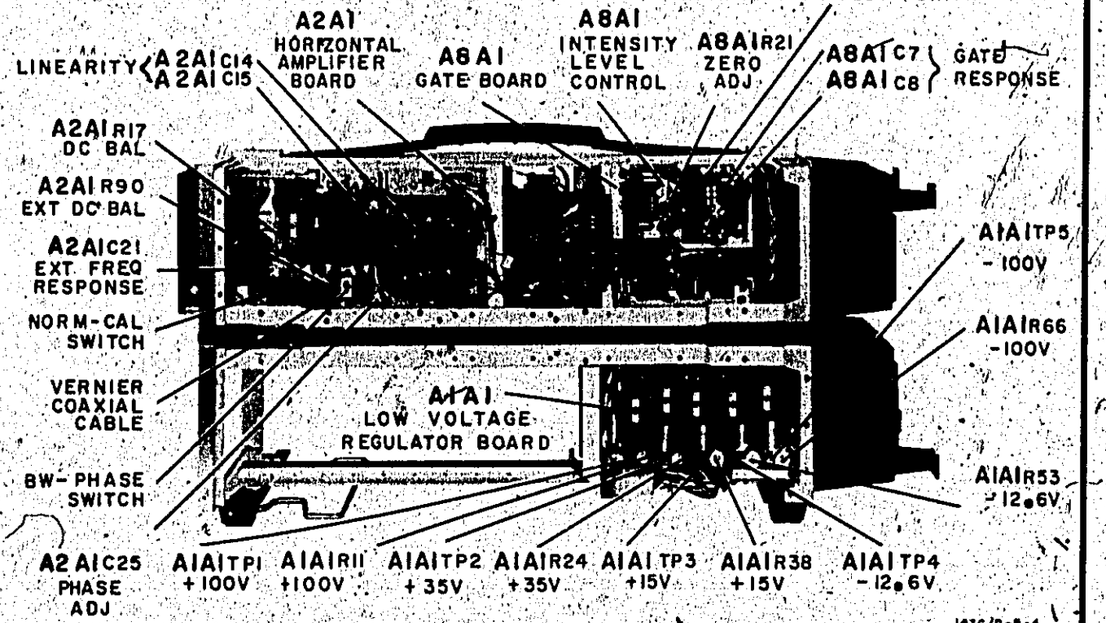
h. Observe display and adjust A2A1C25 for best diagonal line with no elliptical pattern.

i. Set bw-phase switch to bw and disconnect test equipment.









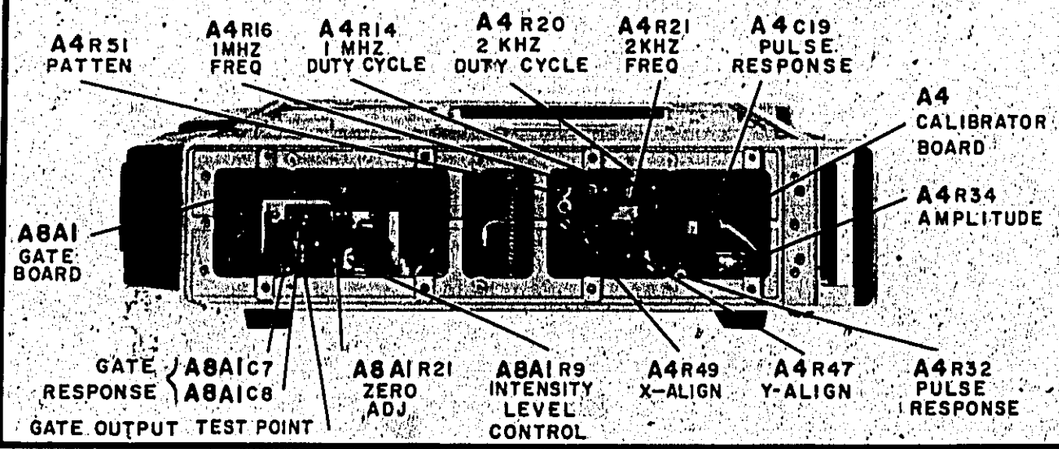


Figure 5-4. Adjustment Locations

PARTS LIST

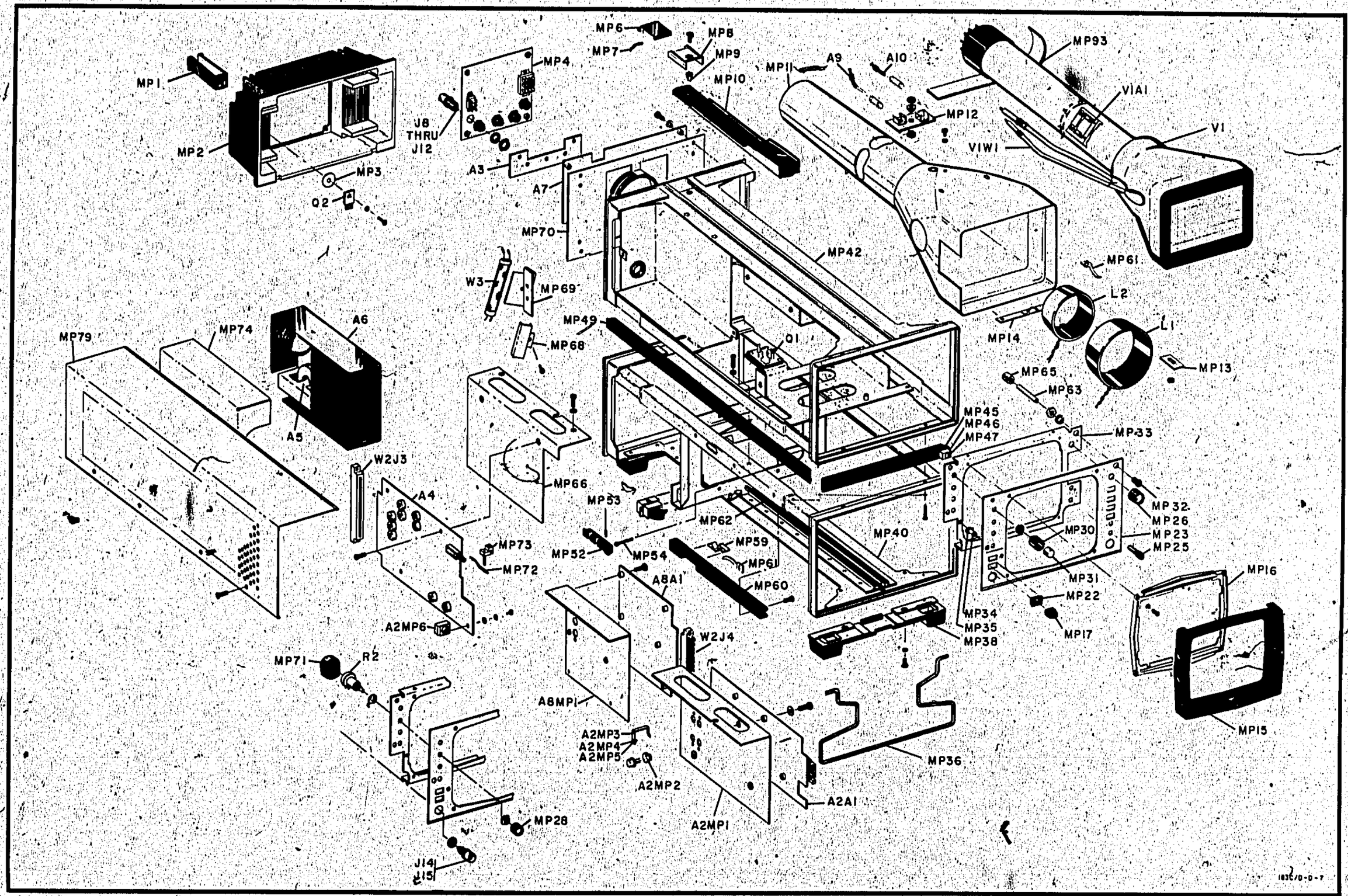


Figure 6-1. Exploded View, Mainframe Chassis

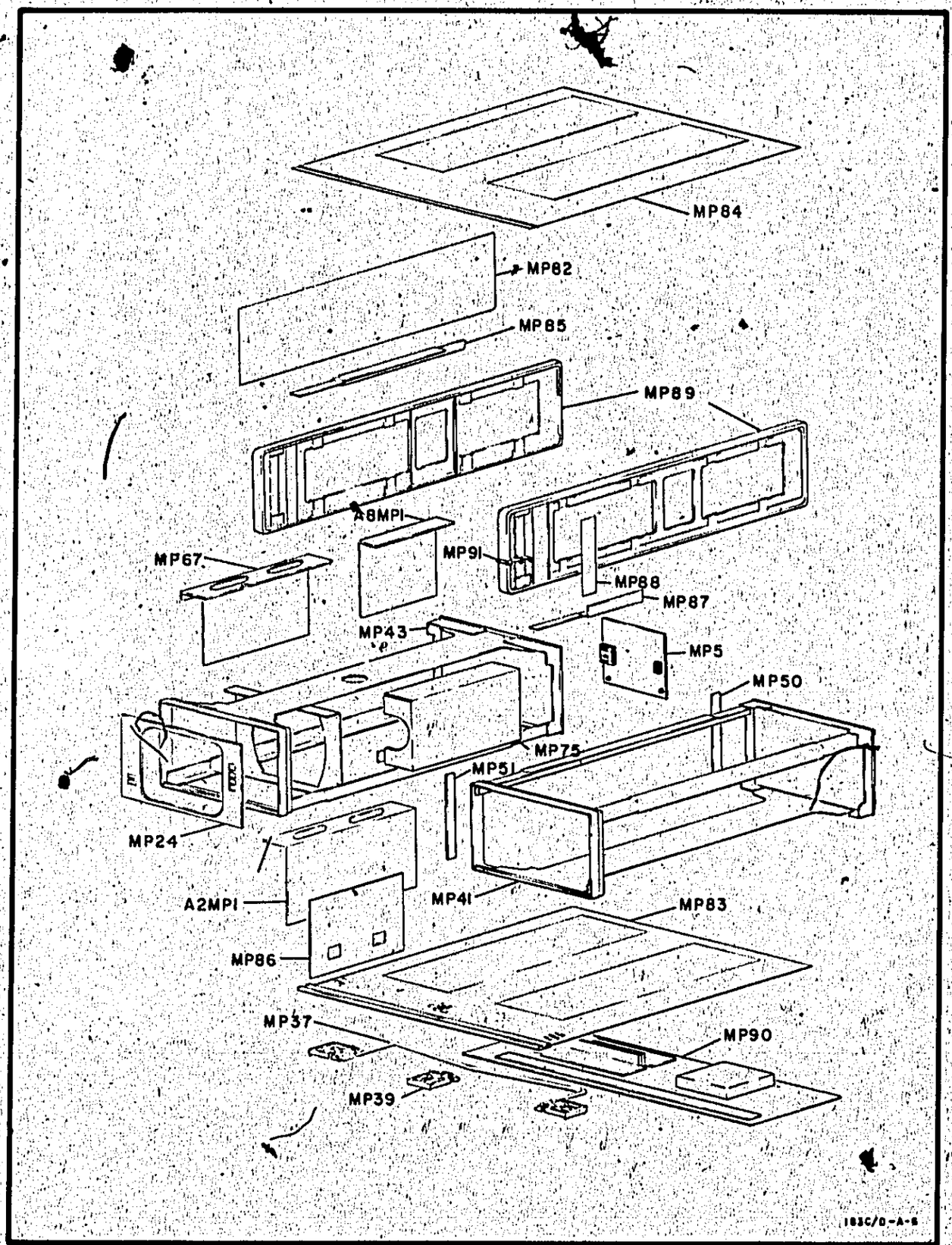


Figure 6-2. Exploded View, Rack Chassis

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts. The abbreviations used in the parts list are described in Table 6-1. Table 6-2 lists the parts in alphanumeric order by reference designator and includes the manufacturer and manufacturer's part number. Table 6-3 contains the list of manufacturer's codes.

6-3. ORDERING INFORMATION.

6-4. To obtain replacement parts from Hewlett-Packard, address order or inquiry to the nearest Hewlett-Packard Sales/Service Office and supply the following information:

a. Instrument model and serial number.

b. HP Part Number of item(s).

c. Quantity of part(s) desired.

d. Reference designator of part(s).

6-5. To order a part not listed in the table, provide the following information:

a. Instrument model and serial number.

b. Description of the part, including function and location in the instrument.

c. Quantity desired.

Table 6-1. Abbreviations for Replaceable Parts List

A	= ampere(s)	GRD	= ground(ed)	NPO	= negative positive zero (zero temperature coefficient)	RWV	= reverse working voltage
ASSY	= assembly	H	= henry(ies)	NPN	= negative-positive-negative	S-B	= slow-blow
BD	= board(s)	HG	= mercury	NSR	= not separately replaceable	SCR	= silicon controlled rectifier
BH	= binder head	HP	= Hewlett-Packard			SE	= selenium
BP	= bandpass	HZ	= hertz			SEC	= second(s)
C	= centi (10^{-2})	IF	= intermediate freq.	OBD	= order by description	SECT	= section(s)
CAR	= carbon	IMPG	= impregnated	OH	= oval head	SI	= silicon
CCW	= counterclockwise	INCD	= incandescent	OX	= oxide	SIL	= silver
CER	= ceramic	INCL	= include(s)			SL	= slide
CMO	= cabinet mount only	INS	= insulation(ed)	P	= peak	SP	= single pole
COAX	= coaxial	INT	= internal	PC	= printed (etched) circuit(s)	SPL	= special
COEF	= coefficient	K	= kilo (10^{3})	PF	= picofarads	ST	= single throw
COMP	= composition	KG	= kilogram	PHL	= Phillips	STD	= standard
CONN	= connector(s)	LB	= pound(s)	PIV	= peak inverse voltage(s)	TA	= tantalum
CRT	= cathode-ray tube	LH	= left hand	PNP	= positive-negative-positive	TD	= time delay
CW	= clockwise	LIN	= linear taper	P/O	= part of	TFL	= teflon
D	= deci (10^{-1})	LOG	= logarithmic taper	PORC	= porcelain	TGL	= toggle
DEPC	= deposited carbon	LPF	= low-pass filter(s)	POS	= position(s)	THYR	= thyristor
DP	= double pole	LVR	= lever	POT	= potentiometer(s)	TI	= titanium
DT	= double throw	M	= milli (10^{-3})	P-P	= peak-to-peak	TNLDIO	= tunnel diode(s)
ELECT	= electrolytic	MEG	= mega (10^{6})	PRGM	= program	TOL	= tolerance
ENCAP	= encapsulated	MET FILM	= metal film	PS	= polystyrene	TRIM	= trimmer
EXT	= external	MET OX	= metal oxide	PWV	= peak working voltage	U	= micro (10^{-6})
F	= farad(s)	MFR	= manufacturer	RECT	= rectifier(s)	V	= volts
FET	= field-effect transistor(s)	MINAT	= miniature	RF	= radio frequency	VAR	= variable
FH	= flat head	MOM	= momentary	RFI	= radio frequency interference	VDCW	= dc working volt(s)
FIL H	= fillister head	MTG	= mounting	RH	= round head or right hand	W	= watt(s)
FXD	= fixed	MY	= mylar	RMO	= rack mount only	W/	= with
G	= giga (10^{9})	N	= nano (10^{-9})	RMS	= root mean square	WIV	= working inverse voltage
GE	= germanium	N/C	= normally closed			W/O	= without
GL	= glass	NE	= neon			WW	= wirewound
		N/O	= normally open				

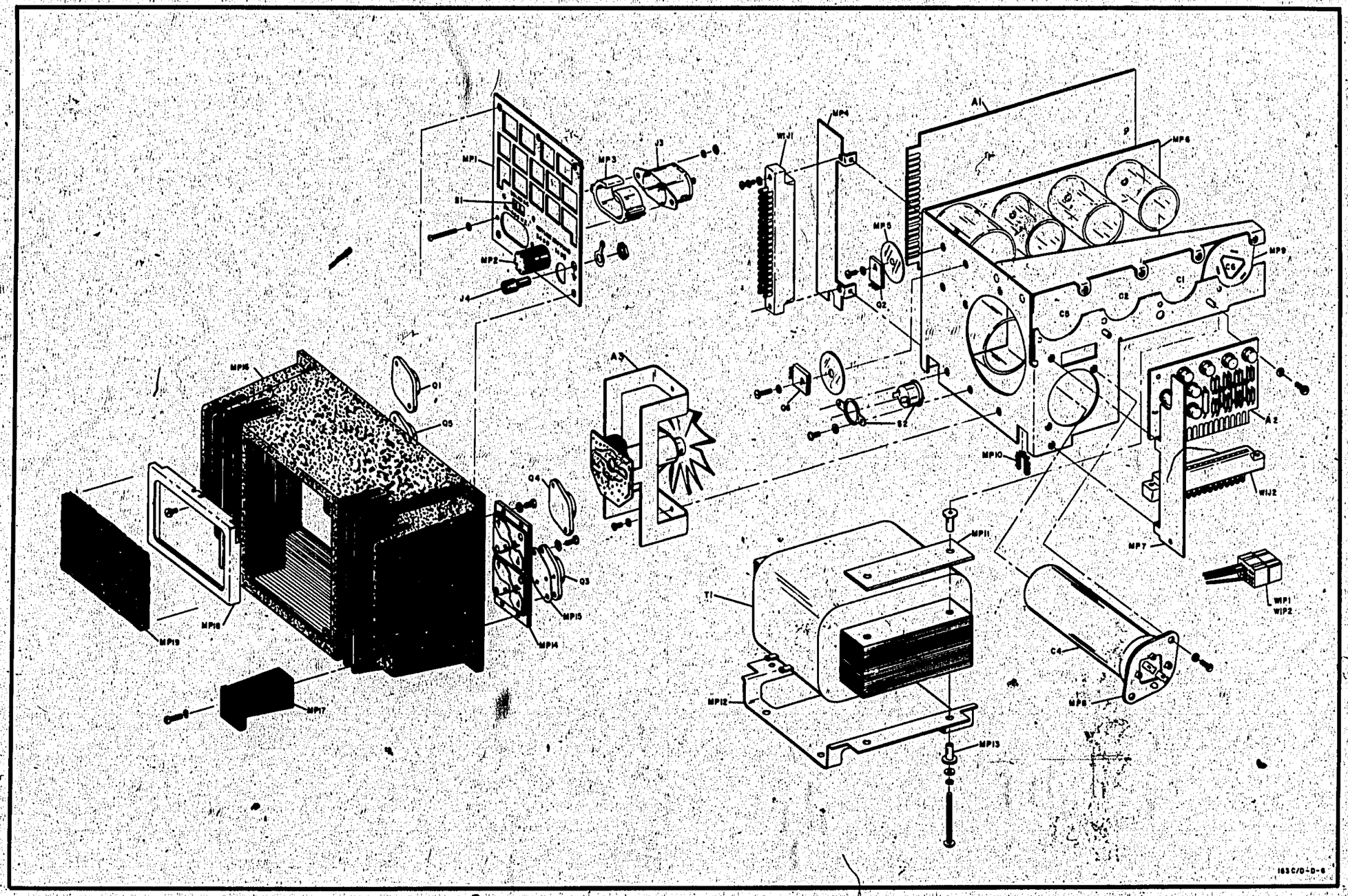


Figure 6-3. Exploded View, A1 Power Module

Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1			ASSY:LOW VOLTAGE POWER SUPPLY (SEE FIGURE 6-2)		
A1A1	00183-66509	1	BOARD ASSY:LOW VOLTAGE REGULATOR	28480	00183-66509
A1A1C1	0180-0094	1	C:FXD ELECT 100 UF +75-10% 25VDCW	56289	30D107G025DD2-DSM
A1A1C2	0160-0161	5	C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A1A1C3	0180-0045	2	C:FXD ELECT 10UF-10%+100% 150VDCW	56289	30D106G150DF4
A1A1C4	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A1A1C5	0180-0045	1	C:FXD ELECT 20 UF +75-10% 50VDCW	56289	30D206G050CC2-DSM
A1A1C6	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A1A1C7	0180-0058	2	C:FXD ELECT 50UF +10%+100% 25VDCW	56289	30D506G025DD4M1
A1A1C8	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A1A1C9	0180-0058		C:FXD ELECT 50UF -10%+100% 25VDCW	56289	30D506G025DD4M1
A1A1C10	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A1A1C11	0180-0045		C:FXD ELECT 10UF-10%+100% 150VDCW	56289	30D106G150DF4
A1A1CR1	1884-0082	2	THYRISTOR:SCR JEDEC TYPE 2N4441	04713	2N4441
A1A1CR2	1884-0082		THYRISTOR:SCR JEDEC TYPE 2N4441	04713	2N4441
A1A1CR3	1901-0026	5	DIODE:SILICON 0.75A 200PIV	04713	SR1358-8
A1A1CR4	1901-0026		DIODE:SILICON 0.75A 200PIV	04713	SR1358-8
A1A1F1	2110-0012	1	FUSE:0.5 AMP 250V	75915	312.500
A1A1F2	2110-0004	3	FUSE:CARTRIDGE 1/4 AMP 250V	75915	3AG/CAT. 312.250
A1A1F3	2110-0002	2	FUSE:CARTRIDGE 2 AMP 3 AG	75915	312.002
A1A1F4	2110-0002		FUSE:CARTRIDGE 2 AMP 3 AG	75915	312.002
A1A1F5	2110-0004		FUSE:CARTRIDGE 1/4 AMP 250V	75915	3AG/CAT. 312.250
A1A1Q1	1855-0062	1	TSTR:SI FET 30V	01295	2N1595
A1A1Q2	1854-0039	2	TSTR:SI NPN	80131	2N3053
A1A1Q3	1854-0039		TSTR:SI NPN	80131	2N3053
A1A1R1	0761-0037	1	R:FXD MET OX 390 OHM 5% 1W	28480	0761-0037
A1A1R2	0757-0946	2	R:FXD FLM 8.2K OHM 2% 1/8W	28480	0757-0946
A1A1R3	0757-0924	2	R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924
A1A1R4	0757-0976	1	R:FXD FLM 150K OHM 2% 1/8W	28480	0757-0976
A1A1R5	0757-0940	1	R:FXD FLM 4700 OHM 2% 1/8W	28480	0757-0940
A1A1R6	0757-0465	4	R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A1A1R7	0811-1676	3	R:FXD WW 6.8 OHM 5% 2W	28480	0811-1676
A1A1R8	0757-0281	1	R:FXD MET FLM 2.74K OHM 1% 1/8W	28480	0757-0281
A1A1R9	0761-0028	1	R:FXD MET OX 12K OHM 5% 1W	28480	0761-0028
A1A1R10	0757-0437	2	R:FXD MET FLM 4750 OHM 1% 1/8W	28480	0757-0437
A1A1R11	2100-1772	4	R:VAR WW 500 OHM 5% TYPE H 1W	28480	2100-1772
A1A1R12	0757-0769	7	R:FXD FLM 51.1K OHM 1% 1/4W	28480	0757-0769
A1A1R13	0761-0038	1	R:FXD MET OX 5600 OHM 5% 1W	28480	0761-0038
A1A1R14	CB 2241	4	R:FXD COMP 220K OHM 10% 1/4W	01121	CB2241
A1A1R15	0757-0924		R:FXD MET FLM 1K OHM 2% 1/8W	28480	0757-0924
A1A1R16	0757-0963	1	R:FXD FLM 43K OHM 2% 1/8W	28480	0757-0963
A1A1R17	0757-0744	1	R:FXD FLM 33.2K OHM 1% 1/4W	28480	0757-0744
A1A1R18	0757-0444	3	R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A1A1R19	0757-0942	1	R:FXD FLM 5.6K OHM 2% 1/8W	28480	0757-0942
A1A1R20	0757-0455	1	R:FXD FLM 36.5K OHM 1% 1/8W	28480	0757-0455
A1A1R21	0811-1676		R:FXD WW 6.8 OHM 5% 2W	28480	0811-1676
A1A1R22	0757-0427	8	R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A1A1R23	0757-0434	5	R:FXD MET FLM 3.65K OHM 1% 1/8W	28480	0757-0434
A1A1R24	2100-1772		R:VAR WW 500 OHM 5% TYPE H 1W	28480	2100-1772
A1A1R25	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A1A1R26	0687-3321	1	R:FXD COMP 3300 OHM 10% 1/2W	01121	EB 3321
A1A1R27	0761-0005	1	R:FXD MET OX 2200 OHM 5% 1W	14674	C-32 OBD
A1A1R28	0684-2241		R:FXD COMP 220K OHM 10% 1/4W	01121	CB 2241
A1A1R29	0757-0911	2	R:FXD FLM 300 OHM 2% 1/8W	28480	0757-0911
A1A1R30	0757-0952	1	R:FXD FLM 15K OHM 2% 1/8W	28480	0757-0952
A1A1R31	0757-0748	3	R:FXD FLM 47.5K OHM 1% 1/4W	28480	0757-0748
A1A1R32	0757-0438	4	R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A1A1R33	0757-0930	2	R:FXD FLM 1.8K OHM 2% 1/8W	28480	0757-0930
A1A1R34	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A1A1R35	0811-1340	2	R:FXD WW 1 OHM 5% 5W	28480	0811-1340
A1A1R36	0757-0427		R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A1A1R37	0757-0434		R:FXD MET FLM 3.65K OHM 1% 1/8W	28480	0757-0434
A1A1R38	2100-1772		R:VAR WW 500 OHM 5% TYPE H 1W	28480	2100-1772
A1A1R39	0757-0439	1	R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A1A1R40	0687-1021	1	R:FXD COMP 1000 OHM 10% 1/2W	01121	EB 1021
A1A1R41	0757-0858	2	R:FXD FLM 82 OHM 2% 1/8W	28480	0757-0858
A1A1R42	0761-0039	1	R:FXD MET OX 680 OHM 5% 1W	28480	0761-0039
A1A1R43	0684-2241		R:FXD COMP 220K OHM 10% 1/4W	01121	CB 2241
A1A1R44	0757-0911		R:FXD FLM 300 OHM 2% 1/8W	28480	0757-0911

See Introduction to this section for ordering information

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A1R45	0757-0946		R:FXD FLM 8.2K OHM 2% 1/8W	28480	0757-0946
A1A1R46	0757-0435	1	R:FXD FLM 3920 OHM 1% 1/8W	28480	0757-0435
A1A1R47	0757-0749		R:FXD FLM 91.1K OHM 1% 1/4W	28480	0757-0749
A1A1R48	0757-0932	1	R:FXD MET FLM 2.2K OHM 2% 1/8W	28480	0757-0932
A1A1R49	0757-0288	1	R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A1A1R50	0811-1340		R:FXD WW 1 OHM 5% 5W	28480	0811-1340
A1A1R51	0757-0427		R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A1A1R52	0757-0283	2	R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A1A1R53	2100-1332		R:VAR WW 500 OHM 5% TYPE H 1W	28480	2100-1772
A1A1R54	0757-0434		R:FXD MET FLM 3.65K OHM 1% 1/8W	28480	0757-0434
A1A1R55	0757-0898		R:FXD FLM 82 OHM 2% 1/8W	28480	0757-0898
A1A1R56	0684-2241		R:FXD COMP 220K OHM 10% 1/4W	01121	CB 2241
A1A1R57	0757-0930		R:FXD FLM 1.8K OHM 2% 1/8W	28480	0757-0930
A1A1R58	0757-0972	1	R:FXD FLM 100K OHM 2% 1/8W	28480	0757-0972
A1A1R59	0757-0748		R:FXD FLM 47.5K OHM 1% 1/4W	28480	0757-0748
A1A1R60	0757-0749		R:FXD FLM 91.1K OHM 1% 1/4W	28480	0757-0749
A1A1R61	0757-0956	1	R:FXD FLM 22K OHM 2% 1/8W	28480	0757-0956
A1A1R62	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A1A1R63	0811-1676		R:FXD WW 6.8 OHM 5% 2W	28480	0811-1676
A1A1R64	0757-0317	1	R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A1A1R65	0757-0427		R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A1A1R66	2100-1773	1	R:VAR WW 1K OHM 5% TYPE H 1W	28480	2100-1773
A1A1R67	0757-0748		R:FXD FLM 47.5K OHM 1% 1/4W	28480	0757-0748
A1A1TP1	1251-0206	4	CONNECTOR:SOCKET 0.15 BDY DIA TEFLON	98291	SKT-400
A1A1TP2	1251-0206		CONNECTOR:SOCKET 0.15 BDY DIA TEFLON	98291	SKT-400
A1A1TP3	1251-0206		CONNECTOR:SOCKET 0.15 BDY DIA TEFLON	98291	SKT-400
A1A1TP4	1251-0206		CONNECTOR:SOCKET 0.15 BDY DIA TEFLON	98291	SKT-400
A1A1TP5	1251-0206		CONNECTOR:SOCKET 0.15 BDY DIA TEFLON	98291	SKT-400
A1A1U1	1821-0002	6	TRANSISTOR ARRAY:SI NPN	02735	CA3045
A1A1U2	1821-0002		TRANSISTOR ARRAY:SI NPN	02735	CA3045
A1A1U3	1821-0002		TRANSISTOR ARRAY:SI NPN	02735	CA3045
A1A1U4	1821-0002		TRANSISTOR ARRAY:SI NPN	02735	CA3045
A1A1U5	1821-0002		TRANSISTOR ARRAY:SI NPN	02735	CA3045
A1A1VR1	1902-0049	4	DIODE:BREAKDOWN 6.19V 5%	04713	SZ10939-122
A1A1VR2	1902-1216	1	DIODE BREAKDOWN:9V 5%	04713	1N938A
A1A1VR3	1902-0049		DIODE:BREAKDOWN 6.19V 5%	04713	SZ10939-122
A1A1VR4	1902-0049		DIODE:BREAKDOWN 6.19V 5%	04713	SZ10939-122
A1A1VR5	1902-3222	1	DIODE BREAKDOWN:17.4V 5%	28480	1902-3222
A1A1VR6	1902-0049		DIODE:BREAKDOWN 6.19V 5%	04713	SZ10939-122
A1A1VR7	1902-3203	3	DIODE BREAKDOWN:SILICON 14.7V 5%	28480	1902-3203
A1A1XF1	2110-0269	3	CLIP:FUSE 0.250" DIA	91506	6008-32CN
A1A1XU1	1200-0768	5	SOCKET:INTEGRATED CIRCUIT 14 CONTACT	91506	314-AG5D-3R
A1A1XU2	1200-0768		SOCKET:INTEGRATED CIRCUIT 14 CONTACT	91506	314-AG5D-3R
A1A1XU3	1200-0768		SOCKET:INTEGRATED CIRCUIT 14 CONTACT	91506	314-AG5D-3R
A1A1XU4	1200-0768		SOCKET:INTEGRATED CIRCUIT 14 CONTACT	91506	314-AG5D-3R
A1A1XU5	1200-0768		SOCKET:INTEGRATED CIRCUIT 14 CONTACT	91506	314-AG5D-3R
A1A2	00183-66513	1	BOARD ASSY:LOW VOLTAGE RECTIFIER	28480	00183-66513
A1A2CR1	1901-0045	8	DIODE:SILICON 0.75A 100PIV	04713	SR1358-7
A1A2CR2	1901-0045		DIODE:SILICON 0.75A 100PIV	04713	SR1358-7
A1A2CR3	1901-0045		DIODE:SILICON 0.75A 100PIV	04713	SR1358-7
A1A2CR4	1901-0045		DIODE:SILICON 0.75A 100PIV	04713	SR1358-7
A1A2CR5	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A1A2CR6	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A1A2CR7	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A1A2CR8	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A1A2CR9	1901-0045		DIODE:SILICON 0.75A 100PIV	04713	SR1358-7
A1A2CR10	1901-0045		DIODE:SILICON 0.75A 100PIV	04713	SR1358-7
A1A2CR11	1901-0045		DIODE:SILICON 0.75A 100PIV	04713	SR1358-7
A1A2CR12	1901-0045		DIODE:SILICON 0.75A 100PIV	04713	SR1358-7
A1A2CR13	1901-0415	8	DIODE:SILICON 50 PIV 3A	28480	1901-0415
A1A2CR14	1901-0415		DIODE:SILICON 50 PIV 3A	28480	1901-0415
A1A2CR15	1901-0415		DIODE:SILICON 50 PIV 3A	28480	1901-0415
A1A2CR16	1901-0415		DIODE:SILICON 50 PIV 3A	28480	1901-0415
A1A2CR17	1901-0415		DIODE:SILICON 50 PIV 3A	28480	1901-0415
A1A2CR18	1901-0415		DIODE:SILICON 50 PIV 3A	28480	1901-0415
A1A2CR19	1901-0415		DIODE:SILICON 50 PIV 3A	28480	1901-0415
A1A2CR20	1901-0415		DIODE:SILICON 50 PIV 3A	28480	1901-0415
A1A2CR21	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A1A2CR22	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A1A2CR23	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A1A2CR24	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A1A2F1	2110-0004		FUSE:CARTRIDGE 1/4 AMP 250V	75915	3AG/CAT. 312.250
A1A2R1	0687-6831	3	R:FXD COMP 68K OHM 10% 1/2W	01121	EB 6831
A1A2R2	0687-6831		R:FXD COMP 68K OHM 10% 1/2W	01121	EB 6831
A1A2R3	0684-8221	2	R:FXD COMP 8200 OHM 10% 1/4W	01121	CB 8221

See introduction to this section for ordering information

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A2R4	0684-8221		R:FXD COMP 8200 OHM 10% 1/4W	01121	CB 8221
A1A2R5	0687-4831		R:FXD COMP 48K OHM 10% 1/2W	01121	EB 4831
A1A2R6	0761-0022	1	R:FXD MET OX 620 OHM 5% 1W	28480	0761-0022
A1A2VR1	1902-3193	1	DIODE BREAKDOWN:13.3V 5%	28480	1902-3193
A1A2XF1	2110-0265		CLIP:FUSE 0.250" DIA	91506	4008-32CM
A1A3	00183-69501	1	BLOWER ASSY NOTE THE MOTOR, CIRCUIT BD, HEAT SINK, FAN BLADE AND BRACKET ARE AVAILABLE ONLY AS A COMPLETE UNIT AS A1A3. CIRCUIT BOARDS AND MOTORS ARE NOT AVAILABLE AS SEPARATE PARTS. INDIVIDUAL CIRCUIT BOARDS PARTS ARE AVAILABLE AS LISTED BELOW.	28480	00183-69501
A1A3C1	0180-0155	6	C:FXD ELECT 2.2 UF 20% 20VDCW	56289	1500225X0020A2-DYS
A1A3CR1	1901-0040	16	DIODE:SILICON 30MA 30MV	07263	FDG1088
A1A3CR2	1901-0040		DIODE:SILICON 30MA 30MV	07263	FDG1088
A1A3CR3	1901-0040		DIODE:SILICON 30MA 30MV	07263	FDG1088
A1A3CR4	1901-0040		DIODE:SILICON 30MA 30MV	07263	FDG1088
A1A3CR5	1901-0049	1	DIODE:SILICON 0.75A 50PIV	04713	SR1358-4
A1A3CR6	1901-0040		DIODE:SILICON 30MA 30MV	07263	FDG1088
A1A3CR7	1901-0040		DIODE:SILICON 30MA 30MV	07263	FDG1088
A1A3Q1	1853-0020	5	TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1A3Q2	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1A3Q3	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1A3Q4	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1A3Q5	1854-0071	1	TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1A3Q6	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1A3R1	0683-0335	1	R:FXD COMP 3.3 OHM 5% 1/4W	01121	CB 0335
A1A3R2	0684-3311	2	R:FXD COMP 330 OHM 10% 1/4W	01121	CB 3311
A1A3R3	0684-3311		R:FXD COMP 330 OHM 10% 1/4W	01121	CB 3311
A1A3R4	0698-7255	2	R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A1A3R5	0698-7255		R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A1A3R6	0698-7239	1	R:FXD FLM 1.33K OHM 2% 1/8W	28480	0698-7239
A1A3VR1	1902-3094	1	DIODE BREAKDOWN:5.11V 2%	28480	1902-3094
A1C1	0140-2314	2	C:FXD ELECT 500 UF +50-10% 160VDCW	00853	505-1612-02
A1C2	0140-2312	1	C:FXD ELECT 350/300 UF 60/160 VDCW	00853	505-1615-02
A1C3			NOT ASSIGNED		
A1C4	0180-2313	2	C:FXD ELECT 6000 UF +75-10% 30VDCW	56289	62D10136-DFP
A1C5	0180-2313		C:FXD ELECT 6000 UF +75-10% 30VDCW	56289	62D10136-DFP
A1C6	0180-2314		C:FXD ELECT 500 UF +50-10% 160VDCW	00853	505-1612-02
A1F1	2110-0025	1	FUSE:CARTRIDGE 3 AMP 125V SLOW BLOW	75915	313003
A1F2	2110-0059	1	FUSE:CARTRIDGE 1-1/2A SLO-BLO	71400	MDL 1.5
A1J3	1251-0148	1	CONNECTOR:POWER 3 PIN MALE	87930	1065-1
A1J4	1510-0038	3	BINDING POST	28480	1510-0038
A1MP1	00183-00210	1	PANEL:REAR POWER	28480	00183-00210
A1MP2	1400-0084	1	FUSEHOLDER:EXTRACTOR POST TYPE	75915	342014
A1MP3	5020-0549	1	SPACER:POWER PLUG	28480	5020-0549
A1MP4	00183-01212	1	BRACKET:PLUG	28480	00183-01212
A1MP5	0340-0850	2	WASHER:TRANSISTOR INSULATOR	04713	14852400F12
A1MP6	00183-61204	1	BRACKET ASSY:CAPACITOR	28480	00183-61204
A1MP7	00183-01231	1	BRACKET:POWER MODULE	28480	00183-01231
A1MP8	1520-0001	1	PLATE:MOUNTING ELECTROLYTIC CAPACITOR	28480	1520-0001
A1MP9	1520-0002	1	PLATE:MOUNTING	28480	1520-0002
A1MP10	0400-0018	1	GROMMET:CHANNEL U-SHAPED	95987	MG-101
A1MP11	00183-01228	4	BRACKET:SHIM	28480	00183-01228
A1MP12	00183-01210	1	BRACKET:LOWER TRANSFORMER	28480	00183-01210
A1MP13	0150-0004	1	BUSHING:INSULATOR FOR #8 HOW	00000	ORD
A1MP14	00183-61203	1	BRACKET ASSY:REGULATOR	28480	00183-61203
A1MP15	1200-0077	1	INSULATOR:TRANSISTOR, MICA	14037	#112
A1MP16	00183-21101	2	HEAT SINK	28480	00183-21101
A1MP17	5040-0447	2	FOOT:REAR(LONG) (183C ONLY)	28480	5040-0447
A1MP18	00183-02301	1	HOLDER:FILTER	28480	00183-02301
A1MP19	9150-0100	1	FILTER:INDUSTRIAL FOAM, GRAY	28480	9150-0100
A1Q1	1854-0417	3	TSTR:SI NPN	28480	1854-0417
A1Q2	1854-0320	3	TSTR:SI NPN	28480	1854-0320
A1Q3	1854-0063	2	TSTR:SI NPN	80131	2N3055
A1Q4	1854-0063		TSTR:SI NPN	80131	2N3055
A1Q5	1854-0417		TSTR:SI NPN	28480	1854-0417
A1Q6	1854-0320		TSTR:SI NPN	28480	1854-0320
A1S1	3101-0033	1	SWITCH:SLIDE DPDT 0.5A 125AC/DC	82389	11A-1001A
A1S2	0440-0077	1	THERMOSTAT:FIXED TEMPERATURE	28480	0440-0077
A1T1	9100-1132	1	TRANSFORMER:POWER	28480	9100-1132
A1W1	00183-61630	1	CABLE ASSY:POWER SUPPLY	28480	00183-61630

See introduction to this section for ordering information

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1W1J1	1251-0334	2	CONN:PC 36(2X18) CONTACTS	07233	251-18-30-261
A1W1J2	1251-0159	2	CONNECTOR:2X15 CONTACT	28480	1251-0159
A1W1P1	1251-2409	2	BODY:R & P CONNECTOR 15 FEMALE CONTACT	27264	1425-15R-1
A1W1P2	1251-2409	1	BODY:R & P CONNECTOR 15 FEMALE CONTACT	27264	1425-15R-1
A2	00183-45504	1	HORIZONTAL AMPLIFIER MODULE (MODEL 183C ONLY)	28480	00183-49504
A2	00183-49505	1	HORIZONTAL AMPLIFIER MODULE (MODEL 183D ONLY)	28480	00183-49505
A2A1	00183-66511		BOARD ASSY: HORIZONTAL AMPLIFIER	28480	00183-66511
A2A1C1	0160-2244	1	C:FXD CER 3.0PF +/-0.25 PF 500VDCW	28480	0160-2244
A2A1C2	0180-0230	6	C:FXD ELECT 1.0 UF 20% 50VDCW	56289	150D105X0050A2-DYS
A2A1C3	0180-0230		C:FXD ELECT 1.0 UF 20% 50VDCW	56289	150D105X0050A2-DYS
A2A1C4	0160-3665	49	C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C5	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C6	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C7	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C8	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C9	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C10	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C11	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C12	0160-3452	8	C:FXD DISC CER 0.02 UF 20% 100VDCW	56289	C023B101H203MS25-CDH
A2A1C13	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C14	0132-0007	2	C:VAR POLY 0.7 TO 3.0 PF 350VDCW	72982	535-033-AR
A2A1C15	0132-0007		C:VAR POLY 0.7 TO 3.0 PF 350VDCW	72982	535-033-AR
A2A1C16	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C17	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C18	0170-0022	1	C:FXD MY 0.1UF 20% 600VDCW	09134	TYPE 24
A2A1C19	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C20	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C21	0121-0055	4	C:VAR CER 2-8 PF 300VDCW	28480	0121-0059
A2A1C22	0160-2250	1	C:FXD CER 5.1 PF 500VDCW	72982	301-000-COH0-519E
A2A1C23	0160-3452		C:FXD DISC CER 0.02 UF 20% 100VDCW	56289	C023B101H203MS25-CDH
A2A1C24			NOT ASSIGNED		
A2A1C25	0121-0105	1	C:VAR CER 9-35 PF NPO	28480	0121-0105
A2A1C26	0180-0230				
A2A1C27	0180-0100	11	C:FXD ELECT 1.0 UF 20% 50VDCW	56289	150D105X0050A2-DYS
A2A1C28	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A2A1C29	0160-3452		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A2A1C30	0180-0100		C:FXD DISC CER 0.02 UF 20% 100VDCW	56289	C023B101H203MS25-CDH
A2A1C31	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A2A1C32	0160-3452		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A2A1C33	0180-0230		C:FXD DISC CER 0.02 UF 20% 100VDCW	56289	C023B101H203MS25-CDH
A2A1C34	0160-0230		C:FXD ELECT 1.0 UF 20% 50VDCW	56289	150D105X0050A2-DYS
A2A1C35	0160-3665		C:FXD ELECT 1.0 UF 20% 50VDCW	56289	150D105X0050A2-DYS
A2A1C36	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C37	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C38	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C39	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C40	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C41	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C42	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C43	0180-0230		C:FXD ELECT 1.0 UF 20% 50VDCW	56289	150D105X0050A2-DYS
A2A1C44	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C45	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C46	0160-3665		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A2A1C47	0160-3452		C:FXD DISC CER 0.02 UF 20% 100VDCW	56289	C023B101H203MS25-CDH
A2A1CR1	1901-0040	4	DIODE:SILICON 30MA 30WV	07263	FDG1088
A2A1CR2	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A2A1CR3	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A2A1CR4	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A2A1L1			NOT ASSIGNED		
A2A1L2	9140-0179	11	COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L3	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L4	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L5	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L6	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L7	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L8	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L9	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L10	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L11	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1L12	9140-0179		COIL/CHOKE 22.0 UH 10%	28480	9140-0179
A2A1MP1	1205-0204	4	HEAT DISSIPATOR:SEMICONDUCTOR	28480	1205-0204
A2A1MP2	1205-0204		HEAT DISSIPATOR:SEMICONDUCTOR	28480	1205-0204

*See introduction to this section for ordering information

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A1MP3	1205-0204	3	HEAT DISSIPATOR:SEMICONDUCTOR	28480	1205-0204
A2A1MP4	1205-0204		HEAT DISSIPATOR:SEMICONDUCTOR	28480	1205-0204
A2A101	1853-0034	17	TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0034
A2A102	1853-0034		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0034
A2A103	1854-0019		TSTR:SI NPN	28480	1854-0019
A2A104	1854-0019		TSTR:SI NPN	28480	1854-0019
A2A105	1854-0019		TSTR:SI NPN	28480	1854-0019
A2A106	1854-0019		TSTR:SI NPN	28480	1854-0019
A2A107	1854-0019		TSTR:SI NPN	28480	1854-0019
A2A108	1854-0019		TSTR:SI NPN	28480	1854-0019
A2A109	1854-0019	5	TSTR:SI NPN	28480	1854-0019
A2A1010	1854-0019		TSTR:SI NPN	28480	1854-0019
A2A1011	1853-0203		TSTR:SI PNP	28480	1853-0203
A2A1012	1853-0203		TSTR:SI PNP	28480	1853-0203
A2A1013			NOT ASSIGNED		
A2A1016 THRU A2A1017	1855-0061	1	TSTR:SI FET	80131	2N3245
A2A1018	1854-0215	6	TSTR:SI NPN	80131	2N3904
A2A1R1	0698-7516	2	R:FXD FLM 244.3 OHM 0.25% 1/8W	28480	0698-7516
A2A1R2	0698-7517	1	R:FXD FLM 990 OHM 0.25% 1/8W	28480	0698-7517
A2A1R3	0698-7516		R:FXD FLM 244.3 OHM 0.25% 1/8W	28480	0698-7516
A2A1R4	0698-7518	2	R:FXD FLM 200 OHM 0.25% 1/8W	28480	0698-7518
A2A1R5	0757-0388	4	R:FXD FLM 30.1 OHM 1% 1/8W	28480	0757-0388
A2A1R6	0757-0190	2	R:FXD MET FLM 20K OHM 1% 1/2W	28480	0757-0190
A2A1R7	0757-0388		R:FXD FLM 30.1 OHM 1% 1/8W	28480	0757-0388
A2A1R8	0757-0434		R:FXD MET FLM 3.65K OHM 1% 1/8W	28480	0757-0434
A2A1R9	0757-0284	3	R:FXD MET FLM 150 OHM 1% 1/8W	28480	0757-0284
A2A1R10	0757-0284		R:FXD MET FLM 150 OHM 1% 1/8W	28480	0757-0284
A2A1R11	0698-3445	1	R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A2A1R12	0757-0434		R:FXD MET FLM 3.65K OHM 1% 1/8W	28480	0757-0434
A2A1R13	0757-0421	2	R:FXD MET FLM 825 OHM 1% 1/8W	28480	0757-0421
A2A1R14	0757-0401	9	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A2A1R15	0757-0482	1	R:FXD MET FLM 511K OHM 1% 1/8W	28480	0757-0482
A2A1R16	0757-0456	6	R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0456
A2A1R17	2100-2516	1	R:VAR CERMET 100K OHM 10% LIN 1/2W	28480	2100-2516
A2A1R18	0757-0456		R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0456
A2A1R19	0758-0042	1	R:FXD MET OX 1300 OHM 5% 1/2W	28480	0758-0042
A2A1R20	0757-0398	2	R:FXD MET FLM 73 OHM 1% 1/8W	28480	0757-0398
A2A1R21	0757-0747	2	R:FXD FLM 9110 OHM 1% 1/4W	28480	0757-0747
A2A1R22	0757-0769		R:FXD FLM 51.1K OHM 1% 1/4W	28480	0757-0769
A2A1R23	0757-0408	1	R:FXD MET FLM 243 OHM 1% 1/8W	28480	0757-0408
A2A1R24	2100-3028	1	R:VAR COMP 200 OHM 10% LIN 1/4W	28480	2100-3028
A2A1R25	0757-0769		R:FXD FLM 51.1K OHM 1% 1/4W	28480	0757-0769
A2A1R26	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A2A1R27	0757-0747		R:FXD FLM 9110 OHM 1% 1/4W	28480	0757-0747
A2A1R28	0757-0427		R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A2A1R29	0757-0388		R:FXD FLM 30.1 OHM 1% 1/8W	28480	0757-0388
A2A1R30	0761-0073	2	R:FXD MET OX 13K OHM 5% 1W	28480	0761-0073
A2A1R31	0764-0044	1	R:FXD MET OX 6.2K OHM 5% 2W	28480	0764-0044
A2A1R32	0761-0073		R:FXD MET OX 13K OHM 5% 1W	28480	0761-0073
A2A1R33	0757-0388		R:FXD FLM 30.1 OHM 1% 1/8W	28480	0757-0388
A2A1R34	0757-0427		R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A2A1R35	0757-0832	2	R:FXD MET FLM 4.75K OHM 1% 1/2W	28480	0757-0832
A2A1R36	0757-0832		R:FXD MET FLM 4.75K OHM 1% 1/2W	28480	0757-0832
A2A1R37	0757-0346	5	R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2A1R38	0757-0758	1	R:FXD FLM 16.2K OHM 1% 1/4W	28480	0757-0758
A2A1R39	0757-0846	2	R:FXD MET FLM 22.1K OHM 1.0% 1/2W	28480	0757-0846
A2A1R40			NOT ASSIGNED		
A2A1R41	0757-0846		R:FXD MET FLM 22.1K OHM 1.0% 1/2W	28480	0757-0846
A2A1R42	0757-0420	4	R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A2A1R43	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A2A1R44	0698-3447	1	R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A2A1R45	0757-0394	4	R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A2A1R46	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A2A1R47	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A2A1R48	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A2A1R49	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A2A1R50	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A2A1R51	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A2A1R52	0757-0280	5	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R53	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A2A1R54	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A2A1R55	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A2A1R56	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R57	0757-0769		R:FXD FLM 51.1K OHM 1% 1/4W	28480	0757-0769
A2A1R58	0757-0769		R:FXD FLM 51.1K OHM 1% 1/4W	28480	0757-0769
A2A1R59	0757-0436	2	R:FXD MET FLM 4.32K OHM 1% 1/8W	28480	0757-0436

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A1R60	0757-0436		R:FXD MET FLM 4.32K OHM 1% 1/8W	28480	0757-0436
A2A1R61	0757-0726	2	R:FXD MET FLM 511 OHM 1% 1/4W	28480	0757-0726
A2A1R62	0757-0726		R:FXD MET FLM 511 OHM 1% 1/4W	28480	0757-0726
A2A1R63	0757-0829	4	R:FXD MET FLM 3650 OHM 1% 1/2W	28480	0757-0829
A2A1R64	0757-0449	3	R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A2A1R65	0757-0829		R:FXD MET FLM 3650 OHM 1% 1/2W	28480	0757-0829
A2A1R66	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A2A1R67	0757-0829		R:FXD MET FLM 3650 OHM 1% 1/2W	28480	0757-0829
A2A1R68	0757-0829		R:FXD MET FLM 3650 OHM 1% 1/2W	28480	0757-0829
A2A1R69	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A2A1R70	0698-7518		R:FXD FLM 200 OHM 0.25% 1/8W	28480	0698-7518
A2A1R71	0757-0853	1	R:FXD MET FLM 91.1K OHM 1% 1/2W	28480	0757-0853
A2A1R72	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A2A1R73	0757-0416	9	R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A2A1R74	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A2A1R75	0757-0283		R:FXD MET FLM 2.00K OHM 1% 1/8W	28480	0757-0283
A2A1R76	0757-0463	1	R:FXD MET FLM 82.5K OHM 1% 1/8W	28480	0757-0463
A2A1R77	0757-0466	1	R:FXD MET FLM 110K OHM 1% 1/8W	28480	0757-0466
A2A1R78	0698-5438	1	R:FXD FLM 100 OHM 0.25% 1/8W	28480	0698-5438
A2A1R79	0698-7515	1	R:FXD FLM 46.7 OHM 0.25% 1/8W	28480	0698-7515
A2A1R80	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A2A1R81	0757-0156	1	R:FXD MET FLM 1.5 MEGOHM 1% 1/2W	28480	0757-0156
A2A1R82	0727-0267	1	R:FXD CARBON 2 MEGOHM 1% 1/2W	28480	0727-0267
A2A1R83	0757-0344	3	R:FXD MET FLM 1.00 MEGOHM 1% 1/4W	28480	0757-0344
A2A1R84	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A2A1R85	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A2A1R86	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A2A1R87	0757-0407	3	R:FXD MET FLM 200 OHM 1% 1/8W	28480	0757-0407
A2A1R88	0757-0847	1	R:FXD MET FLM 27.4K OHM 1% 1/2W	28480	0757-0847
A2A1R89	0698-3512	1	R:FXD FLM 1180 OHM 1% 1/8W	28480	0698-3512
A2A1R90	2100-3514	1	R:VAR CERMET 20K OHM 10% LIN 1/2W	28480	2100-3514
A2A1R91	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A2A1R92	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2A1R93	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2A1R94	0757-0473	2	R:FXD MET FLM 221K OHM 1% 1/8W	28480	0757-0473
A2A1R95	0757-0473		R:FXD MET FLM 221K OHM 1% 1/8W	28480	0757-0473
A2A1R96	0757-0449		R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A2A1S1	3101-1269	1	SWITCH:4 SECTION	28480	3101-1269
A2A1S1			SPECIAL(HORIZONTAL X1)		
A2A1S1			S(HORIZONTAL X10)		
A2A1S1			C(HORIZONTAL EXT-INT)		
A2A1S1			D(HORIZONTAL AC-DC)		
A2A1S2	3101-0973	1	SWITCH:SLIDE DPDT 0.5A 125V AC/DC	79727	G126-0018
A2A1S2			(NORM-CAL)		
A2A1S3	3101-0982	1	SWITCH:SLIDE SPST 0.5A 125V	79727	GF126-0007
A2A1S3			(BW-PHASE)		
A2A1U1	1826-0002		TRANSISTOR ARRAY:SI NPN	02735	CA3045
A2A1VR1	1902-3203		DIODE,BREAKDOWN:SILICON 14.7V 5%	28480	1902-3203
A2A1VR2	1902-3203		DIODE BREAKDOWN:SILICON 14.7V 5%	28480	1902-3203
A2A1VR3	1902-0041	4	DIODE:BREAKDOWN 5.11V 5%	04713	SZ10939-98
A2A1VR4	1902-0041		DIODE:BREAKDOWN 5.11V 5%	04713	SZ10939-98
A2A1XU1	1200-0441	1	SOCKET:IC 14 PIN MINIATURE	28480	1200-0441
A2MP1	00183-01224		BRACKET:HORIZONTAL AMPLIFIER (MODEL 183C ONLY)	28480	00183-01224
A2MP1	00183-01233		BRACKET:HORIZONTAL AMPLIFIER (MODEL 183D ONLY)	28480	00183-01233
A2MP2	0340-0152		INSULATOR:TRANSISTOR	28480	0340-0152
A2MP3	5000-0543		HOLDER:TRANSISTOR	28480	5000-0543
A2MP4	5020-0513		CONTACT:ELECTRICAL	28480	5020-0513
A2MP5	0340-0039		INSULATOR:BUSHING	28480	0340-0039
A2MP6	00183-24701		SUPPORT:BNC	28480	00183-24701
A2Q1	1853-0232		TSTR:SI PNP	28480	1853-0232
A2Q2	1853-0232		TSTR:SI PNP	28480	1853-0232
A2Q3	35657		TSTR:SI NPN	04713	1854-0419
A2Q4	35657		TSTR:SI NPN	04713	1854-0419

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3	00183-66502	1	BOARD ASSY:EMITTER FOLLOWER	28480	00183-66502
A3C1	0160-3645		C:FXD CER 0.01 UF +80-20% 500VDCM	56289	C071A501K103Z525-COH
A3C2	0180-0153		C:FXD ELECT 2.2 UF 20% 20VDCM	56289	150D225X0020A2-DYS
A3C3	0160-3645		C:FXD CER 0.01 UF +80-20% 500VDCM	56289	C071A501K103Z525-COH
A3C4	0180-0155		C:FXD ELECT 2.2 UF 20% 20VDCM	56289	150D225X0020A2-DYS
A3CR1	1901-0040		DIODE:SILICON 30MA 30NV	07263	FDG1088
A3CR2	1901-0040		DIODE:SILICON 30MA 30NV	07263	FDG1088
A3CR3	1901-0040		DIODE:SILICON 30MA 30NV	07263	FDG1088
A3CR4	1901-0040		DIODE:SILICON 30MA 30NV	07263	FDG1088
A3CR5	1901-0040		DIODE:SILICON 30MA 30NV	07263	FDG1088
A3Q1	1853-0036	4	TSTR:SI PNP	80131	2N3906
A3Q2	1853-0036		TSTR:SI PNP	80131	2N3906
A3Q3	1853-0049	1	TSTR:SI PNP	28480	1853-0049
A3R1	0684-2221	8	R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221
A3R2	0684-2221		R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221
A3R3	0684-2221		R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221
A3R4	0684-3921	8	R:FXD COMP 3900 OHM 10% 1/4W	01121	CB 3921
A3R5	0684-2221		R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221
A3R6	0684-2221		R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221
A3R7	0684-2221		R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221
A3R8	0684-3921		R:FXD COMP 3900 OHM 10% 1/4W	01121	CB 3921
A3R9	0757-0804	1	R:FXD MET FLM 200 OHM 1.0% 1/2W	28480	0757-0804
A3R10	0757-0449		R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A3R11	0757-0736	1	R:FXD MET FLM 1.50K OHM 1% 1/4W	28480	0757-0736
A3R12	0757-0427		R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A3R13	0699-0002	9	R:FXD COMP 6.8 OHM 10% 1/2W	01121	EB 6861
A3R14	0699-0002		R:FXD COMP 6.8 OHM 10% 1/2W	01121	EB 6861
A3R15	0684-4721	11	R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A4	00183-66512	1	BOARD ASSY:CALIBRATOR	28480	00183-66512
A4C1	0160-3452		C:FXD DISC CER 0.02 UF 20% 100VDCM	56289	C023B101N203MS25-COH
A4C2	0180-0116	7	C:FXD ELECT 6.8 UF 10% 35VDCM	56289	150D685X9035B2-DYS
A4C3	0140-0160	1	C:FXD MICA 39 PF 5%	72136	RDM19E390J3C
A4C4	0180-0155		C:FXD ELECT 2.2 UF 20% 20VDCM	56289	150D225X0020A2-DYS
A4C5	0180-0155		C:FXD ELECT 2.2 UF 20% 20VDCM	56289	150D225X0020A2-DYS
A4C6	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCM	56289	150D685X9035B2-DYS
A4C7	0160-3452		C:FXD DISC CER 0.02 UF 20% 100VDCM	56289	C023B101N203MS25-COH
A4C8	0160-2257	1	C:FXD CER 10 PF 5% 500VDCM	72982	301-000-COH0-100J
A4C9	0160-2130	1	C:FXD MICA 865 PF 1%	28480	0160-2130
A4C10	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCM	56289	150D685X9035B2-DYS
A4C11	0160-3494	1	C:FXD POLY 0.47 UF 5% 200VDCM	84411	NEW 173
A4C12	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCM	56289	150D685X9035B2-DYS
A4C13	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCM	56289	150D685X9035B2-DYS
A4C14	0160-3452		C:FXD DISC CER 0.02 UF 20% 100VDCM	56289	C023B101N203MS25-COH
A4C15	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCM	56289	150D685X9035B2-DYS
A4C16	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCM	56289	150D685X9035B2-DYS
A4C17	0180-0155		C:FXD ELECT 2.2 UF 20% 20VDCM	56289	150D225X0020A2-DYS
A4C18	0160-3645		C:FXD CER 0.01 UF +80-20% 500VDCM	56289	C071A501K103Z525-COH
A4C19	0121-0407	1	C:VAR TRIMMER 0.7-3.0 PF	72982	536-016
A4C20	0160-3645		C:FXD CER 0.01 UF +80-20% 500VDCM	56289	C071A501K103Z525-COH
A4L1	9140-0144	1	COIL:FXD RF 10.0 UH	99800	1025-44
A4Q1	1854-0019		TSTR:SI NPN	28480	1854-0019
A4Q2	1854-0019		TSTR:SI NPN	28480	1854-0019
A4Q3	1854-0019		TSTR:SI NPN	28480	1854-0019
A4Q4	1854-0019		TSTR:SI NPN	28480	1854-0019
A4Q5	1854-0019		TSTR:SI NPN	28480	1854-0019
A4Q6	1854-0019		TSTR:SI NPN	28480	1854-0019
A4R1	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A4R2	0757-0337	1	R:FXD MET FLM 432 OHM 1% 1/4W	28480	0757-0337
A4R3	0698-4309	2	R:FXD MET FLM 511 OHM 1.0% 1/2W	28480	0698-4309
A4R4	0698-4309		R:FXD MET FLM 511 OHM 1.0% 1/2W	28480	0698-4309
A4R5	0757-0722	1	R:FXD FLM 332 OHM 1% 1/4W	28480	0757-0722
A4R6	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A4R7	0698-3429	1	R:FXD MET FLM 19.6 OHM 1% 1/8W	28480	0698-3429
A4R8	0757-0730	1	R:FXD MET FLM 750 OHM 1% 1/4W	28480	0757-0730
A4R9	0757-0725	2	R:FXD MET FLM 475 OHM 1% 1/4W	28480	0757-0725
A4R10	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A4R11	0698-5529	2	R:FXD MET FLM 162 OHM 1% 1/4W	28480	0698-5529
A4R12	0757-0247	2	R:FXD FLM 750 OHM 1% 1/4W	28480	0757-0247
A4R13	0698-5864	2	R:FXD FLM 6810 OHM 1% 1/4W	28480	0698-5864
A4R14	2100-0755	2	R:VAR WW 1K OHM 5% 1W	28480	2100-0755
A4R15	0698-7526	2	R:FXD FLM 147 OHM 1.0% 1/8W	28480	0698-7526
A4R16	2100-1423	2	R:VAR WW 50 OHM 5% 1W	28480	2100-1423
A4R17	0698-5529		R:FXD MET FLM 162 OHM 1% 1/4W	28480	0698-5529

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4R18	0757-0247		R:FXD FLM 750 OHM 1% 1/4W	28480	0757-0247
A4R19	0698-5844		R:FXD FLM 4810 OHM 1% 1/4W	28480	0698-5844
A4R20	2100-0735		R:VAR WW 1K OHM 5% 1W	28480	2100-0735
A4R21	2100-1423		R:VAR WW 50 OHM 5% 1W	28480	2100-1423
A4R22	0698-7526		R:FXD FLM 147 OHM 1.0% 1/8W	28480	0698-7526
A4R23	0757-0385	1	R:FXD MET FLM 22.1 OHM 1% 1/8W	28480	0757-0385
A4R24	0698-3432	2	R:FXD MET FLM 26.1 OHM 1% 1/8W	28480	0698-3432
A4R25	0757-0411	1	R:FXD MET FLM 332 OHM 1% 1/8W	28480	0757-0411
A4R26	0757-0389	2	R:FXD MET FLM 33.2 OHM 1% 1/8W	28480	0757-0389
A4R27	0757-0389		R:FXD MET FLM 33.2 OHM 1% 1/8W	28480	0757-0389
A4R28	0757-0402	1	R:FXD MET FLM 162 OHM 1% 1/2W	28480	0757-0402
A4R29	0757-0274	2	R:FXD MET FLM 1.21K OHM 1% 1/8W	28480	0757-0274
A4R30	0757-0426	1	R:FXD FLM 1.3K OHM 1% 1/8W	28480	0757-0426
A4R31	0757-0415	3	R:FXD MET/FLM 475 OHM 1% 1/8W	28480	0757-0415
A4R32	2100-0898	2	R:VAR WW 500 OHM 5% LIN 1W	28480	2100-0898
A4R33	0811-1146	1	R:FXD WW 4300 OHM 3% 3W	28480	0811-1146
A4R34	2100-0898		R:VAR WW 500 OHM 5% LIN 1W	28480	2100-0898
A4R35	0757-0421		R:FXD MET FLM 825 OHM 1% 1/8W	28480	0757-0421
A4R36	0757-0417	1	R:FXD MET FLM 562 OHM 1% 1/8W	28480	0757-0417
A4R37	0698-3439	1	R:FXD MET FLM 178 OHM 1% 1/8W	28480	0698-3439
A4R38	0757-0398		R:FXD MET FLM 75 OHM 1% 1/8W	28480	0757-0398
A4R39	0757-0284		R:FXD MET FLM 150 OHM 1% 1/8W	28480	0757-0284
A4R40	0698-5416	1	R:FXD FLM 50 OHM 0.1% 1/8W	28480	0698-5416
A4R41	0698-3432		R:FXD MET FLM 26.1 OHM 1% 1/8W	28480	0698-3432
A4R42	0698-7525	2	R:FXD FLM 61.11 OHM 0.25% 1/8W	28480	0698-7525
A4R43	0698-7524	1	R:FXD FLM 247.5 OHM 0.25% 1/8W	28480	0698-7524
A4R44	0698-7525		R:FXD FLM 61.11 OHM 0.25% 1/8W	28480	0698-7525
A4R45	0761-0030	1	R:FXD MET OX 0200 OHM 5% 1W	28480	0761-0870
A4R46	0687-3311	1	R:FXD COMP 330 OHM 10% 1/2W	01121	EB 3311
A4R47	2100-1777	2	R:VAR WW 20K OHM 5% TYPE H 1W	28480	2100-1777
A4R48	0687-2211	1	R:FXD COMP 220 ohm 10% 1/2W	01121	EB 2211
A4R49	2100-1775	1	R:VAR WW 5K OHM 5% TYPE H 1W	28480	2100-1775
A4R50	0698-3159	2	R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A4R51	2100-1777		R:VAR WW 20K OHM 5% TYPE H 1W	28480	2100-1777
A4R52	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A4R53	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4R54	2100-2917	1	R:VAR WW 50K OHM 20% 1/2W	28480	2100-2917
A4R55	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4R56	0757-0464	1	R:FXD MET FLM 90.9K OHM 1% 1/8W	28480	0757-0464
A4S1	3101-1270	1	SWITCH	28480	3101-1270
A4S2	00183-21901	1	(FREQUENCY AND AMPLITUDE)* SWITCH:BEAMFINDER	28480	00183-21901
A4U1	5060-0491	1	CIRCUIT:HYBRID	28480	5060-0491
A4VR1	1902-3104	2	DIODE:BREAKDOWN 5.62V 5%	04713	SZ10939-110
A4VR2	1902-3172	1	DIODE BREAKDOWN:11.0V 5%	28480	1902-3172
A4VR3	1902-3104		DIODE:BREAKDOWN 5.62V 5%	04713	SZ10939-110
A4VR4	1902-3357	1	DIODE BREAKDOWN:56.2V 5%	28480	1902-3357
A5	00183-61106	1	HIGH VOLTAGE RECTIFIER ASSY	28480	00183-61106
A5A1	00183-66504	1	BOARD ASSY:HIGH VOLTAGE RECTIFIER	28480	00183-66504
A5A1C1	0160-3007	6	C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED RIGHT)	72982	3888-024-Y550-472M
A5A1C2	0160-3008	6	C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED LEFT)	72982	3888-024-Y550-472M
A5A1C3	0160-3007		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED RIGHT)	72982	3888-024-Y550-472M
A5A1C4	0160-3008		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED LEFT)	72982	3888-024-Y550-472M
A5A1C5	0160-3007		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED RIGHT)	72982	3888-024-Y550-472M
A5A1C6	0160-3008		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED LEFT)	72982	3888-024-Y550-472M
A5A1CR1	1901-0341	2	DIODE:SI 7000 PIV 50MA	28480	1901-0341
A5A1CR2	1901-0341		DIODE:SI 7000 PIV 50MA	28480	1901-0341
A5A1R1	0687-1001	1	R:FXD COMP 10 OHM 10% 1/2W	01121	EB 1001
A5A1R2	0687-1531	1	R:FXD COMP 15K OHM 10% 1/2W	01121	EB 1531
A5T1			TRANSFORMER, H.S.R.		
A6	00183-61104	1	QUINTUPLER ASSY:HIGH VOLTAGE	28480	00183-61104
A6C1	0160-3730	4	C:FXD CER 1000 PF +50-20% 15,000VDCW	28480	0160-3730
A6C2	0160-3730		C:FXD CER 1000 PF +50-20% 15,000VDCW	28480	0160-3730
A6C3	0160-3729	2	C:FXD CER 1000 PF +50-20% 10,000VDCW	28480	0160-3729
A6C4	0160-3730		C:FXD CER 1000 PF +50-20% 15,000VDCW	28480	0160-3730
A6C5	0160-3730		C:FXD CER 1000 PF +50-20% 15,000VDCW	28480	0160-3730
A6C6	0160-3729		C:FXD CER 1000 PF +50-20% 10,000VDCW	28480	0160-3729
A6CR1	1880-0026	5	RECTIFIER:SEL 10,000 PIV	03508	6RS10PH1608AB1
A6CR2	1880-0026		RECTIFIER:SEL 10,000 PIV	03508	6RS10PH1608AB1

See introduction to this section for ordering information

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty.	Description	Mfr Code	Mfr Part Number
A6CR3	1880-0226		RECTIFIER:SEL 10,000 PIV	03508	6RS10PH1608AB1
A6CR4	1880-0226		RECTIFIER:SEL 10,000 PIV	03508	6RS10PH1608AB1
A6CR5	1880-0226		RECTIFIER:SEL 10,000 PIV	03508	6RS10PH1608AB1
A6J1	1251-2808	3	CONNECTOR:FEMALE	28480	1251-2808
A6J2	1251-2808		CONNECTOR:FEMALE	28480	1251-2808
A6J3	1251-2808		CONNECTOR:FEMALE	28480	1251-2808
A6R1	0687-2241	1	R:FXD CCMP 220K OHM 10% 1/2W	01121	EB 2241
A6R2	0687-2251	1	R:FXD CCMP 2.2 MEGOHM 10% 1/2W	01121	EB 2251
A7	00183-66501	1	BOARD ASSY:HIGH VOLTAGE REGULATOR	28480	00183-66501
A7C1	0180-0257	1	C:FXD ELECT 47 UF 10% 35VDCW	56289	1500474X9035S2-DYS
A7C2	0160-2503	9	C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A7C3	0160-2503		C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A7C4	0150-0052	1	C:FXD CER 0.05 UF 20% 400VDCW	56289	33C17A
A7C5	0140-2403	1	C:FXD CER 1500 PF 20% 5K VDCW	72982	828-025-X5R0-152M
A7C6	0160-3067		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED RIGHT)	72982	3808-024-Y5S0-472M
A7C7	0160-3068		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED LEFT)	72982	3808-024-Y5S0-472M
A7C8	0160-3067		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED RIGHT)	72982	3808-024-Y5S0-472M
A7C9	0160-3068		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED LEFT)	72982	3808-024-Y5S0-472M
A7C10	0160-2503		C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A7C11	0160-2503		C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A7C12	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	1500475X9035S2-DYS
A7C13	0160-2503		C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A7C14	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	1500475X9035S2-DYS
A7C15	0160-3067		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED RIGHT)	72982	3808-024-Y5S0-472M
A7C16	0160-3068		C:FXD CER 4700 PF 20% 4K VDCW (POLARIZED LEFT)	72982	3808-024-Y5S0-472M
A7CR1	1901-0026		DIODE:SILICON 0.75A 200PIV	04713	SR1358-8
A7CR2	1901-0040		DIODE:SILICON 30MA 30MV	07263	FD610B8
A7CR3	1901-0040		DIODE:SILICON 30MA 30MV	07263	FD610B8
A7CR4	1901-0056	1	DIODE:SILICON 120V	01295	UG-888
A7CR5			NOT ASSIGNED		
A7CR6	1901-0450	2	DIODE:SI 3000 PIV	28480	1901-0490
A7F1	2110-0020	1	FUSE:0.8A 250V SLOW-BLOW	75915	313.8003
A7Q1	1853-0034		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0034
A7Q2	1854-0215		TSTR:SI NPN	80131	2N3904
A7Q3	1855-0057	1	TSTR:SI FET N-CHANNEL	28480	1855-0057
A7R1	0811-1671	1	R:FXD WW 2.7 OHM 5% 2W	28480	0811-1671
A7R2	0687-1011	2	R:FXD CCMP 100 OHM 10% 1/2W	01121	EB 1011
A7R3	0686A-2731	4	R:FXD CCMP 27K OHM 10% 1/4W	01121	CB 2731
A7R4	0687-5611	1	R:FXD CCMP 560 OHM 10% 1/2W	01121	EB 5611
A7R5	0684-4721		R:FXD CCMP 4700 OHM 10% 1/4W	01121	CB 4721
A7R6	0686-2731		R:FXD CCMP 27K OHM 10% 1/4W	01121	CB 2731
A7R7	0684-2721		R:FXD CCMP 2700 OHM 10% 1/4W	01121	CB 2721
A7R8	0684-2731		R:FXD CCMP 27K OHM 10% 1/4W	01121	CB 2731
A7R9	0698-7182	2	R:FXD MET FLM 30 MEGOHM 1% 2W	28480	0698-7182
A7R10	2100-2650	1	R:VAR FLR 200K OHM 10% LIN 1/2W	28480	2100-2650
A7R11	0757-0350	1	R:FXD MET FLM 909K OHM 1% 1/4W	28480	0757-0350
A7R12	0698-5678	1	R:FXD FLM 16.25 MEGOHM 5% 1W	28480	0698-5678
A7R13	2100-1618	1	R:VAR FLR 1 MEGOHM 20% LIN 1/2W	28480	2100-1618
A7R14	0687-2231		R:FXD CCMP 22K OHM 10% 1/2W	01121	EB 2231
A7R15	0757-0344		R:FXD MET FLM 1.00 MEGOHM 1% 1/4W	28480	0757-0344
A7R16	0698-7182		R:FXD MET FLM 30 MEGOHM 1% 2W	28480	0698-7182
A7R17	0757-0844		R:FXD MET FLM 1.00 MEGOHM 1% 1/4W	28480	0757-0344
A7R18	0687-2221	1	R:FXD CCMP 2200 OHM 10% 1/2W	01121	EB 2221
A7R19	0698-5677	1	R:FXD FLM 8.25 MEGOHM 5% 1W	28480	0698-5677
A7R20	0699-0002		R:FXD CCMP 6.8 OHM 10% 1/2W	01121	EB 6861
A7R21	0699-0002		R:FXD CCMP 6.8 OHM 10% 1/2W	01121	EB 6861
A7TP1	1251-0208		CONNECTOR:SOCKET 0.19" BDY DIA TEFLON	98291	SKT-400
A7XF1	2110-0265		CLIP:FUSE 0.250" DIA	91506	6008-32CN
A8	00183-65506	1	GATE BOARD MODULE (MODEL 183C ONLY)	28480	00183-69506
A8	00183-65507	1	GATE BOARD MODULE (MODEL 183D ONLY)	28480	00183-69507

See introduction to this section for ordering information

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8A1	00183-66514	1	BOARD ASSY:GATE	28480	00183-66514
A8A1C1	0160-2236		C:FXD CER 1.0 PF 500VDCW	72982	301-000-C0K0-109C
A8A1C2	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C3	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C4	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C5	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C6	0160-2239	1	C:FXD CER 1.8 PF 500VDCW	72982	301-000-C0K0-189C
A8A1C7	0121-0144	2	C:VAR TEFLON 0.25-1.50 PF 600VDCW	28480	0121-0144
A8A1C8	0121-0144		C:VAR TEFLON 0.25-1.50 PF 600VDCW	28480	0121-0144
A8A1C9	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C40	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C11	0160-2503		C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A8A1C12	0160-2204	3	C:FXD MICA 100PF 5%	72136	RDM15F101J3C
A8A1C13	0160-2204		C:FXD MICA 100PF 5%	72136	RDM15F101J3C
A8A1C14	0160-2145	1	C:FXD CER 5000 PF +80-20% 100VDCW	91418	YA
A8A1C15	0160-2503		C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A8A1C16	00183-66514	1	C:FXD MY 6800 PF 10% 200VDCW	56289	00183-66514
A8A1C17	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A8A1C18	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C19	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C20	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C21	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A8A1C22	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C23	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A8A1C24	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C25	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A8A1C26	0160-3465		C:FXD CER 0.01 UF +80-20% 500VDCW	56289	C071A501K103Z525-CDH
A8A1C27	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A8A1C28	0160-2503		C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A8A1C29	0160-2503		C:FXD CER 0.05 UF 20% 500VDCW	56289	1233C 24A1 CDH
A8A1C30	0160-2204		C:FXD MICA 100PF 5%	72136	RDM15F101J3C
A8A1CR1	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR2	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR3	1901-0347	1	DIODE:SILICON 8V	28480	1901-0347
A8A1CR4	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR5	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR6	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR7	1901-0026		DIODE:SILICON 0.75A 200PIV	04713	SR1358-8
A8A1CR8	1901-0490		DIODE:SI 3000 PIV	28480	1901-0490
A8A1CR9			NOT ASSIGNED		
A8A1CR10	1901-0026		DIODE:SILICON 0.75A 200PIV	04713	SR1358-8
A8A1CR11	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR12	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR13	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR14	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR15	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR16	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR17	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR18	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR19	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR20	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR21	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR22	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR23	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1CR24	1901-0040		DIODE:SILICON 30MA 30WV	07263	FDG1088
A8A1E2	9170-0014	1	BEAD:MAGNETIC SHIELDING	02114	56-590-65/3B
A8A1Q1	1854-0293	1	TST:SI NPN	80131	2N5179
A8A1Q2	1854-0015		TSTR:SI NPN	28480	1854-0015
A8A1Q3	1853-0203		TSTR:SI PNP	28480	1853-0203
A8A1Q4	1853-0203		TSTR:SI PNP	28480	1853-0203
A8A1Q5	1854-0015		TSTR:SI NPN	28480	1854-0015
A8A1Q6	1854-0015		TSTR:SI NPN	28480	1854-0015
A8A1Q7	1853-0203		TSTR:SI PNP	28480	1853-0203
A8A1Q8			NOT ASSIGNED		
A8A1Q9			NOT ASSIGNED		
A8A1Q10	1853-0036		TSTR:SI PNP	80131	2N3906
A8A1Q11	1854-0215		TSTR:SI NPN	80131	2N3904
A8A1Q12	1854-0215		TSTR:SI NPN	80131	2N3904
A8A1Q13	1853-0036		TSTR:SI PNP	80131	2N3906
A8A1Q14	1854-0215		TSTR:SI NPN	80131	2N3904
A8A1Q15	1853-0036		TSTR:SI PNP	80131	2N3906
A8A1Q16	1854-0215		TSTR:SI NPN	80131	2N3904
A8A1Q17	1854-0215		TSTR:SI NPN	80131	2N3904
A8A1Q18	1854-0215		TSTR:SI NPN	80131	2N3904
A8A1Q19	1853-0036		TSTR:SI PNP	80131	2N3906
A8A1R1	0757-0400	1	R:FXD MET FLM 90.9 OHM 1% 1/8W	28480	0757-0400
A8A1R2	0757-0407		R:FXD MET FLM 200 OHM 1% 1/8W	28480	0757-0407

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8A1R3	0757-0407		R:FXD MET FLM 200 OHM 1% 1/8W	28480	0757-0407
A8A1R4	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R5	0684-1031	5	R:FXD COMP 10K OHM 10% 1/4W	01121	CB 1031
A8A1R6	0684-1011	5	R:FXD COMP 100 OHM 10% 1/4W	01121	CB 1011
A8A1R7	0757-0458		R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A8A1R8	0757-0273	1	R:FXD MET FLM 3.01K OHM 1% 1/8W	28480	0757-0273
A8A1R9	2100-2497	1	R:VAR FLM 2000 OHM 10% LIN 1/2W	28480	2100-2497
A8A1R10	0757-0419	1	R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A8A1R11	0684-1011		R:FXD COMP 100 OHM 10% 1/4W	01121	CB 1011
A8A1R12	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R13	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R14	0684-1011		R:FXD COMP 100 OHM 10% 1/4W	01121	CB 1011
A8A1R15	0757-0409	2	R:FXD MET FLM 274 OHM 1% 1/8W	28480	0757-0409
A8A1R16	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A8A1R17	0757-0437		R:FXD MET FLM 4750 OHM 1% 1/8W	28480	0757-0437
A8A1R18	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R19	0757-0430	3	R:FXD MET FLM 2.21K OHM 1% 1/8W	28480	0757-0430
A8A1R20	0757-0274		R:FXD MET FLM 1.21K OHM 1% 1/8W	28480	0757-0274
A8A1R21	2100-1986	1	R:VAR CERMET 1000 OHM 10% LIN 1/2W	28480	2100-1986
A8A1R22	0757-0415		R:FXD MET FLM 475 OHM 1% 1/8W	28480	0757-0415
A8A1R23	0684-1011		R:FXD COMP 100 OHM 10% 1/4W	01121	CB 1011
A8A1R24	0684-2221		R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221
A8A1R25	0684-2221		R:FXD COMP 2200 OHM 10% 1/4W	01121	CB 2221
A8A1R26	0684-1011		R:FXD COMP 100 OHM 10% 1/4W	01121	CB 1011
A8A1R27	0757-0829		R:FXD MET FLM 3650 OHM 1% 1/2W	28480	0757-0829
A8A1R28	0757-0829		R:FXD MET FLM 3650 OHM 1% 1/2W	28480	0757-0829
A8A1R29	0757-0430		R:FXD MET FLM 2.21K OHM 1% 1/8W	28480	0757-0430
A8A1R30	0757-0725		R:FXD MET FLM 475 OHM 1% 1/4W	28480	0757-0725
A8A1R31	0757-0190		R:FXD MET FLM 20K OHM 1% 1/2W	28480	0757-0190
A8A1R32	0687-1011		R:FXD COMP 100 OHM 10% 1/2W	01121	EB 1011
A8A1R33	0764-0046	1	R:FXD MET OX 33K OHM 5% 2W	28480	0764-0046
A8A1R34	0684-4711	3	R:FXD COMP 470 OHM 10% 1/4W	01121	CB 4711
A8A1R35	0757-0415		R:FXD MET FLM 475 OHM 1% 1/8W	28480	0757-0415
A8A1R36	0757-0430		R:FXD MET FLM 2.21K OHM 1% 1/8W	28480	0757-0430
A8A1R37	0757-0441	1	R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A8A1R38	0757-0200	1	R:FXD MET FLM 5.62K OHM 1% 1/8W	28480	0757-0200
A8A1R39	0757-0427		R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A8A1R40	0757-0409		R:FXD MET FLM 274 OHM 1% 1/8W	28480	0757-0409
A8A1R41	0684-1021	4	R:FXD COMP 1000 OHM 10% 1/4W	01121	CB 1021
A8A1R42	0684-1031		R:FXD COMP 10K OHM 10% 1/4W	01121	CB 1031
A8A1R43	0757-0458		R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A8A1R44	0684-1021		R:FXD COMP 1000 OHM 10% 1/4W	01121	CB 1021
A8A1R45	0684-1021		R:FXD COMP 1000 OHM 10% 1/4W	01121	CB 1021
A8A1R46	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R47	0684-4731	3	R:FXD COMP 47K OHM 10% 1/4W	01121	CB 4731
A8A1R48	0684-4711		R:FXD COMP 470 OHM 10% 1/4W	01121	CB 4711
A8A1R49	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R50	0684-1031		R:FXD COMP 10K OHM 10% 1/4W	01121	CB 1031
A8A1R51	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R52	0684-1041	2	R:FXD COMP 100K OHM 10% 1/4W	01121	CB 1041
A8A1R53	0684-1021		R:FXD COMP 1000 OHM 10% 1/4W	01121	CB 1021
A8A1R54	0684-4731		R:FXD COMP 47K OHM 10% 1/4W	01121	CB 4731
A8A1R55	0684-1031		R:FXD COMP 10K OHM 10% 1/4W	01121	CB 1031
A8A1R56	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R57	0684-4711		R:FXD COMP 470 OHM 10% 1/4W	01121	CB 4711
A8A1R58	0684-4721		R:FXD COMP 4700 OHM 10% 1/4W	01121	CB 4721
A8A1R59	0684-1041		R:FXD COMP 100K OHM 10% 1/4W	01121	CB 1041
A8A1R60			NOT ASSIGNED		
A8A1R61	0684-2731		R:FXD COMP 27K OHM 10% 1/4W	01121	CB 2731
A8A1R62	0684-1031		R:FXD COMP 10K OHM 10% 1/4W	01121	CB 1031
A8A1R63	0698-0002		R:FXD COMP 6.8 OHM 10% 1/2W	01121	EB 68G1
A8A1R64	0698-0002		R:FXD COMP 6.8 OHM 10% 1/2W	01121	EB 68G1
A8A1R65	0698-0002		R:FXD COMP 6.8 OHM 10% 1/2W	01121	EB 68G1
A8A1R66	0698-0002		R:FXD COMP 6.8 OHM 10% 1/2W	01121	EB 68G1
A8A1R67	0698-0002		R:FXD COMP 6.8 OHM 10% 1/2W	01121	EB 68G1
A8A1R68	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A8A1R69	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A8A1VR1	1902-0519	1	DIODE,BREAKDOWN:5.1V 400MW	28480	1902-0519
A8A1VR2	1902-0041		DIODE:BREAKDOWN 5.11V 5%	04713	SZ10939-98
A8A1VR3	1902-0041		DIODE:BREAKDOWN 5.11V 5%	04713	SZ10939-98
A8A1VR4	1902-0202	1	DIODE BREAKDOWN:15.0V 5% 1W	28480	1902-0202
A8MP1	00183-01219	1	BRACKET:GATE BOARD (MODEL 183D ONLY)	28480	00183-01219
A8MP1	00183-01209	1	BRACKET:GATE AMPLIFIER (MODEL 183D ONLY)	28480	00183-01209
A8MP2	0340-0152		INSULATOR:TRANSISTOR	28480	0340-0152
A8MP3	5000-0543		HOLDER:TRANSISTOR	28480	5000-0543
A8MP4	5020-0513		CONTACT:ELECTRICAL	28480	5020-0513

See introduction to this section for ordering information.

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A6MP5	0340-0039		INSULATOR:BUSHING	28480	0340-0039
A8Q1	1853-0232		TSTR:SI PNP	28480	1853-0232
A8Q2	1853-0232		TSTR:SI PNP	28480	1853-0232
A9	00183-61601	2	RESISTOR ASSY:CRT TERMINATION (CONSISTS OF N.S.R. PARTS A9CR1 & A9R1)	28480	1902-0202
A10	00183-61601		RESISTOR ASSY:CRT TERMINATION (CONSISTS OF NSR PARTS A10CR1 & A10R1)	28480	00183-61601
C1	0160-2146	1	CAPACITOR:FXD CER 0.02 UF +80-20% 100VDCW	91418	TA
DS1	2140-0016	2	LAMP:INCANDESCENT 6.0V 0.06A	71744	683
DS2	2140-0016		LAMP:INCANDESCENT 6.0V 0.06A	71744	683
J1			(J1 THRU J3 LISTED WITH M2)		
J2			NOT ASSIGNED		
J7	1510-0038		BINDING POST	28480	1510-0038
J8	1250-0083	9	CONNECTOR:BNC	02660	31-221-1020
J9	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J10	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J11	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J12	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J13			NOT ASSIGNED		
J14	1250-0118	2	CONNECTOR:BNC (CALIBRATOR OUTPUT)	24931	28JR 128-1
J14			CONNECTOR:BNC (HORIZONTAL INPUT)	24931	28JR 128-1
J15	1250-0118				
L1	5060-0435	1	COIL:ALIGNMENT Z AXIS	28480	5060-0435
L2	00191-66004	1	COIL:ALIGNMENT, Y AXIS	28480	00191-66004
MP1	5040-0447		FOOT:REAR(LONG)	28480	5040-0447
MP2	00183-21101		HEAT SINK	28480	00183-21101
MP3	0340-0450		WASHER:TRANSISTOR INSULATOR	04713	1485260CF12
MP4	00183-00207	1	PANEL ASSY:REAR DISPLAY (MODEL 183C ONLY)	28480	00183-00207
MP5	00183-00206	1	PANEL ASSY:REAR DISPLAY (MODEL 183D ONLY)	28480	00183-00206
MP6	00180-07201	1	INSERT:KEEPER	28480	00180-07201
MP7	00180-09103	1	(MODEL 183C ONLY) SPRING:INSERT	28480	00180-09103
MP8	00180-22301	1	(MODEL 183C ONLY) KEEPER:HANDLE (MODEL 183C ONLY)	28480	00180-22301
MP9	00180-24704	1	SPACER:HANDLE (MODEL 183C ONLY)	28480	00180-24704
MP10	5040-0459	1	HANDLE	28480	5040-0459
MP11	00183-60602	1	SHIELD:CRT	28480	00183-60602
MP12	00183-61201	1	BRACKET ASSY:RESISTOR	28480	00183-61201
MP13	00180-01218	1	BRACKET:ALIGNMENT COIL	28480	00180-01218
MP14	00180-09105	1	CLIP:GROUND	28480	00180-09105
MP15	5040-0444	1	SHIELD:LIGHT BLOCK NYLON	28480	5040-0444
MP16	5020-0476	1	BEZEL:CRT	28480	5020-0476
MP17	00183-67402	1	KNOB:FOCUS/SCALE	28480	00183-67402
MP18	00183-67403	1	PUSHBUTTON ASSY	28480	00183-67403
MP19	00183-67404	1	PUSHBUTTON ASSY:FREQUENCY	28480	00183-67404
MP20	00183-67405	1	PUSHBUTTON ASSY:AMPLIFIER	28480	00183-67405
MP21	00183-67406	1	PUSHBUTTON ASSY:(INT-EXT)(AC-DC)	28480	00183-67406
MP22	0370-0451	1	BEZEL:PUSHBUTTON:KNOB BLK NYLON	28480	0370-0451
MP23	00183-00211	1	PANEL:FRONT (MODEL 183C ONLY)	28480	00183-00211
MP24	00183-00212	1	PANEL:FRONT (MODEL 183D ONLY)	28480	00183-00212
MP25	1510-0038		BINDING POST	28480	1510-0038
MP26	00180-67402	1	KNOB:HORIZONTAL POSITION	28480	00180-67402
MP27	01803-67407	1	KNOB:HORIZONTAL EXT VERNIER	28480	01803-67407
MP28	00183-67407	2	KNOB ASSY(FOCUS/SCALE)	28480	00183-67407
MP29	00183-67407		KNOB ASSY(FOCUS/SCALE)	28480	00183-67407
MP30	0370-0348	1	KNOB:KNO BLK 0.540" DIA	28480	0370-0348
MP31	00180-67405	1	KNOB:KNO BLK (FIND BEAM)	28480	00180-67405
MP32	1490-0848	1	BUSHING:POT 3/4-32 EXT THREAD(CAL)	00000	080
MP33	00183-00203	1	PANEL:SUB	28480	00183-00203
MP34	1450-0404	1	LENS:CLEAR	28480	1450-0404
MP35	00183-67701	1	BASE:PILOT LIGHT	28480	00183-67701
MP36	1490-0710	1	STAND:TILT (MODEL 183C ONLY)	28480	1490-0710
MP37	1490-0030	1	STAND:TILT (MODEL 183D ONLY)	28480	1490-0030
MP38	5040-0445	1	FOOT:BOTTOM (MODEL 183C ONLY)	28480	5040-0445

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
MP39	5040-0767	1	FOOT ASSY:FN (MODEL 1830 ONLY)	28480	5040-0767
MP40	00183-60106	1	CHASSIS ASSY:POWER (MODEL 183C ONLY)	28480	00183-60106
MP41	00183-60102	1	CHASSIS ASSY:POWER (MODEL 1830 ONLY)	28480	00183-60102
MP42	00183-60105	1	CHASSIS ASSY:DISPLAY (MODEL 183C ONLY)	28480	00183-60105
MP43	00183-60101	1	CHASSIS ASSY:DISPLAY (MODEL 1830 ONLY)	28480	00183-60101
MP44	5020-0553	1	SPACER:REAR (MODEL 183C ONLY)	28480	5020-0553
MP45	5020-0551	1	SPACER:FRONT (MODEL 183C ONLY)	28480	5020-0551
MP46	00180-44701	1	SPACER:TRADEMARK (MODEL 183C ONLY)	28480	00180-44701
MP47	7120-1254	1	TRADEMARK (MODEL 183C ONLY)	28480	7120-1254
MP48	5020-0552	1	SPACER:SIDE (RIGHT) (MODEL 183C ONLY)	28480	5020-0552
MP49	00183-04703	1	SPACER:SIDE, LEFT (MODEL 183C ONLY)	28480	00183-04703
MP50	5000-0469	1	SPACER:REAR (MODEL 1830 ONLY)	28480	5000-0469
MP51	00183-04702	1	SPACER:FRONT FRAME (MODEL 1830 ONLY)	28480	00183-04702
MP52	5040-0463	1	HANGER:PROBE (MODEL 183C ONLY)	28480	5040-0463
MP53	0510-0705	1	PIN:SPRING 0.094" DIA (MODEL 183C ONLY)	00287	0808
MP54	5020-0499	1	HINGE:PROBE HANGER (MODEL 183C ONLY)	28480	5020-0499
MP55	1460-0706	1	SPRING:COMPRESSION (MODEL 183C ONLY)	00000	.080 0
MP56	3050-0441	1	WASHER:SHOULDER .125 ID FOR 64 MOM (MODEL 183C ONLY)	28480	3050-0441
MP57	0510-0552	1	RING:RETAINING STL FOR 0.094" DIA SHAFT (MODEL 183C ONLY)	79136	X5133-9-S-MD
MP58	0403-0125	1			
MP59	0363-0006	1	CONTACT:CONNECTOR SWITCH	28480	0363-0006
MP60	0403-0128	1	GUIDE:PC BD PLUG-IN(LEFT)	28480	0403-0128
MP61	00180-09104	1	CLIP:GROUND	28480	00180-09104
MP62	00183-01208	1	BRACKET:CONNECTOR	28480	00183-01208
MP63	00183-23703	1	SHAFT:HORIZONTAL CAL	28480	00183-23703
MP64	00183-23702	1	SHAFT:ASTIGMATISM	28480	00183-23702
MP65	1490-0841	1	COUPLING:SHAFT 0.127" ID	28480	1490-0841
MP66	00183-01202	1	BRACKET:CALIBRATOR (MODEL 183C ONLY)	28480	00183-01202
MP67	00183-01226	1	BRACKET:CALIBRATOR (MODEL 1830 ONLY)	28480	00183-01226
MP68	00183-01234	1	BRACKET:CLAMP	28480	00183-01234
MP69	00183-01211	1	BRACKET:VERTICAL CABLE	28480	00183-01211
MP70	00183-60205	1	PANEL ASSY:REAR CRT	28480	00183-60205
MP71	5040-0453	1	COVER:POTENTIOMETER(FOCUS)	28480	5040-0453
MP72	00183-23704	1	SHAFT:BEAMFIND	28480	00183-23704
MP73	00183-23201	1	COUPLER:BEAMFIND	28480	00183-23201
MP74	00183-04109	1	COVER:HIGH VOLTAGE (MODEL 183C ONLY)	28480	00183-04109
MP75	00183-04110	1	COVER:HIGH VOLTAGE (MODEL 1830 ONLY)	28480	00183-04110
MP76	00183-05401	1	INSULATOR:HIGH VOLTAGE	28480	00183-05401
MP77	1251-2776	1	CONNECTOR:SPEC. PURPOSE HI-VOLTAGE PLUG	01009	8811M MODIFIED
MP78	5000-8424	1	COVER:TOP RIGHT (MODEL 183C ONLY)	28480	5000-8424
MP79	5000-8425	1	COVER:TOP LEFT (MODEL 183C ONLY)	28480	5000-8425
MP80	00183-04107	1	COVER:BOTTOM, RIGHT (MODEL 183C ONLY)	28480	00183-04107
MP81	00183-04108	1	COVER:BOTTOM, LEFT (MODEL 183C ONLY)	28480	00183-04108
MP82	5000-0444	1	COVER:SIDE (MODEL 1830 ONLY)	28480	5000-0444
MP83	5000-0445	1	COVER:BOTTOM (MODEL 1830 ONLY)	28480	5000-0445

See introduction to this section for ordering information

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
MP84	5000-0446	1	COVER:TOP	28480	5000-0446
MP85	00180-01217	1	(MODEL 183D ONLY) BRACKET:COVER	28480	00180-01217
MP86	00183-01217	1	(MODEL 183D ONLY) BRACKET:SHIELD	28480	00183-01217
MP87	00183-01222	1	(MODEL 183D ONLY) BRACKET:COVER	28480	00183-01222
MP88	5000-0051	1	(MODEL 183D ONLY) TRIM STRIP	28480	5000-0051
MP89	5060-0431	1	(MODEL 183D ONLY) FRAME ASSY:SIDE	28480	5060-0431
MP90	5060-0776	1	(MODEL 183D ONLY) KIT:5 H RACK MOUNT	28480	5060-0776
MP91	5040-0464	1	(MODEL 183D ONLY) HANGER:PROBE	28480	5040-0464
MP92	00183-04111	1	(MODEL 183D ONLY) MASK:REDUCED SCAN	28480	00183-04111
MP93	4342-0026	1	FELT-STRIP:BLK 0.047" THICK	85471	3455
Q1	1854-0417	1	TSTR:SI NPN	28480	1854-0417
Q2	1854-0320	1	TSTR:SI NPN	28480	1854-0320
R1	2100-1904	1	R:VAR COMP 10K OHM 20% LIN 1/4W (INTENSITY)	28480	2100-1904
R2	2100-2920	1	R:VAR COMP 100K OHM 20% 10 CLOG 1/4W (SCALE)		2100-2920
R3	2100-2921	1	R:VAR COMP 5 MEGOHM 20% LIN	28480	2100-2921
R4	2100-2922	1	(FOCUS) R:VAR COMP 15K OHM 20% 5 CLOG 1/4W	28480	2100-2922
R5	2100-2927	1	(EXTERNAL VERNIER HORIZONTAL) N.S.R. R:VAR COMP 2 X 100K OHM 2% LIN (HORIZ POS)	28480	2100-2927
S1	3101-1258	1	SWITCH:TOGGLE SPST (POWER) (POWER)	28480	3101-1258
S2	3101-0070	1	SWITCH:SLIDE FLOODGUN MODE)	79727	8-126
S3	3101-0936	1	SWITCH:SLIDE 4 PDT (CALIBRATOR MODE)	82389	50212L
V1	5083-2252	1	CRT:STANDARD (P31 PHOSPHOR)	28480	5083-2252
V1A1	00183-69619	1	CRT:TERMINATION (SUPPLIED ON ALL CRTS		00183-69619
V1A1CR1	1901-0593	4	DIODE:SI, PIN DIODE	28480	1901-0593
V1A1CR2	1901-0593		DIODE:SI, PIN DIODE	28480	1901-0593
V1A1CR3	1901-0593		DIODE:SI, PIN DIODE	28480	1901-0593
V1A1CR4	1901-0593		DIODE:SI, PIN DIODE	28480	1901-0593
V1A1MP1	00183-67502	1	TERMINATION ASSY:BLACK	28480	00183-67502
V1A1MP2	00183-01601	1	LUG:CRT PIN	28480	28480-01601
V1A1R1	0757-0442	2	R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
V1A1R2	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
V1MP1	00183-01230	1	GROUND:CRT MASK	28480	00183-01230
V1W1			LEAD ASSY:HIGH VOLTAGE, N.S.R.		
W1	8120-0078	1	CABLE ASSY:POWER CORD	28480	8120-0078
W2	00183-61603	1	CABLE ASSY:MAIN (MODEL 183C ONLY)	28480	00183-61603
W2	00183-61604	1	CABLE ASSY:MAIN (MODEL 183D ONLY)	28480	00183-61604
W2J1	1251-0107	1	CONNECTOR:PC 32 CONTACT	02660	28-4200-325
W2J2	1251-2412	2	BODY:R & P CONNECTOR 15 MALE CONTACT		1625-15P
W2J3	1251-0334		CONN PC 36 (2X18) CONTACTS	07233	251-18-30-261
W2J4	1251-0159		CONNECTOR:2X15 CONTACT	28480	1251-0159
W2J5	1251-2412	1	BODY:R & P CONNECTOR 15 MALE CONTACT		1625-15P
W2J6	1251-2410		CONTACT:R & P CONNECTOR	27264	1560-T
W2MP1	1200-0406	1	(MODEL 183D ONLY) COVER:CRT SOCKET	28480	2100-0406
W2R1	0683-1045	1	R:FXD COMP 100K OHMS 5% 1/4W	01121	CB-1045
W2R2	0811-1687	1	R:FXD WW 1.2 OHM 5% 2W	28480	0811-1687

Table 6-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
W2W1	00183-61609	1	CABLE:CCAX, CALIBRATOR EXT INPUT (MODEL 183C ONLY)	28480	00183-61609
W2W2	00183-61619	1	CABLE:CCAX (MODEL 183C ONLY)	28480	00183-61619
W2W2	00183-61607	1	CABLE:CCAX, EXT RESET (MODEL 183C ONLY)	28480	00183-61607
W2W2	00183-61615	1	CABLE:CCAX (MODEL 183D ONLY)	28480	00183-61615
W2W3	00183-61608	1	CABLE:CCAX, ALT. TRIGGER (MODEL 183C ONLY)	28480	00183-61608
W2W3 W2W3	00183-61618	1	CABLE:CCAX (MODEL 183D ONLY)	28480	00183-61618
W2W4	00183-61609	1	CABLE:CCAX, DELAYED GATE (MODEL 183C ONLY)	28480	00183-61609
W2W4	00183-61616	1	CABLE:CCAX DELAYED GATE (MODEL 183D ONLY)	28480	00183-61616
W2W5	00183-61610	1	CABLE:CCAX, MAIN GATE (MODEL 183C ONLY)	28480	00183-61610
W2W5	00183-61617	1	CABLE:CCAX (MODEL 183D ONLY)	28480	00183-61617
W2W6	00183-61611	1	CABLE:CCAX, GATE FROM PLUG-IN (MODEL 183C ONLY)	28480	00183-61611
W2W6	00183-61620	1	CABLE:COAX (MODEL 183D ONLY)	28480	00183-61620
W2W7	00183-61612	1	CABLE:CCAX, YELLOW (MODEL 183C ONLY)	28480	00183-61612
W2W7	00183-61614	1	CABLE:COAX (MODEL 183D ONLY)	28480	00183-61614
W2W8	00183-61613	1	CABLE:CCAX, RED-Z AXIS INPUT (MODEL 183C ONLY)	28480	00183-61613
W2W8	00183-61606	1	CABLE:CCAX RED-Z AXIS INPUT (MODEL 183D ONLY)	28480	00183-61606
W2XV1	1200-0037	1	SOCKET:CRT TUBE	72825	97097
W3	00183-61629	1	CABLE:VERTICAL INPUT, BLUE	28480	00183-61629
W3C1	0180-0249	1	C:FXD ELECT 1.0 UF +50-10% 150VDCW	56289	30D105F150BA2-DSM
W4	00183-61621	1	CABLE:HORIZONTAL OUTPUT (MODEL 183C ONLY)	28480	00183-61621
W4	00180-61625	1	CABLE:HORIZONTAL OUTPUT (MODEL 183D ONLY)	28480	00180-61625
W5	00183-61622	1	CABLE:CCAX, EXT VERNIER CONTROL TO BD	28480	00183-61622
W6	00183-61623	1	CABLE:CCAX, EXT VERNIER CONTROL TO BD	28480	00183-61623
W7	00183-61624	1	CABLE ASSY:HIGH VOLTAGE	28480	00183-61624
W8	00183-61626	1	CABLE:CCAX, HORIZONTAL INPUT (MODEL 183C ONLY)	28480	00183-61626
W8	00183-61627	1	CABLE:CCAX, HORIZONTAL INPUT (MODEL 183D ONLY)	28480	00183-61627

See introduction to this section for ordering information

MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
00000	U.S.A. COMMON	ANY SUPPLIER OF U.S.A.	
00287	CENCO	DANIELSON, CONN.	06239
00853	SANGAMO ELECTRIC CO.PICKENS DIV.	PICKENS, S.C.	29671
01009	ALDEN PROD. CO.	BROCKTON, MASS.	02403
01121	ALLEN BRADLEY CO.	MILWAUKEE, WIS.	53204
01295	TEXAS INSTRUMENTS INC. SEMICONDUCTOR COMPONENTS DIV.	DALLAS, TEX.	75231
02114	FERROXCUBE CORP.	SAUGERTIES, N.Y.	12477
02660	AMPHENOL CORP.	BROADVIEW, ILL.	60153
02735	RCA SOLID STATE & RECEIVING TUBE DIV.	SOMERVILLE, N.J.	08876
03508	G.E. CO. SEMICONDUCTOR PROD. DEPT.	SYRACUSE, N.Y.	13201
04713	MOTOROLA SEMICONDUCTOR PROD.INC.	PHOENIX, ARIZ.	85008
07233	CINCH-GRAPHIK, DIV. UNITED CARR INC.	CITY OF INDUSTRY, CALIF.	91746
07263	FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV.	MOUNTAIN VIEW, CALIF.	94040
09134	TEXAS CAPACITOR CO. INC.	HOUSTON, TEX.	77042
14674	CORNING GLASS WORKS	CORNING, N.Y.	14830
16037	SPRUCE PINE MICA CO.	SPRUCE PINE, N.C.	28777
24931	SPECIALTY CONNECTOR CO. INC.	INDIANAPOLIS, IND.	46227
27264	MOLEX PROD. CO.	DOWNERS GROVE, ILL.	60515
28480	HEWLETT-PACKARD COMPANY	PALO ALTO, CALIF.	94304
56289	SPRAGUE ELECTRIC CO.	N. ADAMS, MASS.	01247
71400	BUSSMANN MFG. DIV. MC GRAW-EDISON CO.	ST. LOUIS, MO.	63017
71744	CHICAGO MINIATURE LAMP WORKS	CHICAGO, ILL.	60640
72136	ELECTRO MOTIVE MFG. CO. INC.	WILLIMANTIC, CONN.	06226
72825	EBY HUGH H. INC.	PHILADELPHIA, PA.	19144
72982	ERIE TECHNOLOGICAL PROD. INC.	ERIE, PA.	16512
75915	LITTELFUSE INC.	DES PLAINES, ILL.	60016
79136	WALDES KOHINOOR INC.	LONG IS. CITY, N.Y.	11101
79727	CONTINENTAL-WIRT ELECTRONICS CORP.	PHILADELPHIA, PA.	19144
80131	ELECTRONIC INDUSTRIES ASSOCIATION	WASHINGTON D.C.	20006
82389	SWITCHCRAFT INC.	CHICAGO, ILL.	60630
84411	TRW CAPACITOR DIV.	OGALLALA, NEBR.	69153
85471	BOYD A.B. CO.	SAN FRANCISCO,CALIF.	94103
87930	POWER MFG. CORP.	PROVIDENCE, R.I.	02903
91418	RADIO MATERIALS CO.	CHICAGO, ILL.	60646
91506	AUGAT INC.	ATTLEBORO, MASS.	02703
95987	WECKESSER CO. INC.	CHICAGO, ILL.	60641
98291	SEALECTRO CORP.	MAMARONECK, N.Y.	10544
99800	DELEVAN ELECTRONICS CORP.	E. AURORA, N.Y.	14052

BACK DATING MANUAL CHANGES

SECTION VII

MANUAL CHANGES AND OPTIONS

7-1. INTRODUCTION.

7-2. This section contains information required to backdate or update this manual for a specific instrument. Descriptions of special options and standard options are also in this section.

7-3. MANUAL CHANGES.

7-4. This manual applies directly to the instrument having a serial prefix as shown on the manual title page. If the serial prefix of the instrument is not the same as the one on the title page, refer to Table 7-1 for changes necessary to backdate the manual to the instrument. When making changes from Table 7-1, make the change with the highest number first. If the serial prefix of the instrument is not listed either in the title page or in Table 7-1, refer to an enclosed MANUAL CHANGES sheet for updating information. Also, if a MANUAL CHANGES sheet is supplied, make all indicated ERRATA corrections.

Table 7-1. Manual Changes

Serial Prefix	Make Changes
No backdating changes are required at this time.	

7-5. SPECIAL OPTIONS.

7-6. Most customer special application requirements and/or specifications can be met by factory modification of a standard instrument. A standard instrument modified in this way will carry a special option number, such as Model 0000A/Option C01.

7-7. An operating and service manual and a manual insert are provided with each special option instrument. The operating and service manual contains information about the standard instrument. The manual insert for the special option describes the factory modifications required to produce the special option instrument. Amend the operating and service manual by changing it to include all manual insert information (and MANUAL CHANGES sheet information, if applicable). When these changes are made, the operating and service manual will apply to the special option instrument.

7-8. If you have ordered a special option instrument and the manual insert is missing, notify the nearest Hewlett-Packard Sales/Service Office. Be sure to give a full description of the instrument, including the complete serial number and special option number.

7-9. STANDARD OPTIONS.

7-10. Standard options are modifications installed on HP instruments at the factory and are available on request. Contact the nearest Hewlett-Packard Sales/Service Office for information concerning standard options.

7-11. Standard options presently available for the Model 183C/D are:

a. OPTION 011: Standard CRT is replaced by P11 phosphor CRT, HP Part No. 5083-2252. The FIND BEAM intensifications feature has been disabled to prevent burn of the sensitive phorphor.

b. OPTION 020: This option is covered in a supplemental manual, Operating Note Option 020 183D, HP Part No 00183-90904.

SCHEMATIC DIAGRÁMS AND TROUBLE - SHOOTING

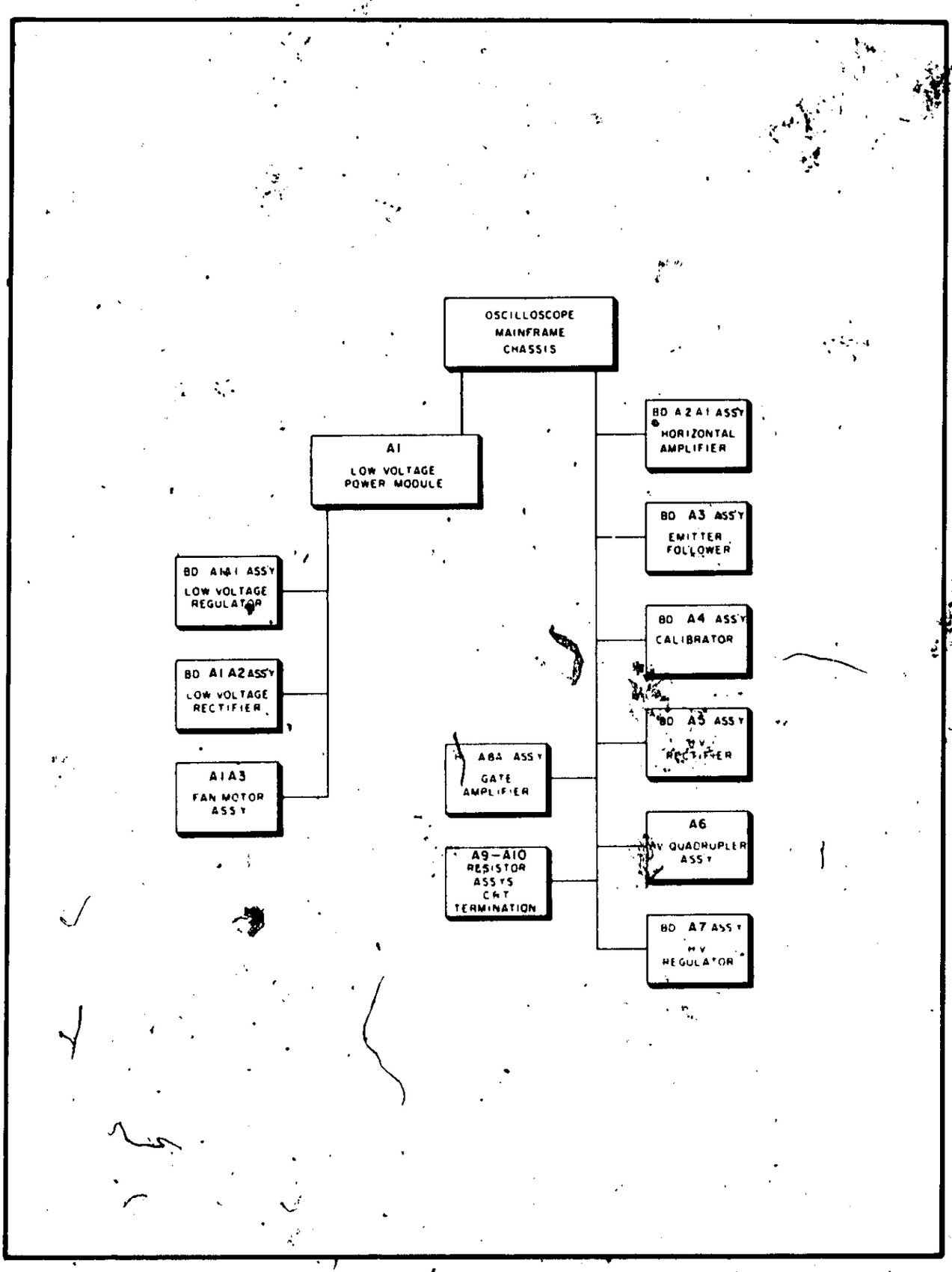


Figure 8-1. Model 183C/D Subassembly Breakdown

SECTION VIII

SCHEMATICS AND TROUBLESHOOTING

8-1. INTRODUCTION.

8-2. This section contains schematics, repair and replacement information, component-identification illustrations, waveforms, test conditions, and troubleshooting charts. Tables 8-1 through 8-5 provide a guide to locating possible problems. Table 8-6 defines symbols and conventions used on the schematics. A disassembly procedure for removing assemblies for repair and replacement is also contained in this section.

8-3. SCHEMATICS.

8-4. Schematics are printed on fold-out pages for easy reference to the text and figures in other sections. The schematics are drawn to show the electronic function of the circuits. Any one schematic may include all or part of several different physical assemblies. Symbols and conventions used in the schematics are defined in Table 8-6.

8-5. The schematics are numbered in sequence with a bold number in a box at the lower right-hand corner of each page. These numbers are used to cross-reference signal connections between schematics. At each circuit breaking point, a notation is made of the signal name and a number (in bold type). This number indicates the associated schematic which contains the source or destination of the signal. To find the source or destination of any point on a given schematic, turn to the schematic referred to by number and find the name of the signal in question.

8-6. A reference designations table on each schematic lists all components shown on the schematic. Component reference designators which have been deleted from the schematic are listed below the table.

8-7. All components within the shaded areas of a schematic are physically located on etched circuit boards. Components not physically located on an etched circuit board are shown in the unshaded areas of the schematic.

8-8. REFERENCE DESIGNATIONS.

8-9. The unit system of reference designations used in this manual is in accordance with the provisions of USA Standard Y32.16-1968, Reference Designations for Electrical and Electronics Parts and Equipments, dated March 1, 1968. Minor variations from the standard, due to design and manufacturing practices, may be noted.

8-10. Each electrical component is assigned a class letter and number. This letter-number combination is the basic reference designation. Components which are not part of an assembly have only the basic reference designation. Components which are part of an assembly have, in addition to the basic designation, a prefix designation indicating the assembly of which the component is a part (resistor R23 on assembly A1 is called A1R23).

8-11. Assemblies are numbered consecutively. If an assembly reference designation is assigned and later deleted, that number is not reused. Figure 8-1 illustrates the sub assembly breakdown.

8-12. COMPONENT LOCATIONS.

8-13. Locations of components on assemblies and sub assemblies are illustrated in photos adjacent to the schematics. Since the schematics are drawn to show function, portions of a particular assembly may appear on several different schematics. The component-location photo is printed next to the schematic that shows most of the circuitry on the assembly. Components located on the chassis are identified in Figure 8-2. The locations of all adjustments are shown in Section V. An exploded view drawing that shows mechanical (and some electrical) parts is located in Section VI.

8-14. SERVICING ETCHED CIRCUIT BOARDS.

8-15. This instrument uses etched circuit boards with plated-through component holes. This allows components to be removed or replaced by unsoldering or soldering from either side of the board. When removing large components, such as potentiometers, rotate the soldering iron tip from lead to lead while applying pressure to the part to lift it from the board. HP Service Note M 20E contains additional information on the repair of etched circuit boards. The important considerations are as follows

a. Do not apply excessive heat.

b. Apply heat to component lead and remove lead with a straight pull away from the board.

c. Use a toothpick to clean hole.

d. Do not force leads of replacement components into holes.

8-16. If the plated metal surface (conductor) lifts from the board, it may be cemented back with a quick-drying acetate-base cement (use sparingly) having good insulating properties. An alternate method of repair is to solder a wire along the damaged area.

8-17. TROUBLESHOOTING.

8-18. GENERAL.

8-19. Effective troubleshooting requires a technician who is familiar with operating procedures and circuit operations. Section III (Operation) and Section IV (Principles of Operation) provide this information. Check suspected malfunctions carefully to determine if improper control settings or connections might cause the trouble.

8-20. The following paragraphs provide detailed troubleshooting for the various circuits of the instrument. When trouble is encountered, try to isolate the problem to a specific circuit and refer to the information concerning that circuit. Read the troubleshooting information provided for that circuit completely before repair. The troubleshooting for each circuit will describe procedures to be followed and conditions that may be peculiar to the circuit.

8-21. TROUBLESHOOTING CHARTS.

8-22. Troubleshooting charts are included for primary circuits. The charts are organized to localize and correct problems rapidly. Start at the beginning of each chart and check the instrument in the sequence presented.

8-23. WAVEFORMS AND VOLTAGES.

8-24. Each schematic has voltage notations adjacent to each point in the circuit to be measured. Conditions for voltage measurements are given adjacent to the schematic. The absence of a voltage on the schematic normally means that measurement at that location could result in erroneous information due to circuit loading.

8-25. TROUBLESHOOTING THE LOW VOLTAGE POWER SUPPLY.

WARNING

Remove power cord before putting jumper between pins 4 and 5.

8-26. Troubleshooting the power supply may be done with the supply removed from the oscilloscope (refer to removal and replacement procedure in this section). An insulated shorting wire must be placed between pins 4 and 5 of A1W1P1 (pin 4 is main power in) to operate the power supply when it is removed from the chassis.

WARNING

With the supply operating with the side panels of the oscilloscope removed, or the supply removed from the chassis and operating with a jumper installed, lethal voltages are exposed.

8-27. If the supply is completely inoperative, inspect the line fuse located on the rear of the power supply. A thermal cutout is also in series with the ac line. The thermal cutout is located in the rear of the supply. It opens the primary line if excessive heat occurs in the heat sink of the power supply. The cutout may be checked with an ohmmeter. It should show continuity at room temperature.

8-28. The voltage from each secondary winding is rectified by a full-wave bridge rectifier and filtered by a capacitor. In the event of diode failure, the supply voltage will vary considerably from the design value and filtering will be severely affected. Loss of capacity in the filter capacitor will affect the voltage and cause excessive ripple at the regulator input.

8-29. Fuses, test points, and voltage adjustment potentiometers for dc voltages are located on the low voltage power supply regulator board. The fuses are connected in series with the regulator transistors. All current output from the supply passes through the particular fuse and series-regulator transistor for that supply.

8-30. The fuses will not open with the supply output shorted if the supply is functioning normally. In case a fuse is open, check the series regulator transistor and drivers.

8-31. The following paragraphs describe procedures to check malfunctions in the low voltage power supply.

8-32. NO OUTPUT VOLTAGE. No output voltage may be the result of an open fuse, open series regulator transistor loss of the +100-volt reference voltage or a defective integrated circuit. In the +15 volt and −12.6 volt supplies, the output may be reduced to a few tenths of a volt by the SCR protection circuit. If a fuse is open, check the series regulator transistor with an ohmmeter or transistor checker first. If the fuse is good, check the +100-volt reference voltage at the test point of the +100-volt output. The integrated circuit may be checked by substituting another unit.

8-33. VOLTAGE TOO HIGH. If the output voltage of the +15-volt and −12.6-volt supplies increases approximately 20% above the nominal value, the SCR overvoltage circuit will short the supply. Check the +100-volt reference voltage and regulation if this condition prevails. To observe the operation of these supplies, before the SCR triggers, operate the supply with a variable transformer input. Too high a voltage may be caused by a shorted series-regulator transistor, shorted driver transistor (contained in integrated circuit except on the +15-volt and −12.6-volt supplies), +100-volt reference out of regulation or set too high, or defective comparator. Removal of the integrated circuit should result in the voltage dropping to zero. If the voltage does not drop, the series-regulator transistor or discrete driver transistor (if used) is shorted

8-34. VOLTAGE TOO LOW. Too low an output voltage is usually a current-limiting condition. Check the output load to see if excessive current is being drawn. Disconnecting Molex plug A1W1P2 (on right side of instrument) will unload the supply. Adjust the potentiometer on the power supply while measuring the output voltage between the test point and chassis. Measure the DC voltage from the bridge rectifier and filter capacitor. Check the integrated circuit by substitution. Measure the +100-volt reference at the voltage divider resistors. Check the resistors for proper value.

8-35. TROUBLESHOOTING THE BLOWER SYSTEM.

8-36. The blower motor and circuit board are only available as a complete assembly. Repair of the motor is not recommended. Repair of the circuit board may be made by conventional methods. If failure should occur, the entire assembly should be replaced. The schematic is shown complete, and circuit board replacement parts are listed in Section VI.

8-37. Air circulated by the blower is drawn through an expanded-foam filter located on the rear of the power supply heat sink. Inspect the filter periodically. Wash the filter in detergent and water. Allow the filter to dry thoroughly before reinstalling.

CAUTION

Do not operate the oscilloscope without the filter installed. Dust and grime will collect on internal parts and cause malfunction.

8-38. TROUBLESHOOTING THE HIGH VOLTAGE POWER SUPPLY.

8-39. The high potentials found in the HVPS attract dust. Periodically remove the covers from the HVPS and clean dust accumulations with a small brush or light air blast.

8-40. Malfunction of the HVPS will usually result in loss of trace or unstable intensity. Troubleshooting may be accomplished with ohmmeter checks of the oscillator transistor, high voltage transformer and regulator circuits. In the event of quintupler failure, replace the assembly.

8-41. TROUBLESHOOTING THE CALIBRATOR CIRCUIT.

8-42. If difficulty is encountered with calibrator operation, try internal and external modes of operation and see if a signal from either mode will supply an output. If no output is available, check the input source to the calibrator, the pulse shaping circuit, the output attenuator, or switching. Voltages are indicated on the schematic. Check the supply voltages to the calibrator section.

8-43. TROUBLESHOOTING THE GATE AMPLIFIER.

8-44. Gate amplifier problems will usually affect the CRT trace. Before troubleshooting the gate amplifier, check the signal output from the horizontal time base (collector of A8A1Q1 on gate board). The signal should be approximately 1.3 volts. If the signal is not present at this point, check the interconnecting wiring from the time base to the gate amplifier board, and the biasing circuit of Q1.

8-45. SERVICING THE CRT TERMINATION CIRCUIT.

8-46. Replacement of components on the termination circuit (CRT neck and shield) is critical. The lead length and location of replacement components should be maintained to reduce reflections.

8-47. TROUBLESHOOTING THE CRT TERMINATION CIRCUIT.

8-48. Troubleshoot the CRT termination circuit by dc voltage measurements. The voltages given may vary slightly and still provide proper operation.

8-49. In the 180-mode (refer to theory of operation, CRT termination circuit in Section IV), install a 180-series vertical plug-in amplifier (make sure the plug-in complies with the instrument compatibility paragraph in Section II). Diodes CR1 through CR4 should be forward biased and should exhibit a voltage drop of 0.6 volt dc anode-to-cathode. Approximately +55 volts dc should be measured at the two neck pins of the CRT where the vertical cable connects (with trace at center graticule). On the calibrator board, +34 volts dc should be measured at resistor A4R45. Diodes A9CR1 and A10CR1 should be back biased in the 180-mode with +55 volts dc at the cathode and approximately +35 volts dc at the anode.

8-50. In the 183-mode, install a 183-series vertical amplifier and 183-series horizontal time base. Diodes CR1 through CR4 are back biased with +59 volts dc on the cathodes and +45 volts on the anodes (both voltages measured to chassis ground). Diodes A9CR1 and A10CR1 are forward biased and should have approximately 0.6 volt dc drop anode-to-cathode. Transistor Q1 should have +100 volts dc at the collector, +57.1 volts dc at the base and +56.4 volts dc at the emitter (voltages referenced to chassis ground).

8-51. TROUBLESHOOTING THE HORIZONTAL AMPLIFIER.

8-52. Trouble in the horizontal amplifier will usually cause an unbalanced condition. The trace will usually shift from the center of the CRT and may leave the

Table 8-1. Troubleshooting Chart, Low Voltage Power Supply Module

Trouble	Probable Cause	Isolation Procedure
No Output	Open fuse	Replace the fuse.
(pilot lamp out)	Thermal cutout open.	Allow instrument to cool. Check ventilation filter, fan operation and possible overload condition.
	Faulty thermal cutout.	Check continuity, replace cutout.
	Faulty switch.	Check continuity of switch.
No Output (pilot lamp on)	+100V supply fuse open.	Inspect and replace.
	Faulty bias supply.	Check AC output on transformer taps 4 & 9.
	Faulty diode (CR1 thru CR4).	Check DC output between A1W1J1-R (+) and A1W1J1-14(–).
	Faulty zener.	Measure DC across A1A1VR1 (6.19V).
	Faulty +100V supply.	Measure between TP1 and chassis.
	Faulty comparator circuit.	If +100 Vdc is not present replace A1A1U1.
	Open regulator transistor.	If voltage is still not present, replace A1Q1 in heat sink.
Regulation poor (all voltages)	+100V supply out of regulation.	Measure voltage at TP1 (+100 Vdc).
	Voltages high.	Replace A1A1U1, check A1Q1 in heat sink.
	Reference out of tolerance.	Measure DC across A1A1VR2 (9V).
Voltages on all supplies too high or low	+100V supply incorrectly adjusted.	Adjust A1A1R11 while measuring +100 Vdc output between TP1 and chassis.
No voltage from +15V or –12.6V supply	SCR turned on, shorting out supply.	Turn off supply and restart. Use variable to supply the line voltage to observe operation.
		+100V supply output too high.

NOTE

The +15-volt and –12.6-volt power supplies have an overvoltage-protection circuit which utilizes an SCR. If an overvoltage or transient condition appears at the output of these supplies, the SCR is triggered into conduction, shorting out the supply. In order to clear the short, shut down the supply to allow the SCR to return to the off condition.

Table 8-1. Troubleshooting Chart, Low Voltage Power Supply Module (cont'd)

Trouble	Probable Cause	Isolation Procedure
+35V, +15V, −12.6V Or −100V supplies (no output)	Fuse open.	Inspect and replace.
	Faulty comparator.	Replace integrated circuit with good unit.
	Faulty driver transistor.	Check A1A1Q2 (+15V) Check A1A1Q3 (−12.6V)
	Open series regulator.	Check A1Q2 (+35V) Check A1Q3 (+15V) Check A1Q4 (−12.6V) Check A1Q5 (−100V)
	Faulty diode in bridge circuit.	Measure dc output of bridge circuit at filter capacitor.
	Open winding in transformer.	Measure ac output on transformer secondaries.
(Voltage too high and unregulated)	Faulty integrated circuit.	Replace integrated circuit with good unit.
	Shorted series regulator transistor.	Check appropraite transistor in heat sink. A1Q2 (+35V) A1Q3 (+15V) A1Q4 (−12.6V) A1Q5 (−100V)
	Shorted driver transistor. (+15V and −12.6V supplies only).	Check A1A1Q2 or A1A1Q3.

viewing area completely. Troubleshooting the horizontal amplifier differential stages may be done by clamping the stages together. The following steps describe this method.

CAUTION

The procedure for clamping the bases of the differential amplifier stages together can damage the equipment unless done properly. Do not allow the jumper wire to contact the chassis or other components.

a. Use a short jumper wire with an insulated miniature clip on each end.

b. Turn the instrument off while making connections with the jumper.

c. Connect the jumper between the bases of A2Q3 and A2Q4.

NOTE

Transistors A2Q3 and A2Q4 are mounted on the bracket underneath the horizontal amplifier board. Connection between the bases may be made on the top side of the board at resistors A2A1R52 and A2A1R56.

d. With the jumper in place, turn on the oscilloscope If the trace returns to the center of the CRT, Q7 and Q8 are functioning properly.

e. Turn the oscilloscope off. Remove the jumper wire

f. Place the jumper between the bases of A2A1Q7 and A2A1Q8. Check the operation according to step d.

g. Proceed as in step d to differential pair A2A1Q5, A2A1Q6 and also A2A1Q3, A2A1Q4.

h. Using this method, the trace will return to center on the CRT if the stages between the point clamped and the output are functioning properly. When a stage is reached where the trace does not return, voltage and ohmmeter measurements should reveal the trouble.

8-53. REMOVAL AND REPLACEMENT PROCEDURES.

8-54. The following paragraphs describe removal and replacement of assemblies and components of the Model 183C/D. Steps that do not specify Model 183C or Model 183D are for both models.

8-55. LOW VOLTAGE POWER SUPPLY MODULE REPLACEMENT.

8-56. To remove the low voltage power supply module:

a. Remove power cord and probes.

b. Remove lower-left and lower-right covers on Model 183C, or bottom cover on Model 183D.

c. Turn instrument upside down, remove four screws from center support holding power module.

d. Disconnect two nylon connectors on forward part of supply.

e. Turn oscilloscope right-side-up with front facing rear of workbench.

CAUTION

When power supply is removed from mainframe, be careful with components on regulator board. When reinstalling power supply, make sure wires are not pinched.

f. Remove two screws (upper-right and lower-left) from power module heat sink and slide power module from mainframe.

g. To replace power supply module, reverse steps a through f.

8-57. HVPS COMPONENTS REPLACEMENT.

WARNING

Disconnect power from instrument before working on HV supply. Dangerous voltages are exposed.

8-58. The HVPS regulator board is mounted on rear panel of display section of instrument. Access may be obtained by removing heat sink. The oscillator transistor is mounted inside of heat sink. When replacing transistor, be sure transistor is completely insulated from heat sink by insulating washer. If collector of transistor becomes shorted to chassis, the HVPS fuse on regulator board will open when power is applied. Do not over-tighten screw mounting transistor. HVPS regulator board may be removed by disconnecting square-pins and removing screws holding circuit board to rear panel.

8-59. The HV rectifier board and quintupler are housed together under the box cover located to the rear beside the CRT. To remove the assembly, proceed as follows:

a. Remove power cord and probes.

b. Remove upper-left cover on Model 183C or top cover on Model 183D.

WARNING

When disconnecting HV plug from HVPS quintupler box, short exposed end of plug to chassis to discharge CRT.

c. With insulated long-nose pliers, disconnect HV plug from HVPS quintupler box and short out as described in preceding warning.

d. On Model 183D disconnect vertical cable from CRT.

e. On Model 183D remove vertical cable bracket from horizontal bracket.

f. Remove two screws securing HV quintupler cover and remove cover.

g. On Model 183C disconnect square pins from HV rectifier board and remove quintupler assembly.

h. On Model 183D disconnect square pins at the same time as you are removing the HV quintupler assembly.

i. If removal of HV rectifier board is desired, disconnect wires from quintupler assembly and remove four screws.

j. To replace HV components reverse steps a through i.

8-60. CALIBRATOR BOARD REPLACEMENT.

8-61. To remove calibrator board:

a. Remove power cord and probes.

b. Remove upper-left cover on Model 183C, or left cover and side casting on Model 183D.

c. Remove FIND BEAM switch knob.

d. Unsolder BNC connector from calibrator board and unscrew connector from front panel.

e. Disconnect square pins and disconnect plug from calibrator board.

f. Remove three screws that mount calibrator board to bracket.

Table 8-2. Troubleshooting Chart, High Voltage Power Supply

WARNING

THE HVPS VOLTAGES ARE DANGEROUS. CONTACT CAN RESULT IN INJURY OR DEATH.

Trouble	Probable Cause	Isolation Procedure
No HV Output (HV oscillator not operating) Check for waveform	Open Line Fuse.	Check and replace.
	Open HV fuse.	Disconnect instrument. Inspect fuse on HV regulator board.
	Inoperative LVPS.	Refer to LVPS troubleshooting. Check +100V, +15V & −12.6V outputs.
	Faulty oscillator transistor Q2.	Check or replace.
	Loss of power to HV oscillator.	Measure .2 ohm continuity across collector winding.
	Open base circuit in HV oscillator.	Measure .1 ohm continuity across base winding.
	Shorted secondary of HV oscillator transformer.	Measure 250 ohms continuity across winding associated with A5A1CR1.
		Measure 400 ohms continuity across both windings associated with A5A1CR2.
	Inoperative Regulator circuit.	Make ohmmeter measurements in HV regulator.
HV oscillator operating out of regulation	Inoperative regulator.	Make ohmmeter measurements in HV regulator to locate faulty component.

Table 8-3. Troubleshooting Chart, Calibrator

Trouble	Probable Cause	Isolation Procedure
No output (any mode)	Faulty power source, plug, or cable.	See schematic and measure voltages at calibrator plug.
	Faulty bias to pulse shaper A4U1.	Measure dc voltage at each pin of pulse shaper with mode switch in EXT position.
	Faulty switch or attenuator.	Check waveform at output of pulse shaper (pin 8) with mode switch in INT (2 kHz).
	No signal input to pulse shaper.	Check waveform at input of pulse shaper (pin 14) with mode switch in INT.
No output (internal mode only)	Faulty voltage supply to multivibrators.	Measure dc voltage supplied to A4C10 from FREQ switch A4S1A. FREQ in 1 MHz position.
		Measure dc voltage supplied to A4C4 from plug.
		Measure dc voltage supplied to A4C12 from FREQ switch A4S1A. FREQ in 2 kHz position.
No output (internal mode one freq only)	Faulty transistor.	Check transistors in inoperative multivibrator.
No output (external mode only)	Faulty or no input from emitter follower.	Measure waveform input to base of Schmitt trigger transistor A4Q1. Input should be −0.8V to trigger.
	Apply main gate output signal to EXT CAL input jack on rear panel to trouble-shoot calibrator in external mode. (Time base must be installed to use gate output as source).	(Mode switch in EXT position, −1.0V signal applied to external input).
		Check voltages supplied to emitter follower A3Q3.
		Check transistor A3Q3.
	Faulty Schmitt trigger circuit.	Measure voltages applied to Schmitt trigger circuit.
		Check transistors in Schmitt trigger circuit.

Table 8-3. Troubleshooting Chart, Calibrator (cont'd)

Trouble	Probable Cause	Isolation Procedure
Incorrect amplitude	NOTE The calibrator must be terminated into 50 ohms ±0.5 ohm for accurate measurement. Unloaded output (high impedance) will provide 1.0 and 0.1 volt.	
Incorrect amplitude (50 mV only)	Faulty attenuator or switch.	Check values of resistors between A4U1 and calibrator output jack. Clean or repair switch.
Incorrect amplitude (0.5V and 50 mV)	Amplitude adjustment.	Readjust, refer to Section V.
	Faulty pulse shaper.	Measure all dc voltages at pulse shaper pins and at calibrator output. High Z output should be 1.0V and 0.1V.
Improper duty cycle of freq (one INT mode only, 1 MHz or 2 kHz)	Adjustments.	Readjust, refer to Section V.
	Faulty component in multivibrator circuit.	Check and replace faulty component
	NOTE When components are replaced in the multivibrator or pulse shaper circuits, refer to Section V and check adjustments.	
(both INT modes)	Improper voltage supplied to multivibrators.	Measure voltages and correct.
Distorted waveform. (one INT mode only, 1 MHz or 2 kHz)	Faulty component in multivibrator circuit.	Check and replace faulty component
	Faulty bias to pulse shaper.	Measure voltages at pins of pulse shaper.
	Faulty input signal to pulse shaper.	Check waveform of input signal to pulse shaper.
	Faulty pulse shaper.	Check all voltages, components and waveforms.
(EXT mode only)	Faulty component in Schmitt trigger circuit.	Check and replace faulty component

g. Remove board by sliding it toward rear of instrument. Rock board slightly to allow switch knobs to clear front panel.

h. To replace calibrator board reverse steps a through g.

8-62. INTEGRATED CIRCUIT REPLACEMENT.

8-63. The IC (integrated circuits) in this instrument are of two general configurations, plug-in types and those soldered in place. Remove a plug-in IC with a straight pull away from the board. Soldered IC units may be removed with soldering irons which simultaneously heat all connections (available from various manufacturers). Soldering irons with built-in desoldering tools also facilitate quick removal.

CAUTION

Unless an IC has definitely failed, be careful to prevent damage when removing or replacing it.

8-64. Use the following procedure for removing an IC with a standard soldering iron.

a. Gently grip each lead of the integrated circuit with tweezers.

b. Heat solder joint until molten and lift lead away from board. Do not overheat integrated circuit or etch on circuit board. Use a small soldering iron with chisel tip (40 watt or less with 1/8-inch tip).

c. Repeat process for each lead until integrated circuit is loose.

d. To install new integrated circuit, press each lead against board gently with soldering iron tip. Hold lead in place with tweezers until solder cools.

8-65. GATE AMPLIFIER BOARD REPLACEMENT.

8-66. To remove gate amplifier board:

a. Remove power cord and probes.

b. Remove upper-right cover on Model 183C or top and left cover of 183D.

c. Disconnect gate amplifier output wire (white) from HV regulator board.

d. Disconnect plug from circuit board.

e. Remove screw located on top of gate amplifier board bracket. Screw has countersunk head and secures bracket to mainframe.

f. Remove two lower screws from gate amplifier board that secure board and bracket to mainframe.

g. Remove board (with bracket attached) from mainframe.

h. If board must be removed from bracket, remaining screws can be removed and board and bracket separated.

WARNING

The white heat sinks on the output transistors are made of Beryllium Oxide. The material is safe in solid form. Do not file, scrape or alter the material in a manner which will create power or dust, it is harmful if inhaled.

i. To replace gate amplifier reverse steps a through h.

8-67. CATHODE RAY TUBE REPLACEMENT.

8-68. To remove CRT:

WARNING

When removing or replacing the CRT, wear a face mask or goggles, and gloves. The CRT is evacuated. An accidental tap could cause implosion.

a. Remove power cord and probes.

b. Remove plug-in units and all instrument covers.

c. Remove light shield.

d. Remove four screws securing bezel and remove bezel.

e. Disconnect wires from CRT neck pins.

f. Disconnect (957) wire from calibrator board (square pin). Cut Ty Wrap to free wire.

g. Remove four screws holding heat sink on display portion of mainframe.

h. Disconnect CRT socket from rear of CRT.

i. Loosen clamp on neck of CRT.

WARNING

When disconnecting HV plugs from HVPS quintupler box, short exposed end of plugs to chassis to discharge CRT.

Table 8-4. Troubleshooting Chart, Gate Amplifier

Trouble	Probable Cause	Isolation Procedure
No main gate or alternate trigger	Faulty signal connection.	Trace signal path from time base through W21J1 to gate board.
	Intensity level too low.	Refer to Section V for intensity level adjustment.
	Incorrect bias to Q1.	Isolate inputs. Check bias component
Trace intensity too dim or too bright	INT, zero adjustment, or intensity level incorrect.	Refer to Section V for adjustment.
	Intensity limit control in HVPS incorrectly adjusted.	Refer to HVPS adjustments in Section V.
	Faulty component. NOTE Amplitude of waveform at TP 3 should be adjustable from 0 to approximately 80 volts with INT control.	Measure amplitude of waveform at TP 3. Measure dc voltages from TP 1 Through TP 3. Check A13A1Q1
Leading edge of waveforms too dim on fast sweep speeds	Risetime of gate signal too slow.	Check adjustment of A13A1C7 and A13A1C8, refer to Section V for procedure. Check waveforms and measure dc voltages TP 1 through TP 3.
No alternate trigger or pulsed floodgun. Main gate output OK	Transistor failure Q10 through Q13. Faulty component.	Check waveforms and measure dc voltages TP 4 and TP 5.
No pulsed floodgun. Main gate and alternate trigger OK	Transistor failure Q16, Q17 or Q18. Component failure.	Measure dc voltages at Q16, Q17, Q18 and Q19. Check continuity through R2 and S2 and connecting wiring.
No floodgun (normal mode)	Transistor failure or component failure.	Check dc voltages at A13A1Q19. Check continuity through R2 and S2.

j. With insulated long-nose pliers, disconnect HV plugs from HVPS quintupler box and short out as described in preceding warning.

k. Remove CRT by gently sliding it out of shield while guiding attached wires through openings in CRT shield.

l. To replace CRT, reverse steps a through k.

8-69. HORIZONTAL AMPLIFIER REPLACEMENT.

8-70. To remove horizontal amplifier:

a. Remove power cord, probes, and plug-in units.

b. Remove upper right cover on Model 183C or top and bottom covers on Model 183D.

c. On Model 183D remove horizontal amplifier cover by removing one screw toward rear of cover and loosen three screws at the front. Cover fits on the display side of spacer.

d. Disconnect all wires from horizontal amplifier board (note placement).

e. Unsolder BNC connector from circuit board and unscrew BNC connector from front panel.

f. On Model 183D disconnect vertical cable from CRT. Remove vertical cable bracket from Horizontal board bracket.

g. Remove screw located on top of horizontal amplifier board bracket.

h. Remove two screws on lower part of circuit board that secure board and bracket to mainframe.

i. Remove circuit board with bracket attached by sliding them toward rear of instrument. Rock board slightly to allow switch knobs to clear front panel.

j. If board must be removed from bracket, remaining screws can be removed and board and bracket separated.

WARNING

The white heat sinks on the output transistors are made of Beryllium Oxide. The material is safe is solid form. Do not file, scrape or alter the material in a manner which will create powder or dust, it is harmful if inhaled.

k. To replace horizontal amplifier, reverse steps a through j.

Table 8-5. Troubleshooting Chart, Horizontal Amplifier

Trouble	Probable Cause	Isolation Procedure
Output unbalanced (trace off center)	DC balance out of adjustment.	Refer to Section V and perform balance adjustment.
	Horizontal position voltage out of range.	Check base of A11A1U1Q1. Horizontal position should provide 0 volt.
	Component faulty.	Isolate defective stage with procedure given in troubleshooting paragraph.
	NOTE Differential amplifier voltages should be close between stages. Voltage differences may indicate faulty components.	Measure dc voltages through differential amplifiers.
		Make ohmmeter checks at areas of voltage differences.
No output	No input signal from time base.	Connect CALIBRATOR OUT to HORIZONTAL EXT INPUT. Set HORIZONTAL INT - EXT switch to EXT position.
	Faulty time base.	Refer to time base manual.
	Faulty connectors or wiring.	Check output of time base through J1 to horizontal board A11A1.
	Faulty horizontal attenuator.	Set HORIZONTAL X1 - X10 switch to X10. X10 bypasses attenuator.
	Incorrect voltages.	Measure dc voltages on horizontal amplifier circuit board.
	Faulty A2U1.	Measure dc voltages at pins of A11A1U1.
		Check by subsititution.
	Faulty transistor.	Check dc voltages at pins A11A1Q1 and A11A1Q2.
Horizontal amplifier out of calibration.	Incorrect calibration.	Refer to Section V and perform gain adjustment.
	Incorrect voltages.	Measure dc voltages.
	Attenuator damaged.	Switch to X10 range and recheck calibration.
		Check A11A1S1.
Poor horizontal linearity	Incorrect adjustment.	Refer to Section V and perform horizontal amplifier linearity adjustment.
	Amplifier distortion.	Check waveforms for linearity.
Horizontal amplifier OK (no display on CRT)	Disconnected or broken output cable.	Inspect visually.

Table 8-6. Schematic Notes

Refer to MIL-STD-15-1A for schematic symbols not listed in this table.

= Etched circuit board

= Front-panel marking

= Rear-panel marking

= Front-panel control

= Screwdriver adjustment

P/O = Part of

CW = Clockwise end of variable resistor

NC = No connection

3 = Waveform test point (with number)

A = Common electrical point (with letter) not necessarily ground

= Single-pin connector on board

A = Pin of a plug-in board (with letter or number)

= Coaxial cable connected to snap-on jack

= Coaxial cable connected directly to board

= Wire connected to pressure-fit socket on board

= Main signal path

= Primary feedback path

= Secondary feedback path

= Field-effect transistor (P-type base)

= Field-effect transistor (N-type base)

= Breakdown diode (voltage regulator)

= Tunnel diode

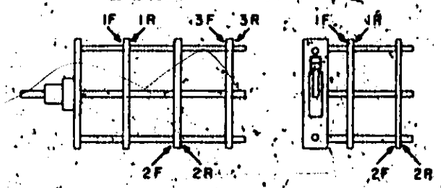
= Step-recovery diode

= Circuits or components drawn with dashed lines (phantom) show function only and are not intended to be complete. The circuit or component is shown in detail on another schematic.

(925) = Wire colors are given by numbers in parentheses using the resistor color code
((925) is vht red grn)

0 Black	5 Green
1 Brown	6 Blue
2 Red	7 Violet
3 Orange	8 Gray
4 Yellow	9 White

Switch wafers are identified as follows:



= Optimum value selected at factory, typical value shown, part may have been omitted.

Unless otherwise indicated:
resistance in ohms
capacitance in picofarads
inductance in microhenries

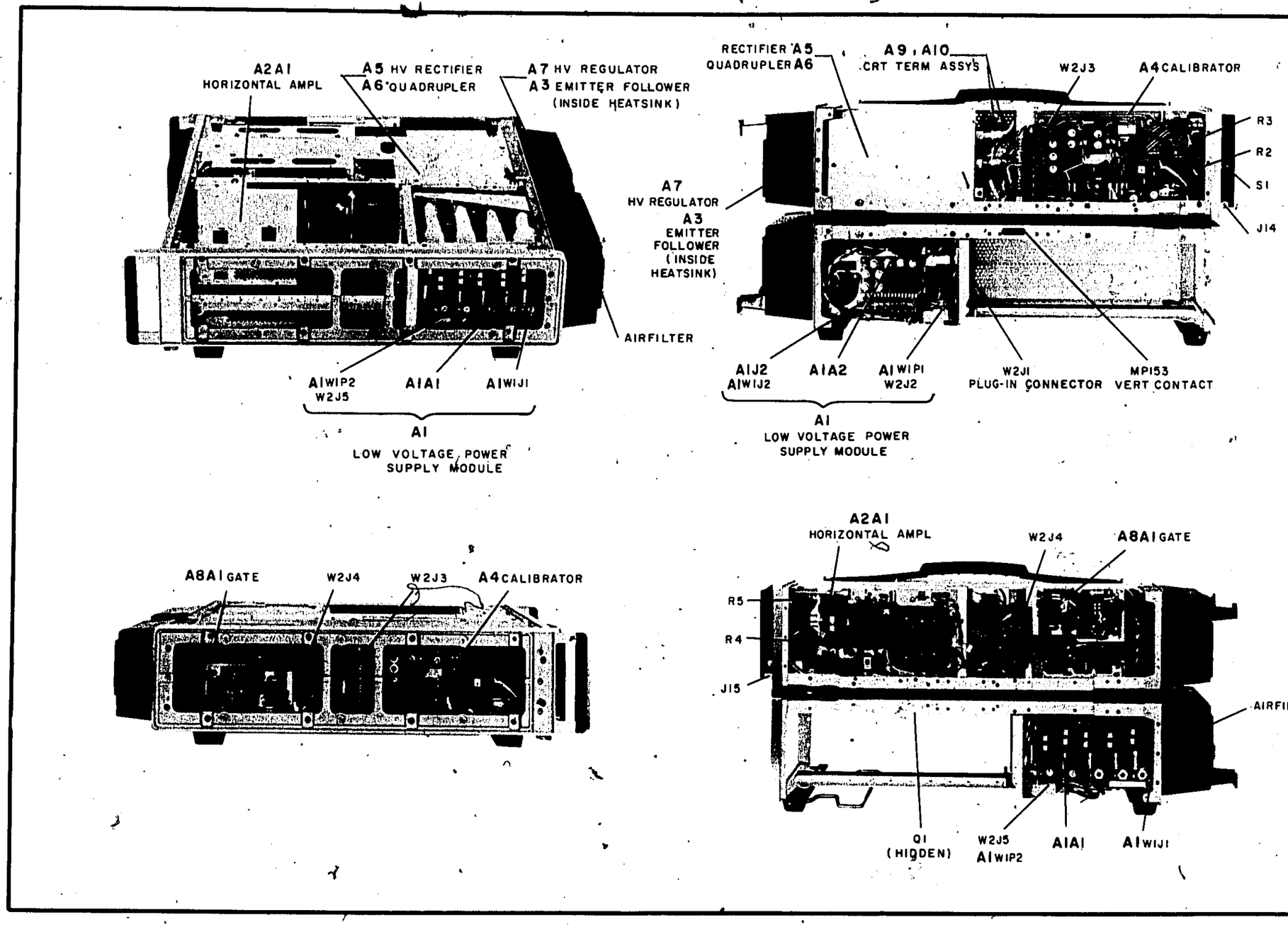


Figure 8-2. Chassis Component Locations

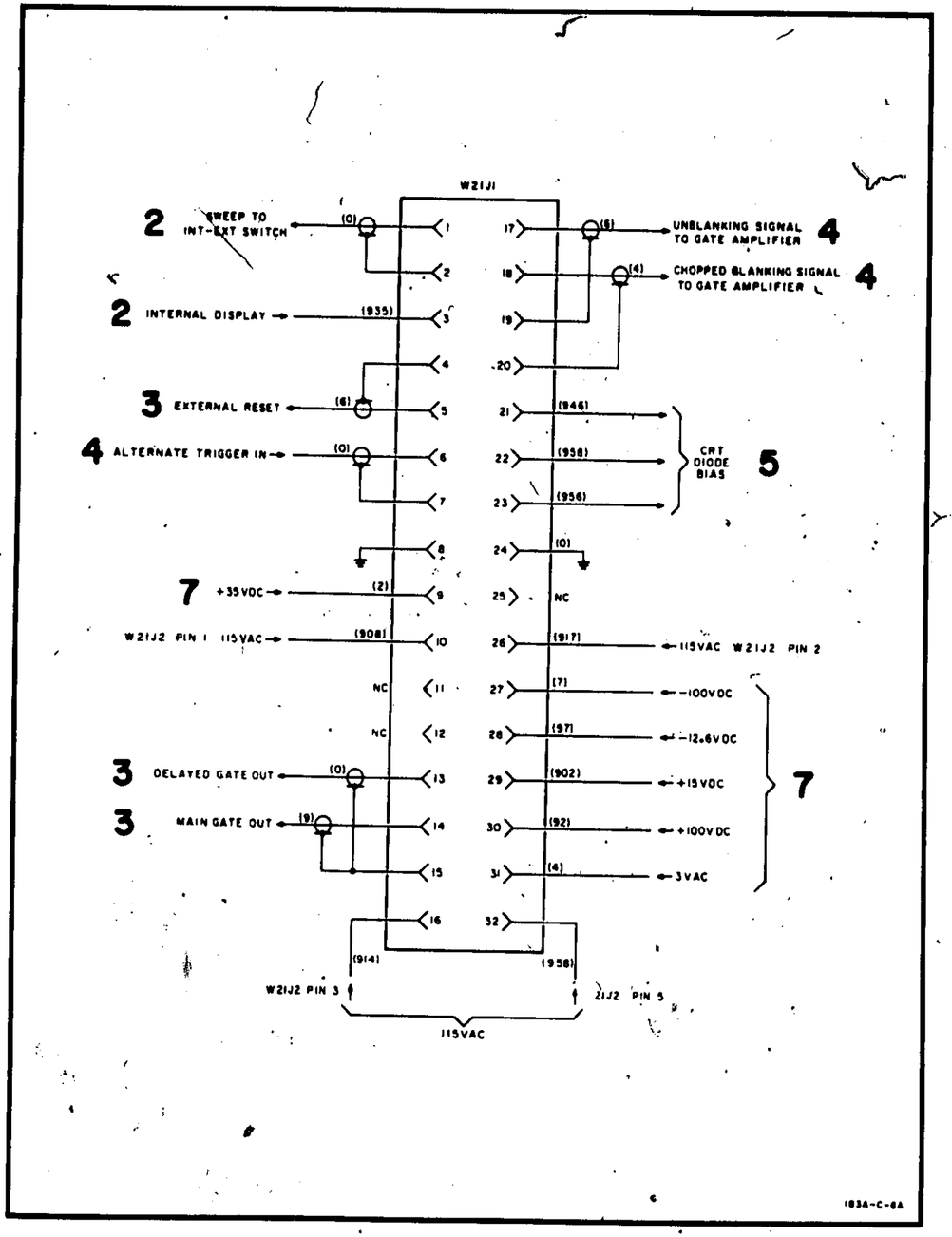


Figure 8-3. Jack Connections

VOLTAGE MEASUREMENT CONDITIONS

a. Set Model 183A/B Oscilloscope:

(1) CALIBRATOR MODE SWITCH ..... EXT

(2) No signal applied to CALIBRATOR EXT INPUT.

b. All measurements made in reference to chassis ground.

c. Voltages may vary slightly between units.

d. Voltages shown on schematic are dc.

WAVEFORM MEASUREMENT CONDITIONS

a. For waveforms 1 and 2 set Model 183A/B Oscilloscope:

CALIBRATOR MODE SWITCH	EXT
TIME/DIV	5 usec
SWEEP HOLD OFF	NORM
SWEEP VERNIER	CAL

b. Connect MAIN GATE OUT to CALIBRATOR EXT INPUT and also to external trigger input of monitor oscilloscope using TEE connector and cables.

c. Set monitor oscilloscope:

horizontal magnifier	X1
display	INT
Time base trigger source	EXT
HORIZONTAL TIME/DIV	5 usec
TRIGGER SLOPE	+
Trigger signal coupling	AC
SWEEP MODE	AUTO
VERTICAL V/DIV	0.02
POLARITY	+

d. For waveforms 3 through 6.

(1) Set Model 183A/B Oscilloscope:

CALIBRATOR MODE SWITCH	INT
CALIBRATOR FREQ	2 kHz
CALIBRATOR AMPL	0.5 V

(2) Disconnect monitor oscilloscope horizontal trigger cable from CALIBRATOR EXT INPUT and connect to CALIBRATOR OUT jack.

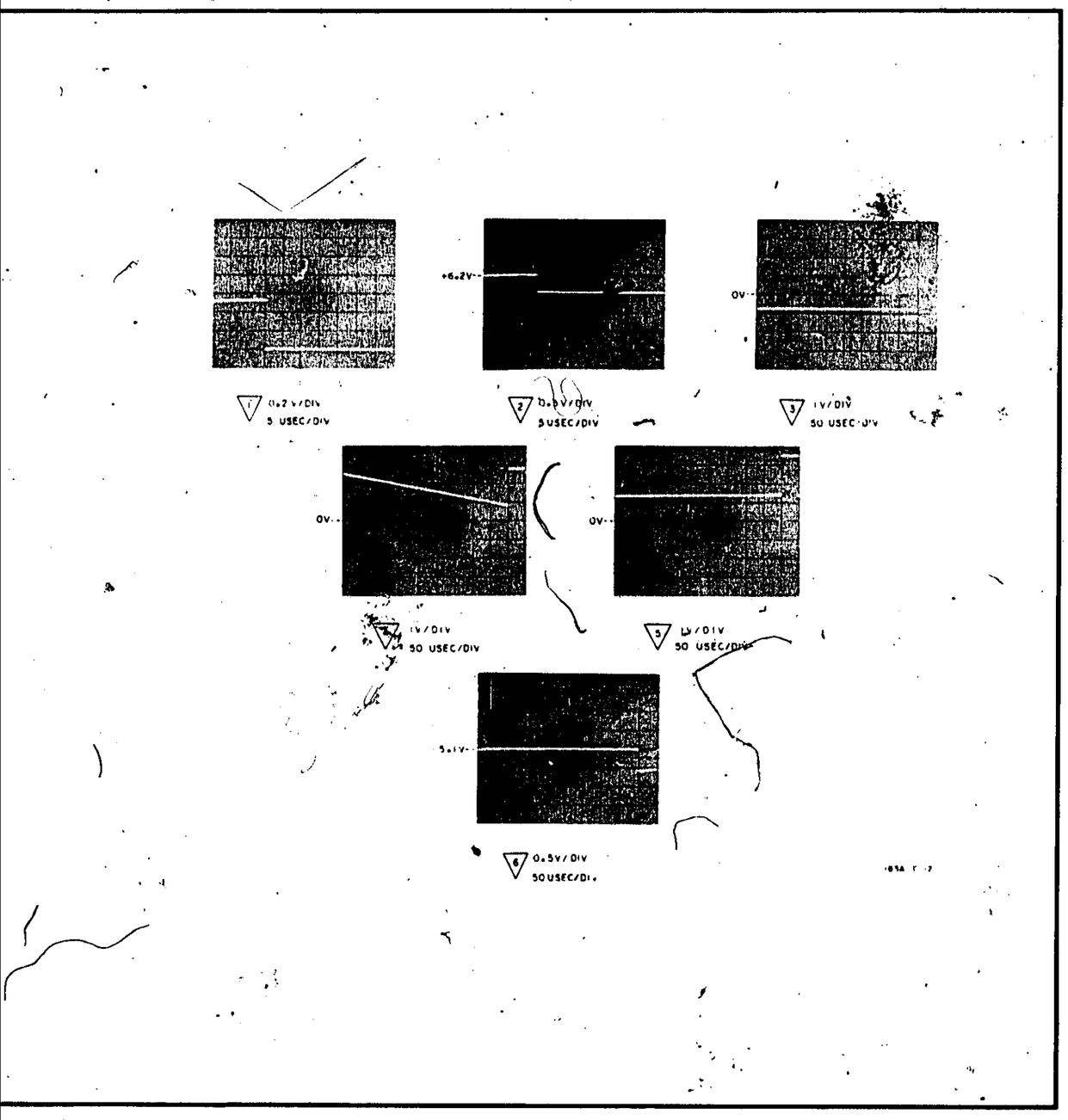
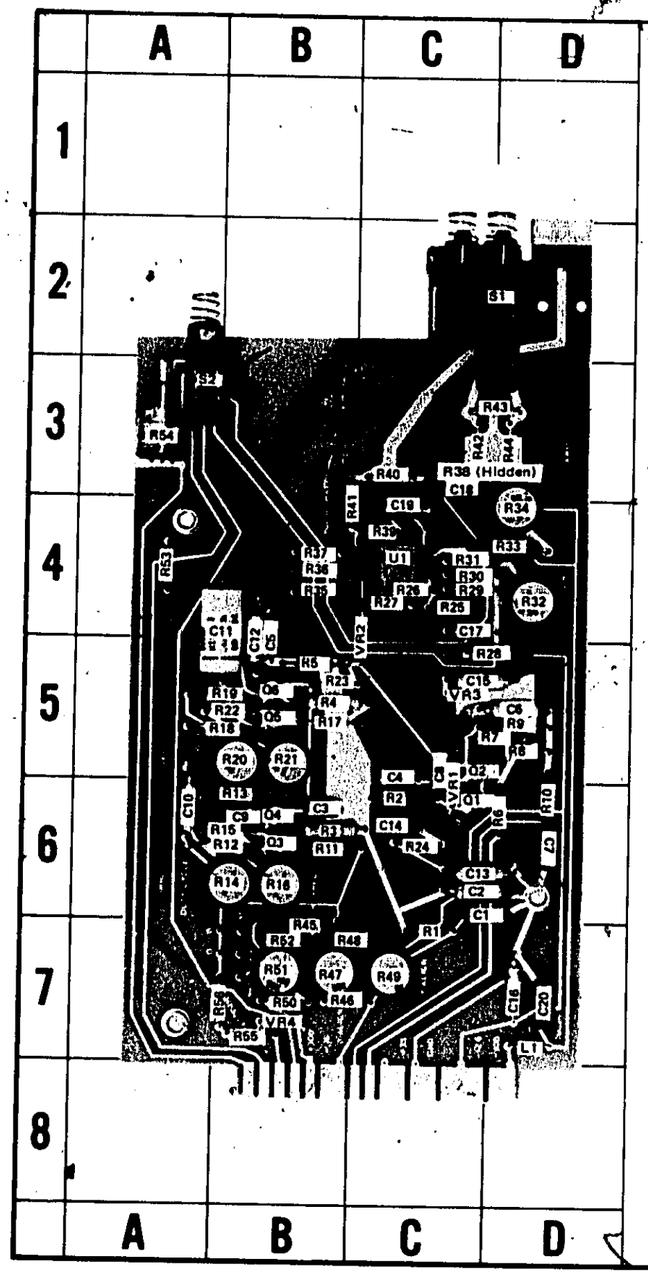


Figure 8-4. Calibrator Waveforms and Voltage Measurement Conditions



REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-6	R19	B-5
C2	C-6	C20	B-5
C3	B-6	R21	B-5
C4	C-5	R22	B-5
C5	B-4	R23	B-5
C6	D-5	R24	C-6
C7	D-6	R25	C-4
C8	C-5	R26	C-4
C9	B-6	R27	C-4
C10	A-6	R28	C-5
C11	A-4	R29	C-4
C12	B-4	R30	C-4
C13	C-6	R31	C-4
C14	C-6	R32	D-4
C15	C-5	R33	D-4
C16	D-7	R34	D-4
C17	C-4	R35	B-4
C18	C-3	R36	B-4
C19	C-3	R37	B-4
C20	D-7	R38	C-3
L1	D-7	R39	C-4
Q1	C-6	R40	C-3
Q2	C-5	R41	C-3
Q3	B-6	R42	B-3
Q4	B-6	R43	D-3
Q5	B-5	R44	D-3
Q6	B-5	R45	B-7
R1	C-7	R46	B-7
R2	C-6	R47	B-7
R3	B-6	R48	C-7
R4	B-5	R49	C-7
R5	B-5	R50	B-7
R6	D-6	R51	B-7
R7	D-5	R52	B-7
R8	D-5	R53	A-4
R9	D-5	R54	A-3
R10	D-6	R55	B-7
R11	B-6	R56	B-7
R12	B-6	S1	C-2
R13	B-6	S2	A-3
R14	B-6	U1	C-4
R15	B-6	VR1	C-6
R16	B-6	VR2	C-4
R17	B-5	VR3	C-5
R18	B-5	VR4	B-7

Figure 8-5. Component Location, Calibrator Board

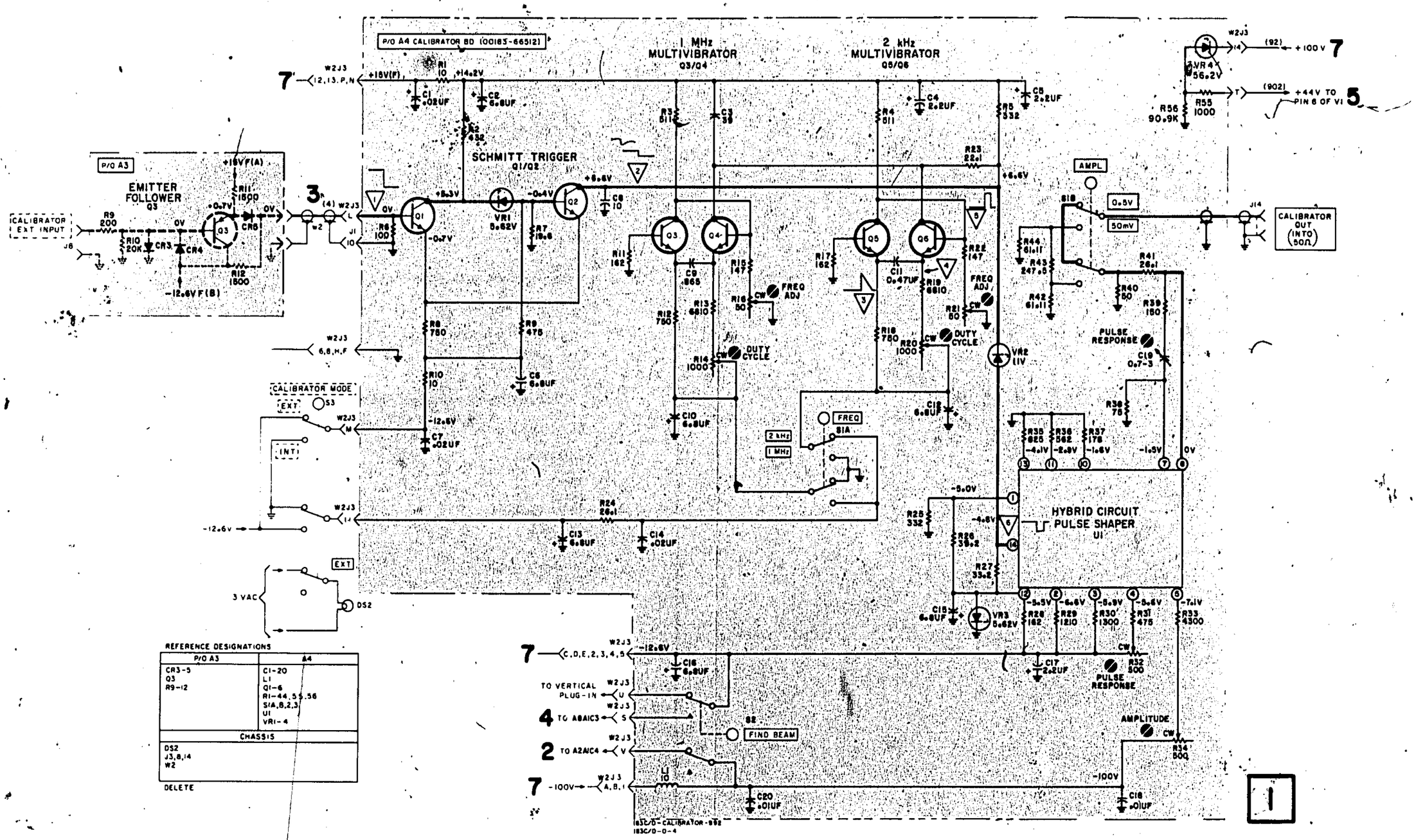


Figure 8-6. Calibrator Schematic

VOLTAGE MEASUREMENT CONDITIONS

a. Set Model 183A/B Oscilloscope:

horizontal input	EXT
horizontal coupling	DC
horizontal magnifier	X10
NORM - CAL switch	NORM
BW - PHASE switch	BW

b. Adjust HORIZONTAL POSITION for 0 volt at base (pin 2) of U1Q1.

c. Adjust DC BALANCE (R17) for 0 volt at base (pin 9) of U1Q4.

d. Voltages may differ slightly between instruments.

e. All measurements made in reference to chassis ground.

f. Voltages shown on schematic are dc.

WAVEFORM MEASUREMENT CONDITIONS

a. Set Model 183A/B Oscilloscope:

horizontal input	INT
horizontal magnifier	X1
TIME/DIV	0.5 usec
SWEEP HOLD OFF	NORMAL
SWEEP VERNIER	CAL

b. Set monitor oscilloscope:

horizontal magnifier	X1
DISPLAY	INT
Time base triggering	INT
HORIZONTAL TIME/DIV	0.5 usec
TRIGGER SLOPE	+
Trigger signal coupling	AC
SWEEP MODE	AUTO
vertical V/DIV	NOTED
POLARITY	+UP
COUPLING	AC

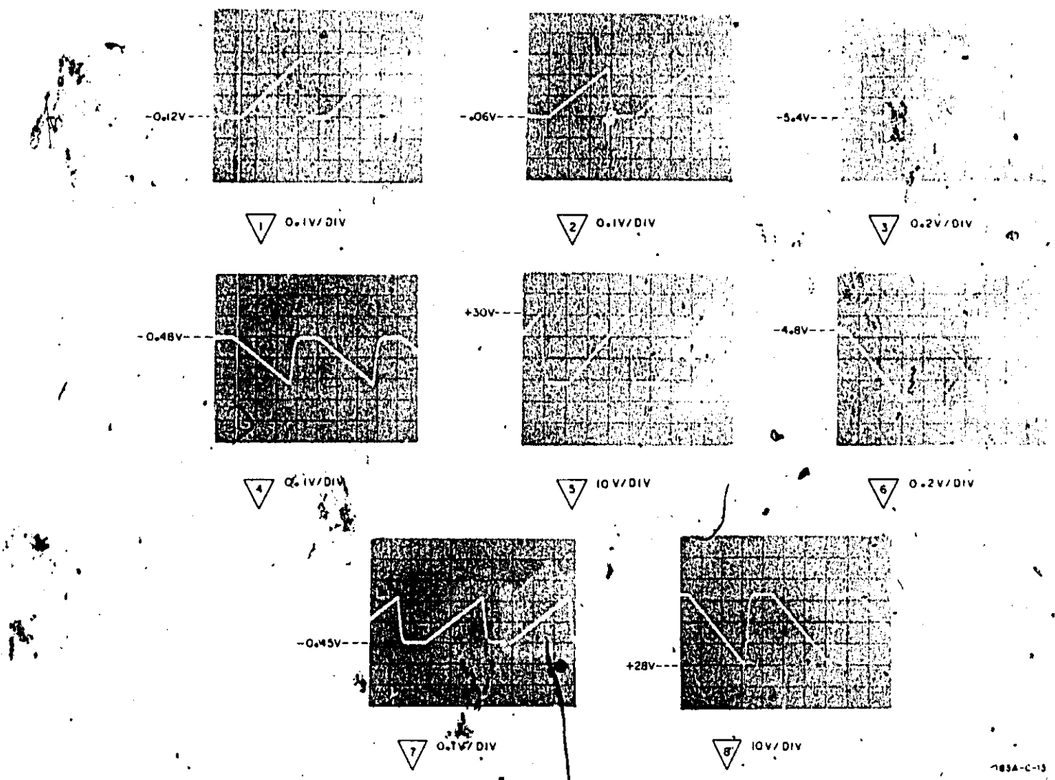
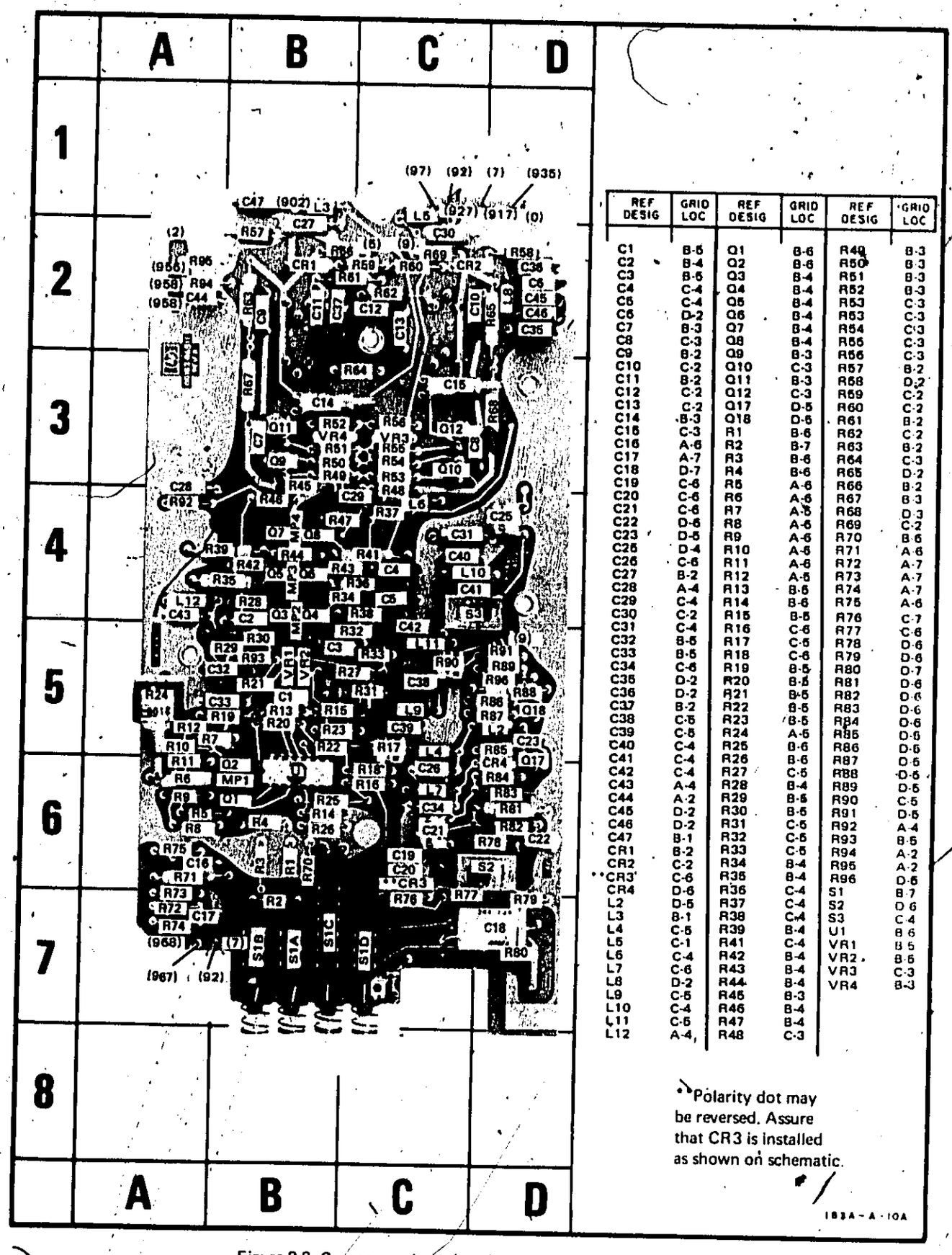


Figure 8-7. Horizontal Amplifier Waveforms and Voltage Measurement Conditions



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-5	Q1	B-6	R49	B-3
C2	B-4	Q2	B-6	R50	B-3
C3	B-5	Q3	B-4	R51	B-3
C4	C-4	Q4	B-4	R52	B-3
C5	C-4	Q5	B-4	R53	C-3
C6	D-2	Q6	B-4	R54	C-3
C7	B-3	Q7	B-4	R55	C-3
C8	C-3	Q8	B-4	R56	C-3
C9	B-2	Q9	B-3	R57	B-2
C10	C-2	Q10	C-3	R58	D-2
C11	B-2	Q11	B-3	R59	C-2
C12	C-2	Q12	C-3	R60	C-2
C13	C-2	Q17	D-5	R61	B-2
C14	B-3	Q18	D-5	R62	C-2
C15	C-3	R1	B-6	R63	B-2
C16	A-6	R2	B-7	R64	C-3
C17	A-7	R3	B-6	R65	D-2
C18	D-7	R4	B-6	R66	B-2
C19	C-6	R5	A-6	R67	B-3
C20	C-6	R6	A-6	R68	D-3
C21	C-6	R7	A-5	R69	C-2
C22	D-6	R8	A-6	R70	B-6
C23	D-5	R9	A-6	R71	A-6
C25	D-4	R10	A-6	R72	A-7
C26	C-6	R11	A-6	R73	A-7
C27	B-2	R12	A-5	R74	A-7
C28	A-4	R13	B-6	R75	A-6
C29	C-4	R14	B-6	R76	C-7
C30	C-2	R15	B-5	R77	C-6
C31	C-4	R16	C-6	R78	D-6
C32	B-5	R17	C-6	R79	D-6
C33	B-5	R18	C-6	R80	D-7
C34	C-6	R19	B-5	R81	D-6
C35	D-2	R20	B-5	R82	D-6
C36	D-2	R21	B-5	R83	D-6
C37	B-2	R22	B-5	R84	D-6
C38	C-5	R23	B-5	R85	D-5
C39	C-5	R24	A-5	R86	D-5
C40	C-4	R25	B-6	R87	D-6
C41	C-4	R26	B-6	R88	D-6
C42	C-4	R27	C-5	R89	D-5
C43	A-4	R28	B-4	R90	C-5
C44	A-2	R29	B-5	R91	D-5
C45	D-2	R30	B-5	R92	A-4
C46	D-2	R31	C-5	R93	B-5
C47	B-1	R32	C-5	R94	A-2
CR1	B-2	R33	C-5	R95	A-2
CR2	C-2	R34	B-4	R96	D-6
**CR3	C-6	R35	B-4	S1	B-7
CR4	D-6	R36	C-4	S2	D-6
L2	D-5	R37	C-4	S3	C-4
L3	B-1	R38	C-4	U1	B-6
L4	C-5	R39	B-4	VR1	B-5
L5	C-1	R41	C-4	VR2	B-6
L6	C-4	R42	B-4	VR3	C-3
L7	C-6	R43	B-4	VR4	B-3
L8	D-2	R44	B-4		
L9	C-5	R45	B-3		
L10	C-4	R46	B-4		
L11	C-5	R47	B-4		
L12	A-4,	R48	C-3		

**Polarity dot may be reversed. Assure that CR3 is installed as shown on schematic.

183A-A-10A

Figure 8-8. Component Locations Horizontal Amplifier Board

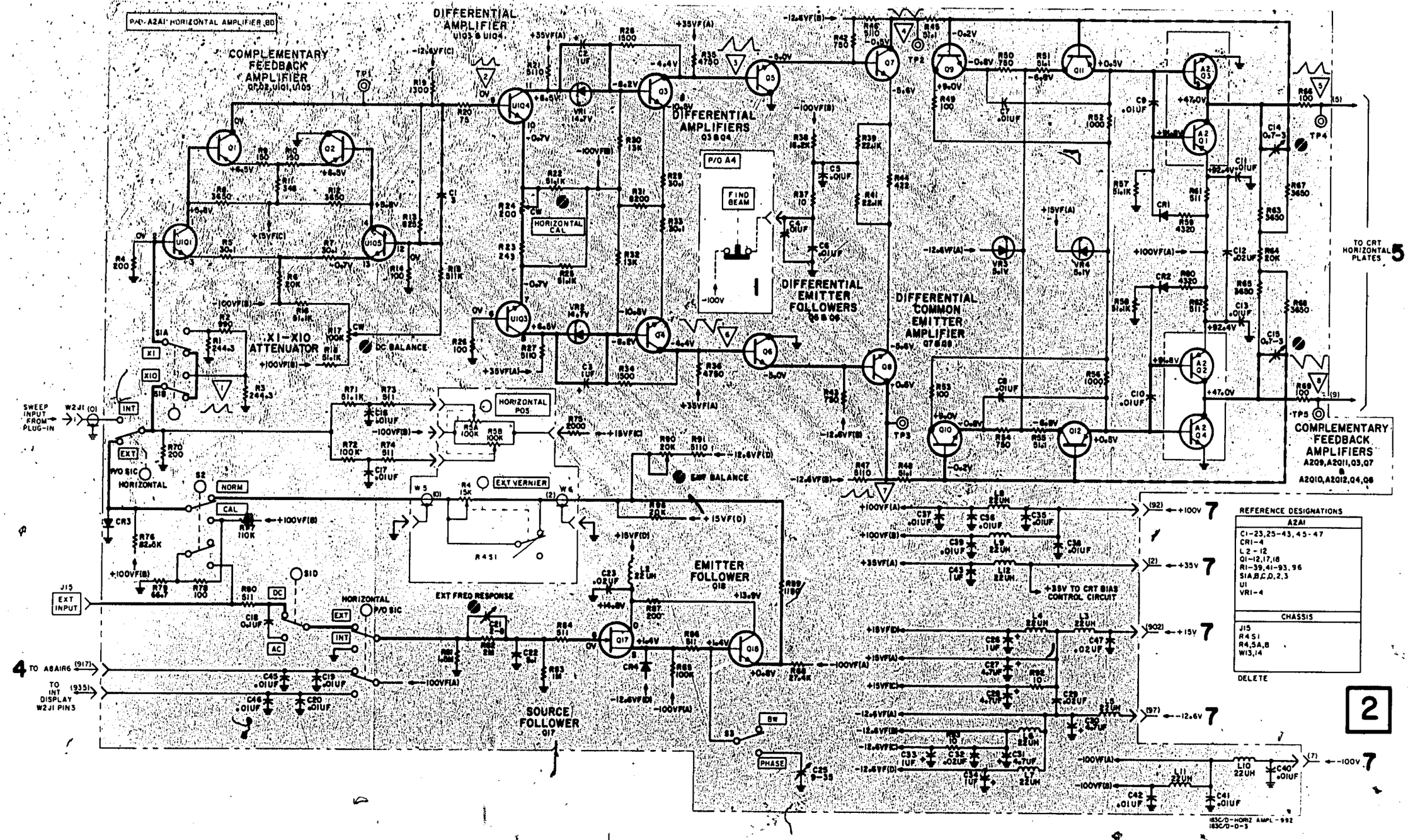


Figure 8-9. Horizontal Amplifier Schematic

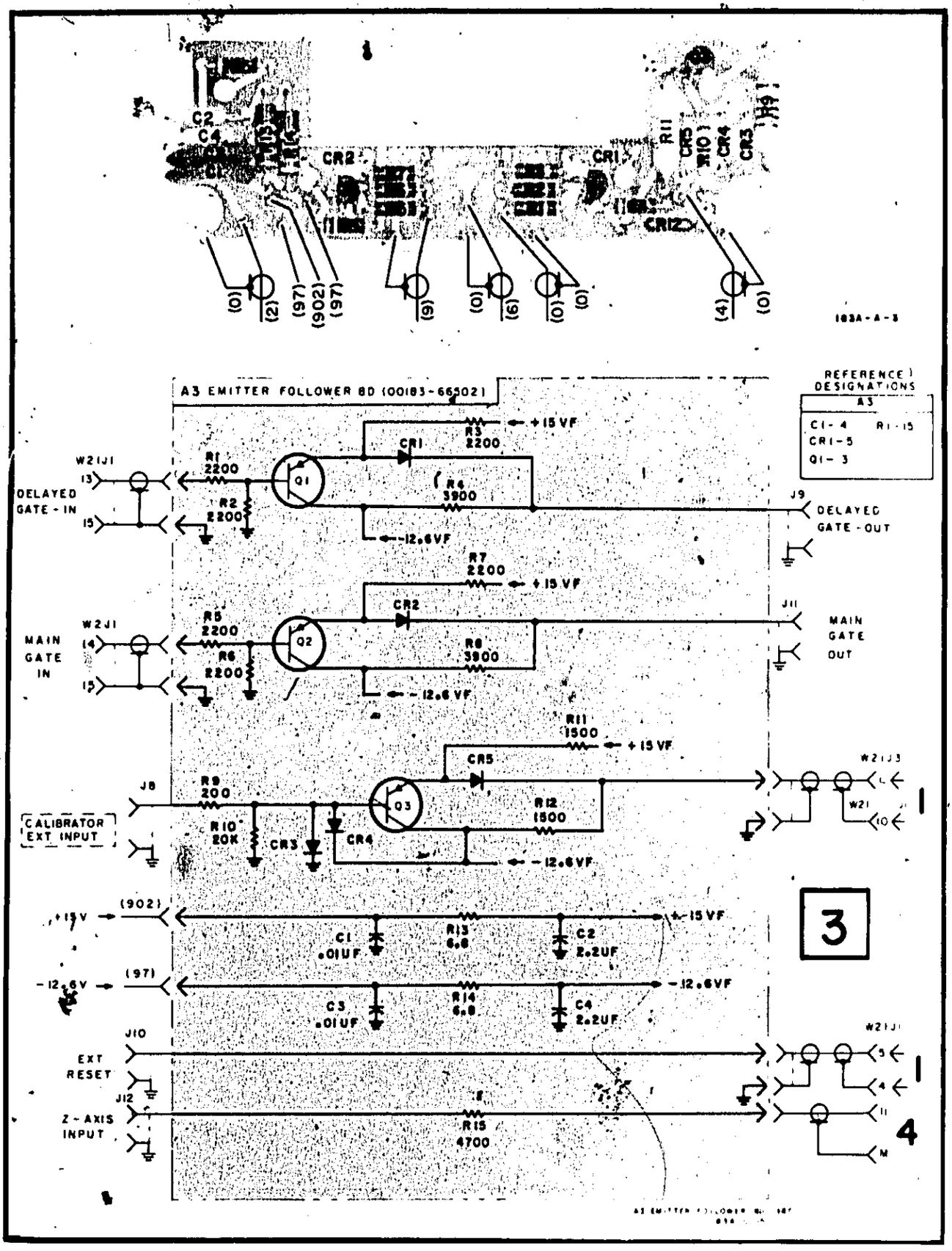


Figure 8-10. Component Locations, Schematic, Emitter Follower Board

VOLTAGE MEASUREMENT CONDITIONS

a. Set Model 183A/B Oscilloscope:

horizontal input	EXT
FLOODGUN MODE	NORM
scale pot	(just out of detent) ON

b. Set INT control fully counterclockwise.

c. Adjust intensity level adjustment A13A1R9 to obtain +11.9 volts measured between base of Q2 and chassis.

d. Adjust zero adjustment A13A1R21 to obtain −5.6 volts measured between base of A13A1Q5 and chassis.

e. All measurements made in reference to chassis ground.

f. Voltages may differ slightly between instruments.

g. Voltages shown on schematic are dc.

WAVEFORM MEASUREMENT CONDITIONS

a. Set Model 183A/B Oscilloscope:

INT	NORMAL VIEWING
horizontal input	INT
horizontal coupling	DC
horizontal magnifier	X1
TIME/DIV	0.5 usec
SWEEP HOLD OFF	NORM
SWEEP VERNIER	CAL
FLOODGUN MODE	PULSED
scale pot	(just out of detent) ON

b. Set monitor oscilloscope:

horizontal magnifier	X1
DISPLAY	INT
Time base triggering	INT
TRIGGER SLOPE	+
Trigger coupling	AC
SWEEP MODE	AUTO
TIME/DIV	NOTED
vertical V/DIV	NOTED
POLARITY	+UP
COUPLING	DC

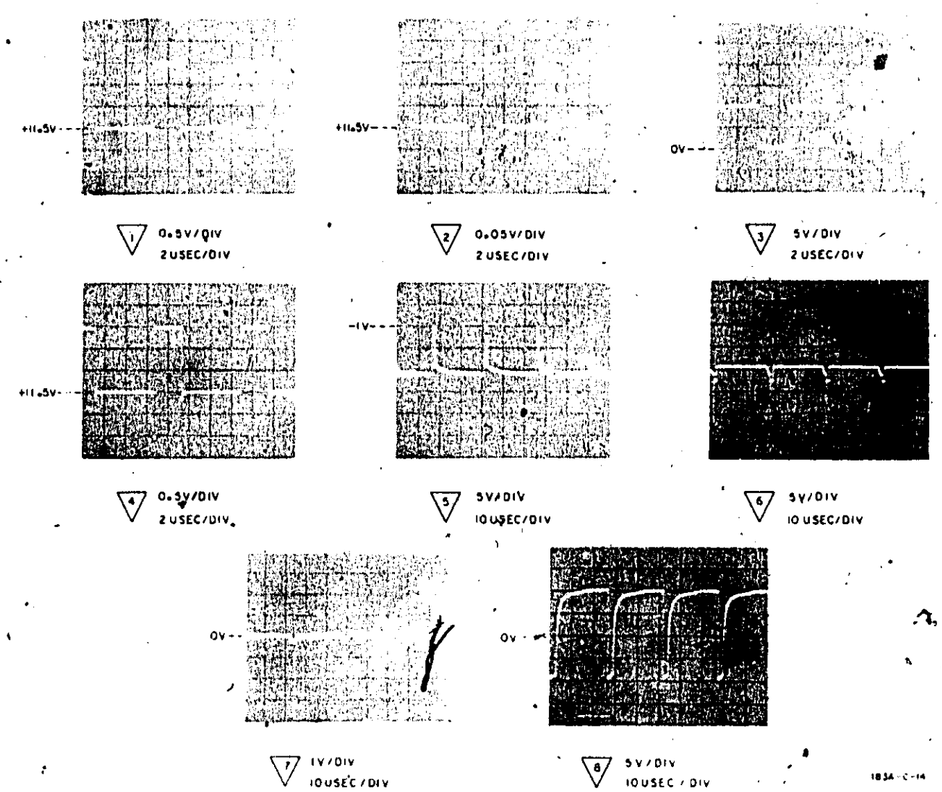
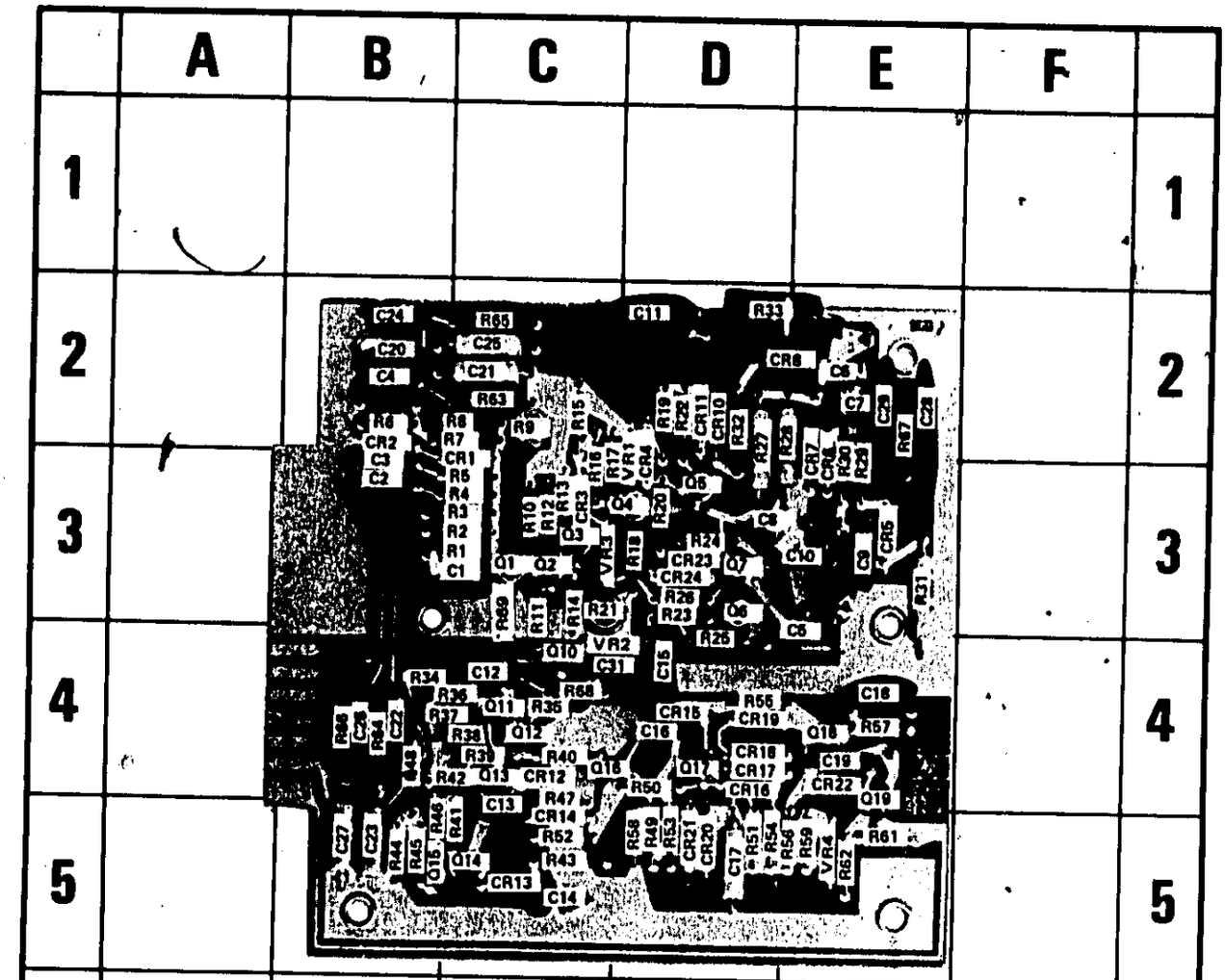


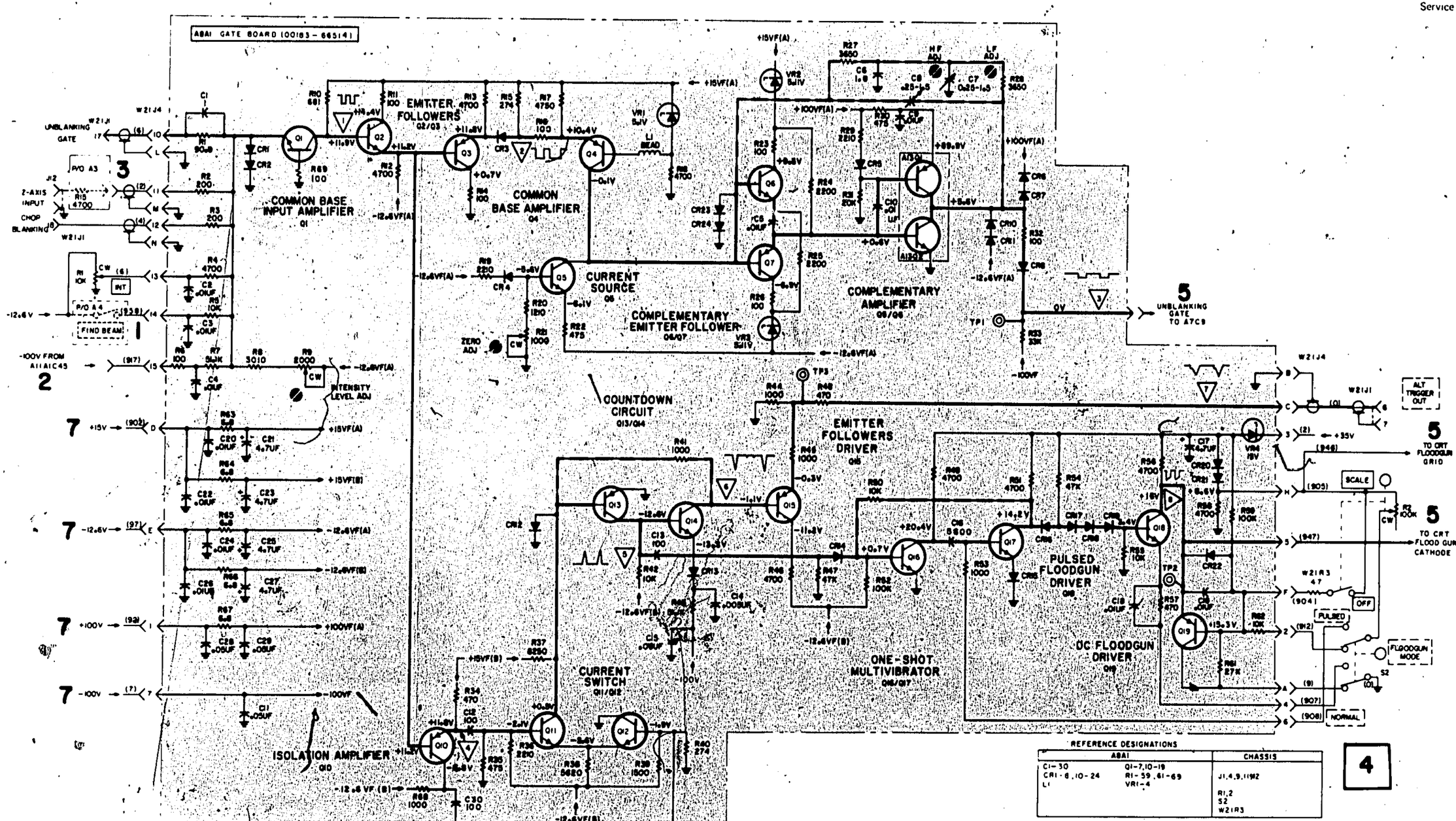
Figure 8-11. Gate Amplifier Voltage and Waveform Measurement Conditions



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-3	C19	E-4	CR7	E-3	Q1	C-3	R2	C-3	R20	D-3	R38	C-4	R56	E-5
C2	B-3	C20	B-2	CR8	E-2	Q2	C-3	R3	C-3	R21	C-3	R39	C-4	R57	E-4
C3	B-3	C21	C-2	CR10	D-2	Q3	C-3	R4	C-3	R22	D-2	R40	C-4	R58	D-5
C4	B-2	C22	B-4	CR11	D-2	Q4	D-3	R5	C-3	R23	D-3	R41	C-5	R59	E-5
C5	E-4	C23	B-5	CR12	C-4	Q5	D-3	R6	B-2	R24	D-3	R42	C-4	R61	E-5
C6	E-2	C24	B-2	CR13	C-5	Q6	D-3	R7	C-2	R25	D-4	R43	C-5	R62	E-5
C7	E-2	C25	C-2	CR14	C-5	Q7	D-3	R8	C-2	R26	D-3	R44	B-5	R63	C-2
C8	D-3	C26	B-4	CR15	D-4	Q10	C-4	R9	C-2	R27	D-2	R45	B-5	R64	B-4
C9	E-3	C27	B-5	CR16	D-4	Q11	C-4	R10	C-3	R28	D-2	R46	B-5	R66	C-2
C10	E-3	C28	E-2	CR17	D-4	Q12	C-4	R11	C-3	R29	E-3	R47	C-4	R66	B-4
C11	D-2	C29	E-2	CR18	D-4	Q13	C-4	R12	C-3	R30	E-3	R48	B-4	R67	E-2
C12	C-4	C30	C-4	CR19	D-4	Q14	C-5	R13	C-3	R31	E-3	R49	D-5	R68	C-4
C13	C-4	CR1	C-3	CR20	D-5	Q15	B-5	R14	C-3	R32	D-2	R50	D-4	R69	C-3
C14	C-5	CR2	B-2	CR21	D-5	Q16	C-4	R15	C-2	R33	D-2	R51	D-5	VR1	D-3
C15	D-4	CR3	C-3	CR22	E-4	Q17	D-4	R16	C-3	R34	B-4	R52	C-5	VR2	C-4
C16	D-4	CR4	D-3	CR23	D-3	Q18	E-4	R17	C-3	R35	C-4	R53	D-5	VR3	C-3
C17	D-5	CR5	E-3	CR24	D-3	Q19	E-4	R18	D-3	R36	B-4	R54	D-5	VR4	E-5
C18	E-4	CR6	E-3	L1	D-3	R1	C-3	R19	D-2	R37	B-4	R55	D-4		

183A-A-88

Figure 8-12. Component Locations, Gate Amplifier Board



REFERENCE DESIGNATIONS

A8A1		CHASSIS
C1-30	Q1-7,10-19	J1,4,9,11W2
CR1-8,10-24	R1-59,61-69	R1,2
L1	VR1-4	S2
		W2R3

Figure 8-13. Gate Amplifier Schematic

WAVEFORM MEASUREMENT CONDITIONS

a. Set Model 183A/B Oscilloscope:

Turn power on.

b. Set monitor oscilloscope:

horizontal magnifier	X1
DISPLAY	INT
Time base triggering	INT
TRIGGER SLOPE	+
Trigger coupling	AC
SWEEP MODE	AUTO
TIME/DIV	10 usec
vertical V/DIV	1 VOLTS/DIV
POLARITY	+UP
COUPLING	DC

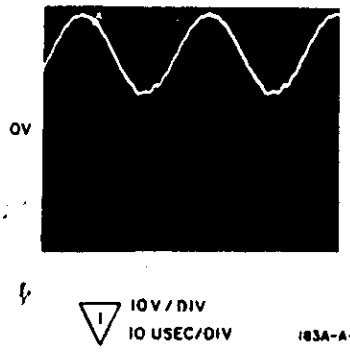
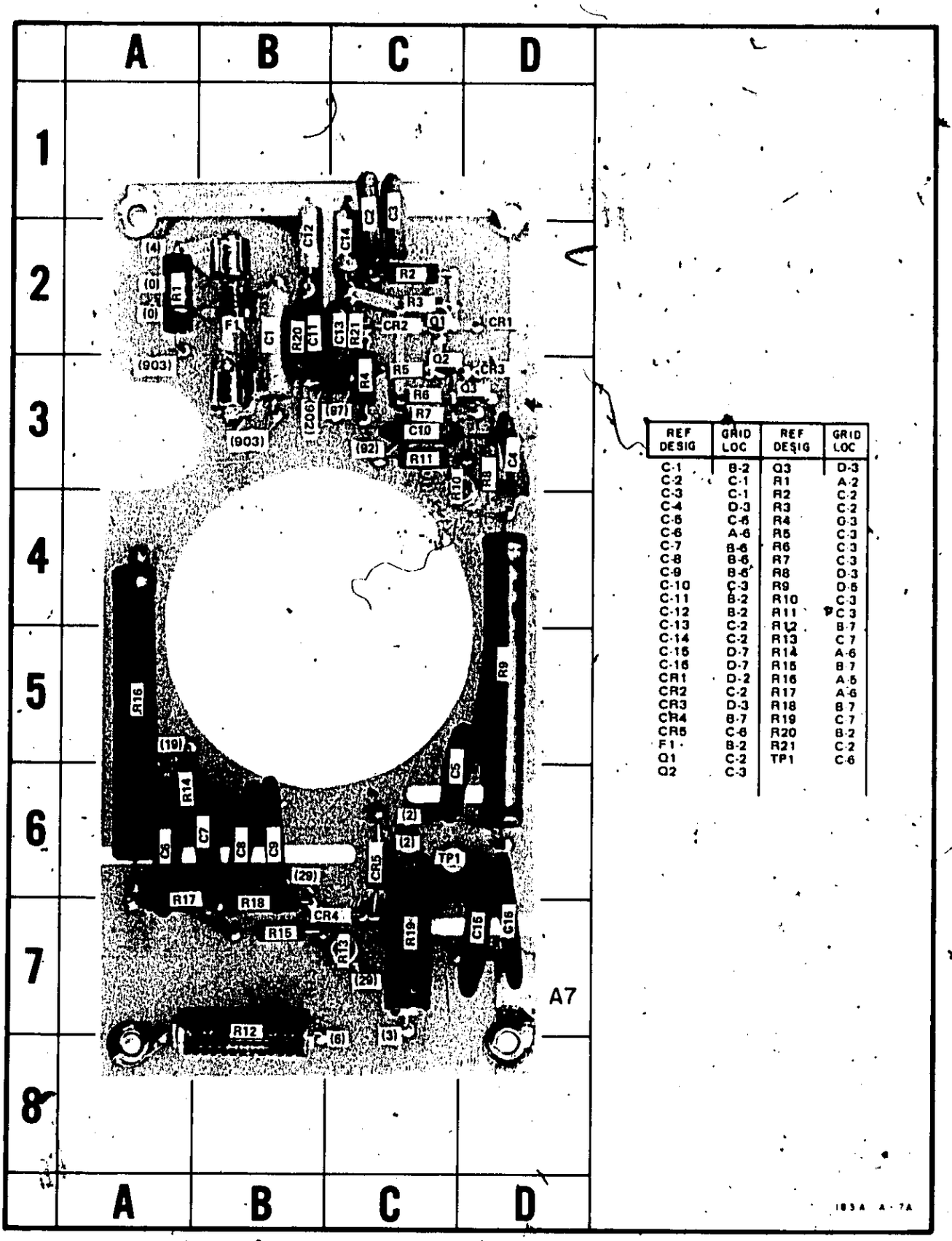


Figure 8-14. HVPS Waveform Measurement Conditions



REF DESIG	GRID LOC	REF DESIG	GRID LOC
C-1	B-2	Q3	D-3
C-2	C-1	R1	A-2
C-3	C-1	R2	C-2
C-4	D-3	R3	C-2
C-5	C-6	R4	D-3
C-6	A-6	R5	C-3
C-7	B-6	R6	C-3
C-8	B-6	R7	C-3
C-9	B-6	R8	D-3
C-10	C-3	R9	D-5
C-11	B-2	R10	C-3
C-12	B-2	R11	C-3
C-13	C-2	R12	B-7
C-14	C-2	R13	C-7
C-15	D-7	R14	A-6
C-16	D-7	R15	B-7
CR1	D-2	R16	A-5
CR2	C-2	R17	A-6
CR3	D-3	R18	B-7
CR4	B-7	R19	C-7
CR5	C-6	R20	B-2
F1	B-2	R21	C-2
Q1	C-2	TP1	C-6
Q2	C-3		

183A A-7A

Figure 8-15. Component Locations, HVPS Regulator Board

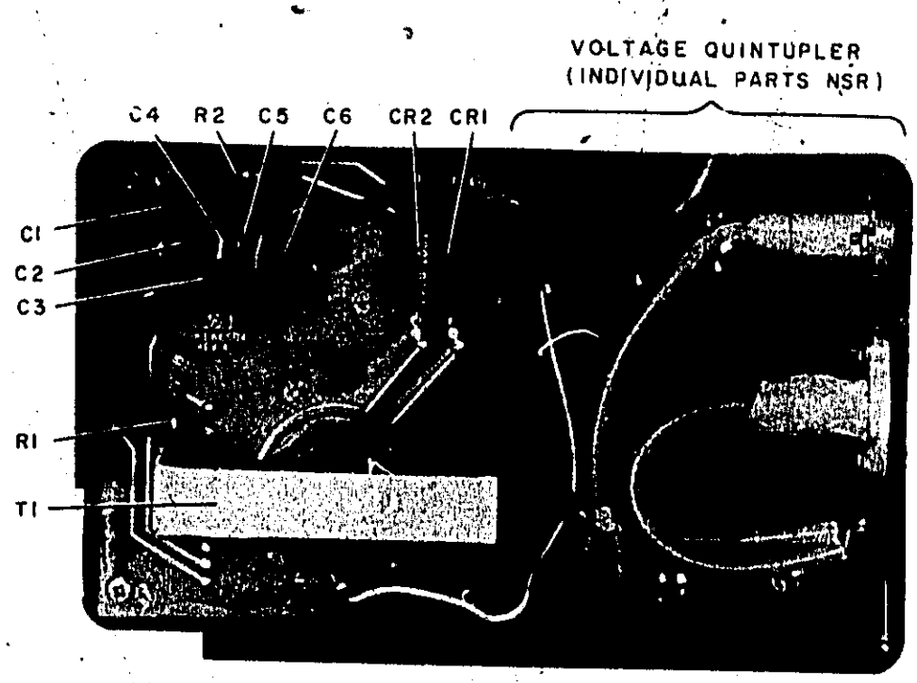
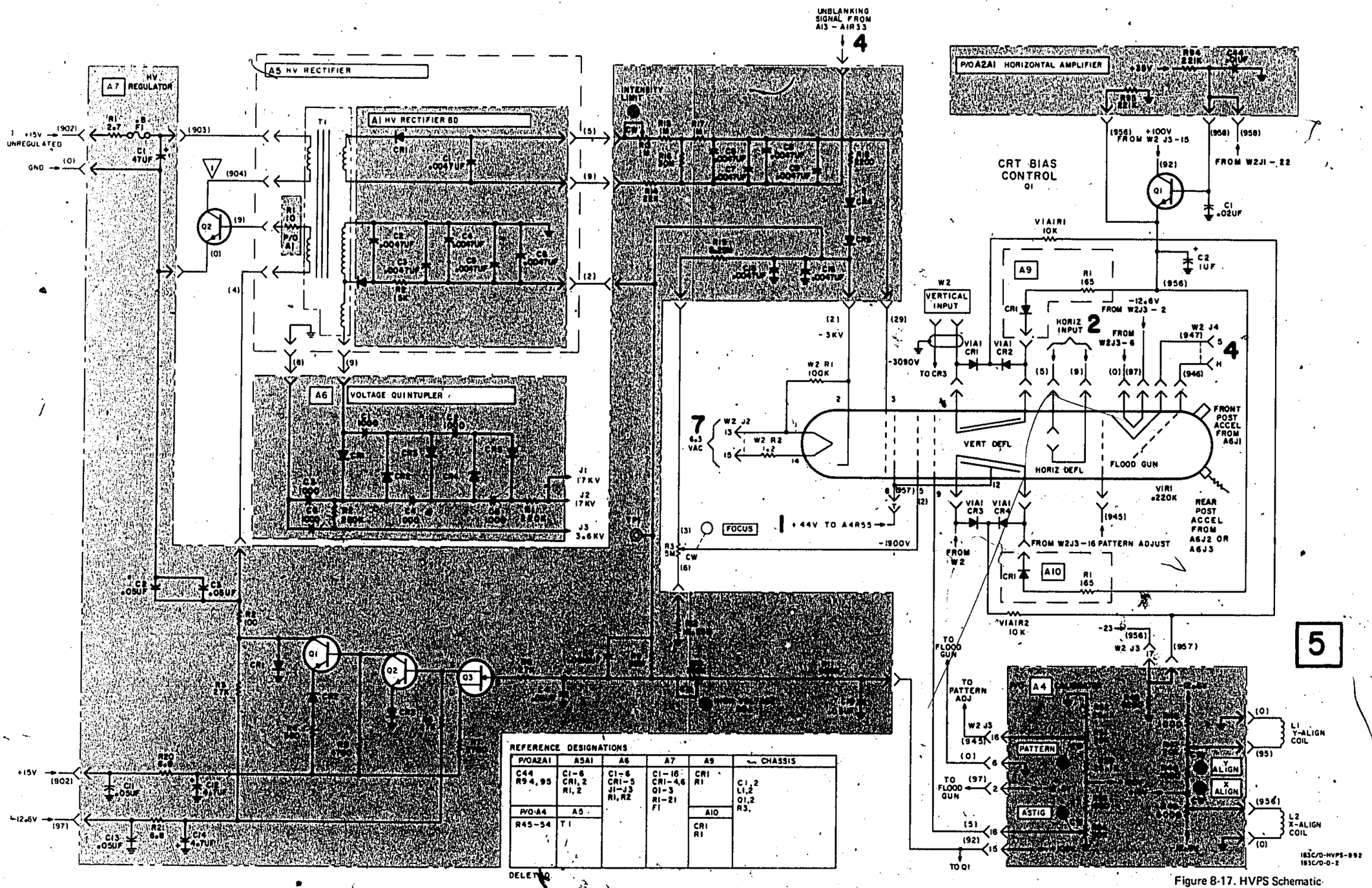


Figure 8-16. Component Locations, HVPS Quintupler

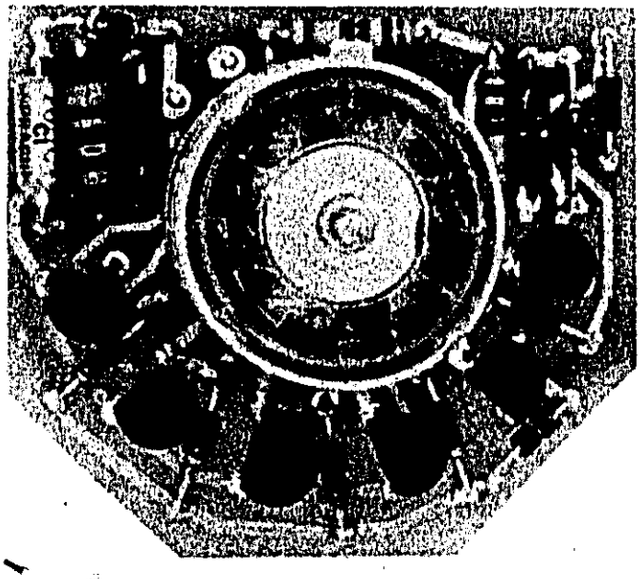


REFERENCE DESIGNATIONS

P/O A2A1	A5A1	A6	A7	A9	CHASSIS
C44 R94, 95	C1-6 CR1, 2 R1, 2	C1-6 CR1-5 J1-J3 R1, R2	C1-16 CR1-4, 6 Q1-3 R1-21 F1	CR1 R1	C1, 2 L1, 2 Q1, 2 R3,
P/O A4	A5			A10	
R45-54	T1			CR1 R1	

DELETED

Figure 8-17. HVPS Schematic



163A-A-2

Figure 8-18. Component Locations, Blower Motor Assembly

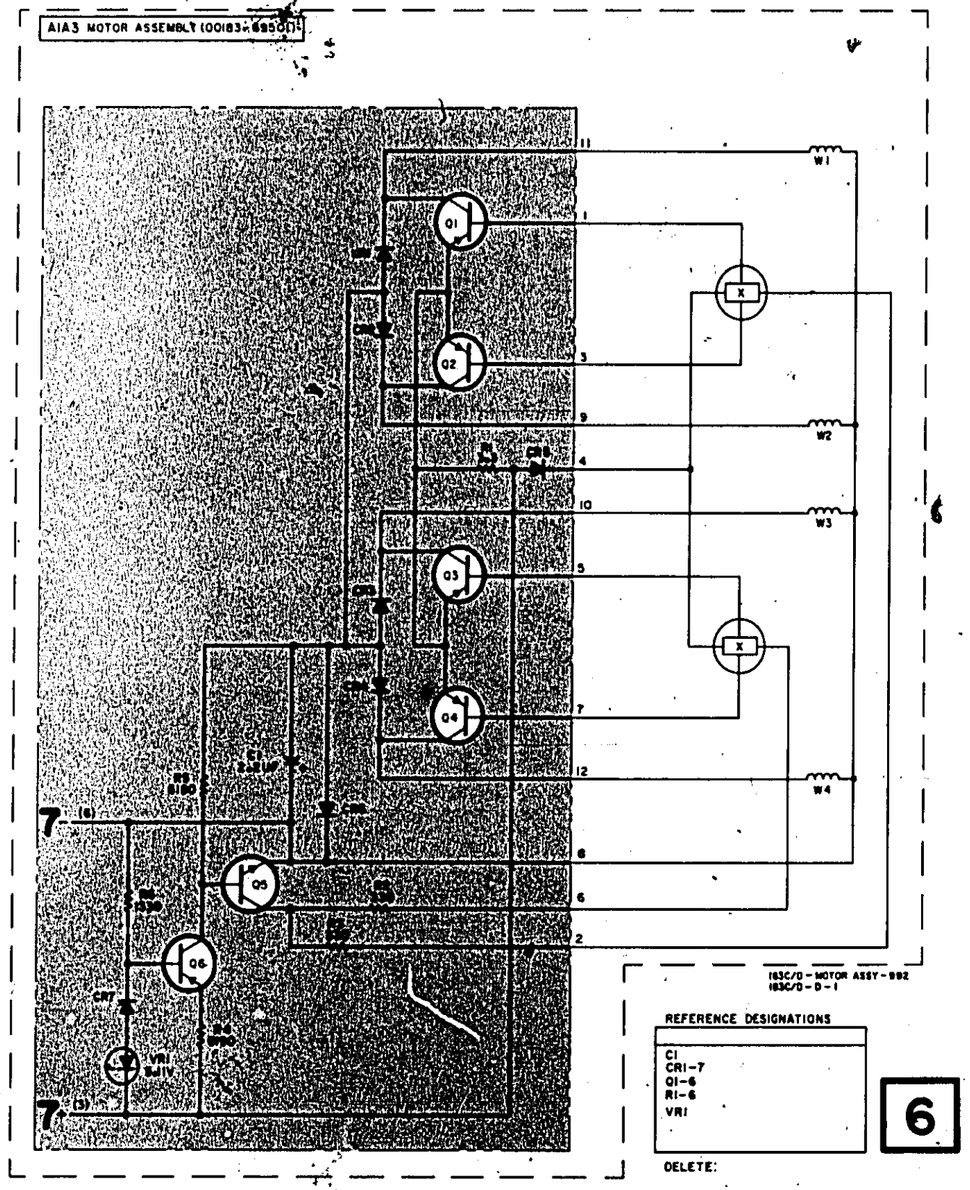
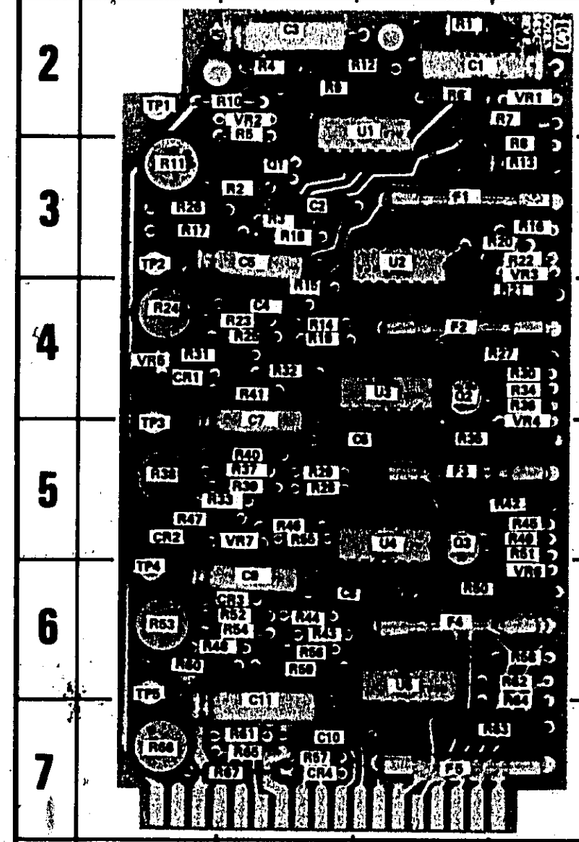


Figure 8-19. Blower Motor Schematic



REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-2	R31	A-4
C2	B-3	R32	B-4
C3	B-2	R33	A-5
C4	B-4	R34	D-4
C5	B-3	R35	C-5
C6	C-5	R36	D-4
C7	B-4	R37	B-5
C8	B-6	R38	A-5
C9	B-6	R39	B-5
C10	B-7	R40	B-5
C11	B-6	R41	B-4
CR1	A-4	R42	D-5
CR2	A-5	R43	B-6
CR3	B-6	R44	B-6
CR4	B-7	R45	D-5
F1	C-3	R46	B-5
F2	C-4	R47	A-5
F3	C-5	R48	A-6
F4	C-6	R49	D-5
F5	C-7	R50	C-6
Q1	B-3	R51	D-5
Q2	C-4	R52	B-6
Q3	C-5	R53	A-6
R1	C-2	R54	B-6
R2	B-3	R55	B-5
R3	B-3	R56	B-5
R4	B-2	R57	B-7
R5	B-2	R58	D-6
R6	C-2	R59	B-6
R7	D-2	R60	A-6
R8	D-3	R61	B-7
R9	B-2	R62	D-6
R10	B-2	R63	D-7
R11	A-3	R64	D-6
R12	B-2	R65	B-7
R13	D-3	R66	A-7
R14	B-4	R67	B-7
R15	B-4	TP1	A-2
R16	D-3	TP2	A-3
R17	A-3	TP3	A-5
R18	B-3	TP4	A-6
R19	B-4	TP5	A-6
R20	D-3	U1	C-2
R21	D-4	U2	C-3
R22	D-3	U3	C-4
R23	B-4	U4	C-5
R24	A-4	U5	C-6
R25	B-4	VR1	D-2
R26	A-3	VR2	B-2
R27	D-4	VR3	D-3
R28	B-5	VR4	D-4
R29	B-5	VR5	A-4
R30	D-4	VR6	D-6
		VR7	B-5

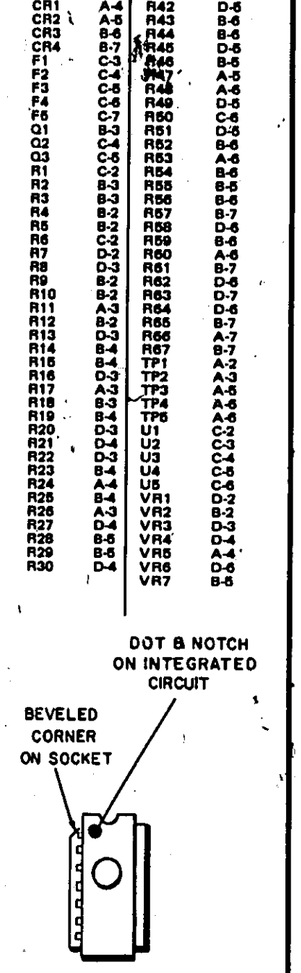
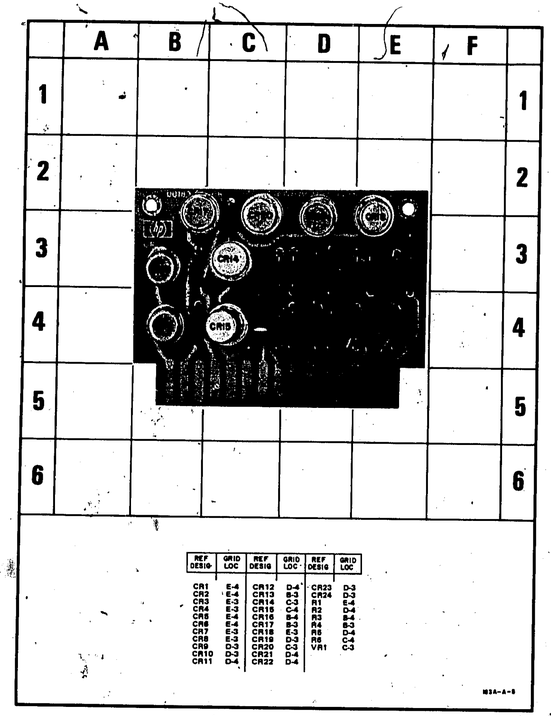
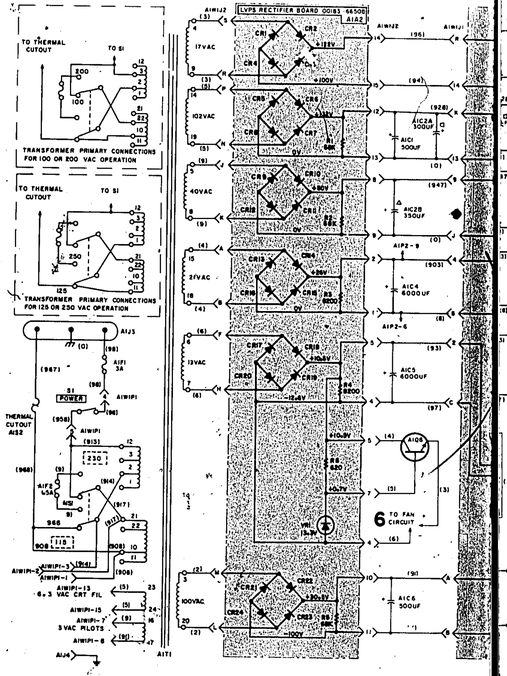


Figure 8-20. Component Locations, LVPS Regulator Board



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
CR1	E4	CR12	D4	CR23	D3
CR2	E4	CR13	D3	CR24	D3
CR3	E3	CR14	C3	R1	E4
CR4	E4	CR15	C4	R2	D4
CR5	E4	CR16	E4	R3	E4
CR6	E4	CR17	E3	R4	E3
CR7	E3	CR18	D3	R5	D4
CR8	E3	CR19	D3	R6	C4
CR9	D3	CR20	C3	VR1	C3
CR10	D3	CR21	D4		
CR11	D4	CR22	D4		

Figure 8-21. Component Locations, LVPS Rectifier Board



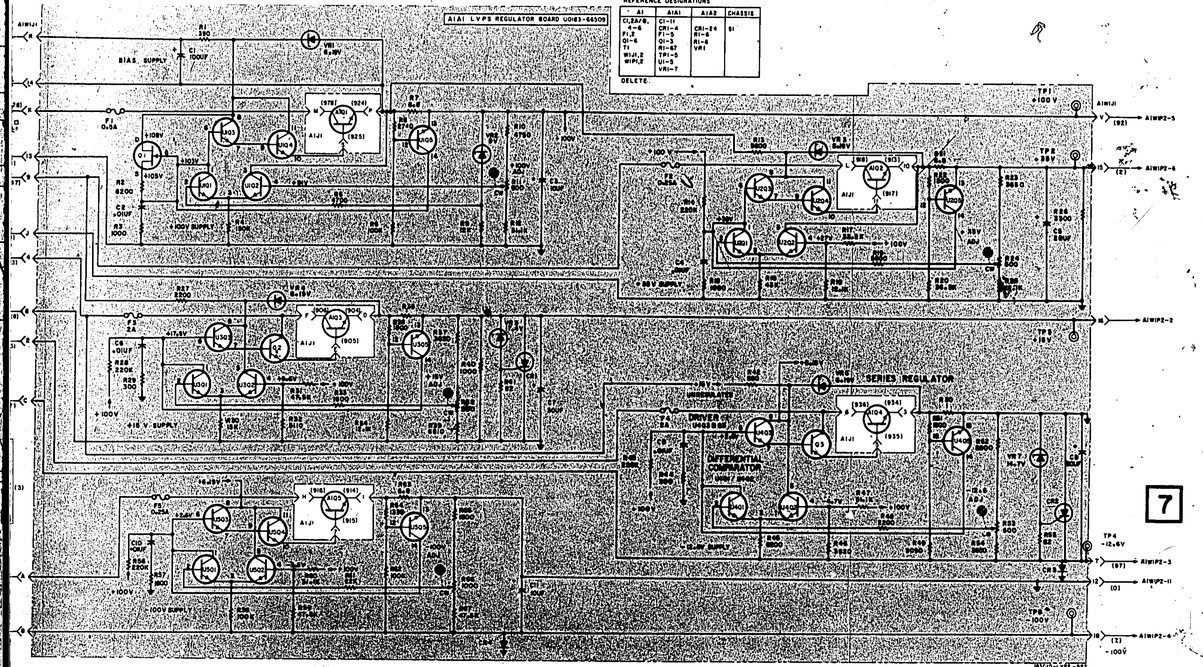


Figure 8-22. LVPS Schematic

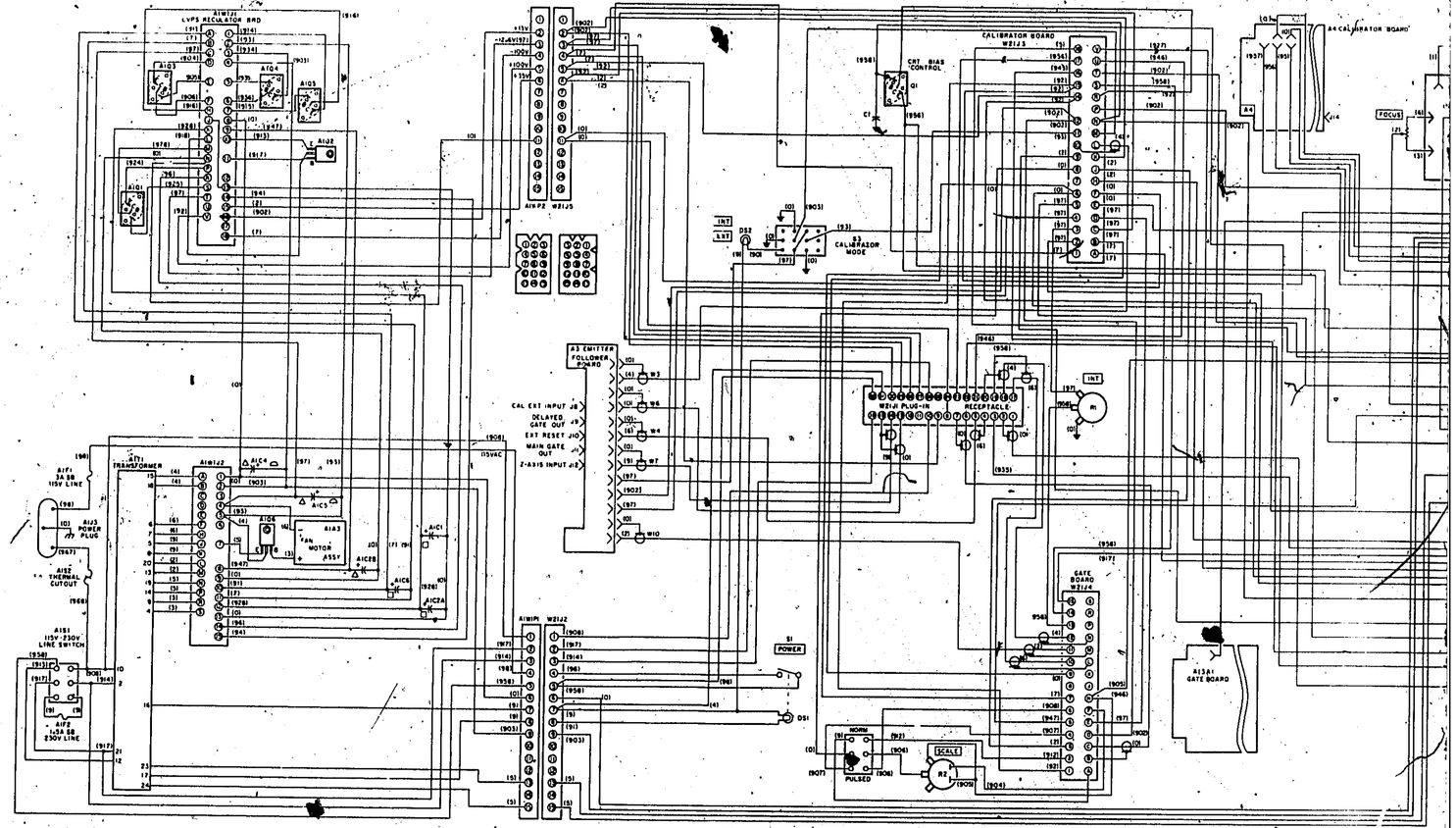


Figure 8-23. Model 183C/D Wiring Diagram

CATHODE-RAY TUBE WARRANTY

The cathode-ray tube (CRT) supplied in your Hewlett-Packard Oscilloscope and replacement CRT's purchased from hp are warranted by the Hewlett-Packard Company against electrical failure for a period of one year from the date of sale. Broken tubes and tubes with phosphor or mesh burns are not included under this warranty. If the CRT is broken when received, a claim should be made with the responsible carrier.

Your nearest Hewlett-Packard Sales/Service Office (listed at rear of instrument manual) maintains a stock of replacement tubes and will assist in processing the warranty claim.

We would like to evaluate every defective CRT. This engineering evaluation helps us to provide a better product for you. Please fill out the CRT Failure Report on the reverse side of this sheet and return it with the defective CRT to:

Hewlett-Packard Company
1900 Garden of the Gods Road
Colorado Springs, Colorado 80907

Attention: CRT QA

To avoid damage to the tube while in shipment, please follow the shipping instructions below; warranty credit is not allowed on broken tubes.

SHIPPING INSTRUCTIONS

It is preferable that the defective CRT be returned in the replacement CRT carton. If the carton or packaging material is not available, pack the CRT according to the instructions below:

1. Carefully wrap the tube in 1/4 inch thick cotton batting or other soft padding material.
2. Wrap the above in heavy kraft paper.
3. Pack wrapped tube in a rigid container which is at least 4 inches larger than the tube in each dimension.
4. Surround the tube with at least 4 inches of packed excelsior or similar shock absorbing material; be sure the packing is tight all around the tube.

Thank you,

CRT Department

CATHODE-RAY TUBE FAILURE REPORT

DATE _____

FROM:

NAME _____

COMPANY _____

ADDRESS _____

1. hp INSTRUMENT MODEL NO. _____
2. hp INSTRUMENT SERIAL NO. _____
3. CRT SERIAL NO. _____
4. Please describe the failure and, if possible, show the trouble on the appropriate CRT face below.

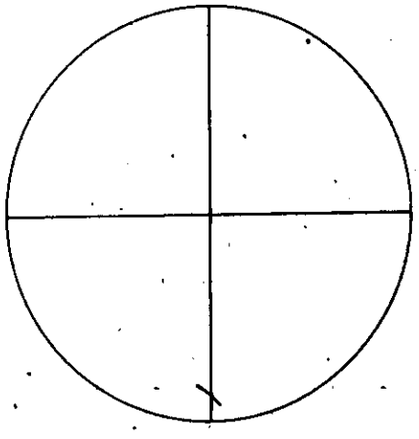
_____

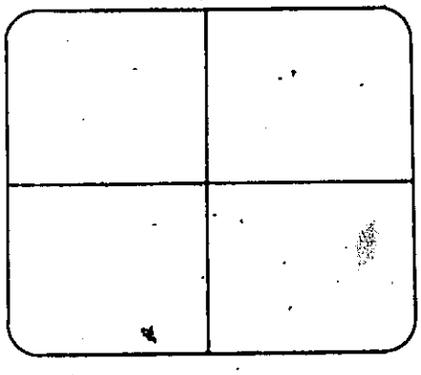
_____

_____

_____

_____





5. Is the CRT within warranty? Yes_____ No_____
6. hp Sales/Service Office _____ Repair Order No. _____

CUT ALONG DOTTED LINE

02537-4

SERVICE NOTES

SERVICE NOTE

Supersedes:

183A/B-2

HP MODEL 183A/B/C/D/ OSCILLOSCOPE

IMPROVED FLOODGUN CIRCUIT RELIABILITY AND POSITIVE FLOODGUN TURN OFF

(This service note involves two separate modifications to the floodgun circuit)

Serial Numbers for Part 1

183A Serial Prefix below 1113A
183B Serial Prefix below 1112A
183C Serial Prefix below 1117A
183D Serial Prefix below 1115A

Serial Numbers for Part 2

183A Serial Numbers 941-00101 through 941-00200
183B Serial Numbers 963-00119 through 936-00130

PART 1

There is a possibility that transients from some CRT's may damage Q19 in the floodgun circuit. To protect Q19, a capacitor is added to filter the CRT floodgun grid lead.

The floodgun driver circuit is also modified to insure that the CRT floodgun can be positively turned off in all modes of operation.

This modification (Part 1) should be performed on any 183 which exhibits failure problems in the floodgun circuit. It should also be performed on any 183 which will not turn the CRT floodgun completely off.

BW/mh/WA

6/71-8

HEWLETT hp PACKARD

Parts Required for Modifications Part 1

Quantity	Description	Ref. Desig.	HP Part No.
1	2.87 Volt Zener diode	A13VR5	1902-3024
1	15KΩ 1/2 Watt 10%	A13R61	0684-1531
1	1 µfd. Capacitor 35V	A13C31	0180-0291

Procedure for Part 1

1. Remove power cable from instrument.
2. Remove side cover to expose the gate board.
3. Remove and discard CR20 and CR21 on the gate board.
4. Remove and discard R61 on the gate board.
5. Install a short piece of wire in place of CR20 which was removed in step 3.
6. Install VR5 in place of CR21 which was removed in step 3. The anode side of VR5 should be connected to R58.
7. Install C31 piggyback across R58.
8. Install new R61 (15K 0684-1531) in place of R61 removed in step 4.
9. Some scopes may have a 470Ω resistor in series with the 9-4-6 wire to pin H of J4, or a 47Ω resistor in series with the 9-0-4 wire to pin F of J4. In either case remove these resistors and reconnect the wires to their appropriate pins on J4.

   (Note) The resistors mentioned in step 9 were initially installed to protect the floodgun circuit. Unfortunately they interfer with floodgun turn off in the pulsed mode and must be removed. Protection is now provided by the new circuit configuration and C31.

10. Disconnect the 9-0-5 wire from W21J4 pin H and reconnect the 9-0-5 wire to the junction of VR4 and VR5 on the PC board. It may be necessary to remove the 9-0-5 wire from the cable harness in order to get enough slack to move the wire.
11. Reassemble instrument.
12. Calibration is not affected.

PART 2

The high voltage rectifier circuit is generating transients into the signal ground leads. These transients may cause damage to the floodgun driver circuit. To prevent this the high voltage rectifier board must be grounded directly to the chassis through a separate ground lead. This modification should be performed on any 183 (with above listed serial numbers part 2) passing through your facility for repair or service.

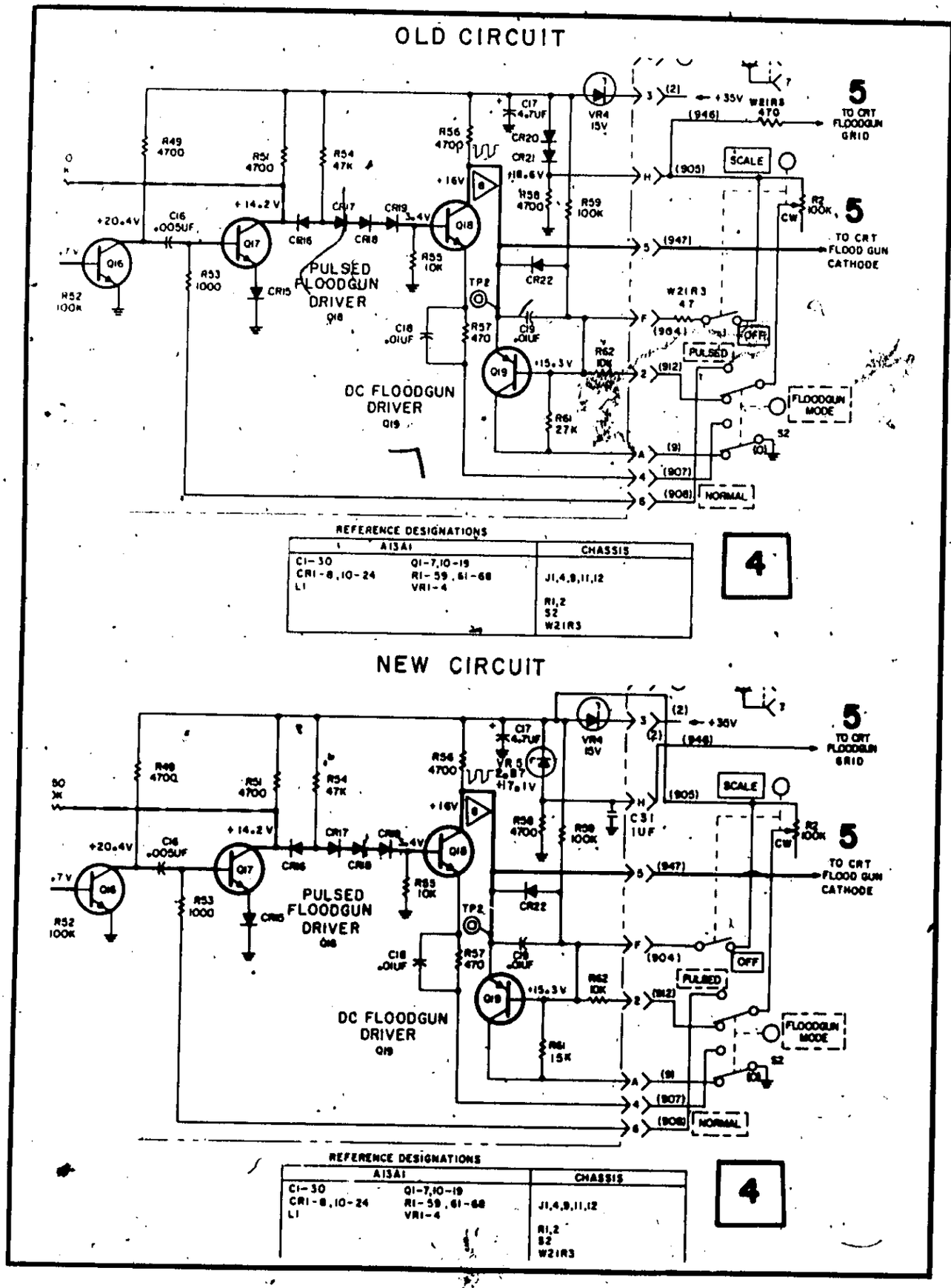
Parts Required for Modifications Part 2

Quantity	Description	HP Part No.
1	14" 5KV wire	8150-2178
1	Sq. pin connector	0362-0264
1	ground lug	0360-0016

Procedure for Part 2

1. Remove power cable from instrument.
2. Remove two covers to expose the high voltage rectifier board.
3. Remove heat sink on rear of display portion of instrument by removing 4 screws. Set the heat sink on top of the instrument. The high voltage regulator board should be exposed.
4. Remove the old ground lead (black) from the cable harness to the sq. pin on the HV rectifier board. Tie this wire back into the cable harness.
5. Install a ground lug (0360-0016) on the ground side of R12 on the HV regulator board.
6. Route and connect the new ground lead between this lug and the ground for the HV rectifier board.
7. Reassemble the instrument.
8. No adjustments required.

Figure 8-13. p/o Gate Amplifier Schematic



SERVICE NOTE

Supersedes:

None

HP Model 183A/B/C/D Oscilloscope

Serial Numbers

183A	Serial numbers	below	1107A-00876
183B	Serial numbers	below	1108A-00386
183C	Serial numbers	below prefix	1111A
183D	Serial numbers	below	1109A-00128

High Voltage Oscillator Modification

A 22μH coil must be installed in series with the base lead of the high voltage oscillator transistor.

The modification will insure that the high voltage oscillator runs at the correct frequency to insure proper high voltage regulation. The modification will also prevent the high voltage fuse from blowing as a result of the oscillator running at the wrong frequency. This modification should be performed on all instruments which pass through your facility for service.

Parts Required

Quantity	Description	Circuit Reference	HP Part No.
1 ea.	22 μH	L3	9140-0179
1 ea.	Solder lug terminal		0360-0010

BW/bw/WA

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Installation Procedure

1. Remove the rear heat sink behind the display module (4 screws) to expose the high voltage transistor.

2. Install the solder lug terminal. (0360-0010) Use the screw which holds the cable harness clamp. The cable clamp is right next to the high voltage oscillator transistor.

3. Disconnect the white lead from the base of Q2 and reconnect it to the solder terminal.

4. Install the coil L3 (9140-0179) between the base of Q2 and the solder terminal.

5. Make appropriate schematic corrections.

6. Recalibration is not necessary.

SERVICE NOTE

Supersedes:

None

HP Model 183A/B/C/D Oscilloscope

Serial Numbers

183A	Serial	Numbers	Below	1109A-00951
183B	"	"	"	1108A-00386
183C	"	"	"	1120A-00114
183D	"	"	"	1115A-00138

INTENSITY FLICKER

L1 on A13 the gate board assembly must be changed to a non-conductive bead. (HP Part No. 9170-0029).

The old style bead (HP Part No. 9170-0016) is resistive and as the 183 is tapped or vibrated the amount of resistance inserted in the base of Q4 is varied. The result is intensity flicker displayed on the CRT.

Parts Required

Quantity	Description	Ref. Designator	HP Part No.
1	Core: Ferrite bead	A13L1	9170-0029

Instructions

1. Remove A13Q4 from the gate board.
2. Discard the old (white) bead from the base of A13Q4.
3. Reinstall the new (green) bead along with A13Q4.
4. Revise the replaceable parts list in the manual to reflect this change.

BW/bw/WA 8/71-08

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SERVICE NOTE

Supersedes

None

HP MODEL 183A/B/C/D OSCILLOSCOPE

Serial Numbers

183A Serial Prefix Below 1204A-
183B Serial Prefix Below 1204A-
183C Serial Prefix Below 1208A-
183D Serial Prefix Below 1134A-

Improved Trigger Performance for Single Sweep Operation

Random noise in the 183 system can cause the time base to trigger accidentally. In single sweep mode of operation, this results in failure of the trigger circuit to stay armed for an extended period of time.

By changing the grounding pattern of the high voltage supply the internal noise which causes the single shot random triggers should be eliminated.

Parts required for modification

Quantity	Description	HP Part No.
8 inches	22 ga. 3KV gray wire	8150-2269
3 inches	Shrink tubing	0890-0720
1 ea.	4-40 screw	2200-0139
1 ea.	4-40 nut	2260-0002
1 ea.	Lock washer	2190-0019
1 ea.	Ground lug	0360-0016

BW/bw/WA

Procedure for modifying grounding of
H. V. rectifier on 183A/C

1. Disconnect power cord and remove the top left cover to expose the high voltage box.

2. Disconnect the post accelerator lead plug (s) from their respective jack (s) on High Voltage quintupler/rectifier assy. (Note connection for futrue reconnection). Warning these lead (s) will retain a dangerous High Voltage charge. Handle them with insulated fuse puller and discharge both plug (s) and jack (s) to instrument chassis before touching them with hands.

3. Remove 2 screws securing cover over H. V. quintupler/rectifier and remove the cover.

4. Disconnect 22 ga. 3KV insulated grey wire from square pin near rear of rectifier section. Remove square pin clip from end of wire and solder an approx. 8 inch piece of 22 ga. 3KV grey wire (HP part no. 8150-2269) to end of existing wire. Cover joint with several layers of shrink tubing (HP part no. 0890-0720). Thread extended grey wire thru rubber grommet in sheetmetal at rear of H. V. rectifier and up to top side of instrument. Dress wire inside box away from components as much as is possible especially joint area.

5. Refer to oscilloscope chassis, left upper side rail, in the area of the H. V. quintupler/rectifier assembly. Approximately 2 1/2 inches from rear panel are two holes. In the smaller of the two holes; using a 4-40 screw, (2200-0139), nut (2260-0002) and lockwasher (2190-0019), install a grounding lug (0360-0016) on the inside of the upper center rail. Note: check that head of screw does not interfere with installation cover on instrument.

6. Route the grey wire that was brought out in step #8 to the grounding lug that was added in #9., Solder the grey wire to the grounding lug keeping wire short and direct.

7. Replace H. V. quintupler/rectifier cover and reinstall all screws, and wires removed in previous steps being careful to reconnect post accelerator lead (s) as they were before.

8. Replace cover and check for proper operation.

Procedure for Modifying grounding of H. V.

Quintupler on 183B/D

1. Disconnect power cord and remove plugins. Also remove the top and bottom covers from the instrument.

2. Disconnect the post accelerator lead plug (s) from their respective jack (s) on High Voltage quintupler/rectifier assy. (Note connection for future reconnection). Warning these lead (s) will retain a dangerous High Voltage charge. Handle them with insulated fuse puller and discharge both plug (s) and jack (s) to instrument chassis before touching them with hands.

3. Disconnect two yellow wires to neck pins of CRT being very careful not to break them (yellow wires have small connector on end that slip over CRT pins). Note proper connection of wires for later reinstallation.

4. Remove two screws holding mounting bracket for the vertical deflection plate shielded cable (cable from which the two yellow wires of step #3 came from). Slide cable and bracket approx. 1/2 inch toward front of instrument being careful not to break leads of capacitor connected to shield of cable.

5. Remove screw and nut holding cable clamp near upper front corner of H. V. quintupler/rectifier cover and move cable away from and forward of cover.

6. Remove 2 screws securing cover over H. V. quintupler/rectifier.

7. Slide H. V. quintupler/rectifier cover forward enough to clear post accelerator jack (s) and to allow rear corner of cover to be moved past sheet metal at rear of instruments. Remove cover from the top side of the instrument being careful that ear on cover doesn't catch and break any wires.

8. Disconnect 22 ga. 3KV insulated grey wire from square pin near rear of rectifier section. Remove square pin clip from end of wire and solder an approx. 8 inch piece of 22 ga. 3KV grey wire (HP part no. 8150-2269) to end of existing wire. Cover joint with several layers of shrink tubing(HP part no. 0890-0720). Thread extended grey wire thru rubber grommet in sheetmetal at rear of H. V. rectifier and up to top side of instrument. Dress wire inside box away from components as much as is possible especially joint area.

9. Refer to oscilloscope chassis, upper center rail, in the area between the H. V. quintupler/rectifier assembly, and the filter capacitors; approximately 2 1/2 inches from rear panel are two holes. In the smaller of the two holes; using a 4-40 screw, (2200-0139), nut (2260-0002), and lockwasher (2190-0019), install a grounding lug (0360-0016) on the inside of the upper center rail. Note: check that head of screw does not interfere with installation of top cover on instrument.

10. Route the grey wire that was brought out in step #8 under upper center rail and along it to grounding lug that was added in step #9. Solder grey wire to grounding lug keeping wire short and direct.

11. Replace H. V. quintupler/rectifier cover and reinstall all screws, nuts, cable clamp and wires removed in previous steps being careful to reconnect post accelerator leads and yellow vertical deflection leads as they were before.

12. Check for loose hardware or broken wires in area of modification.

13. Install plugins and turn on instrument: check for proper operation and proper polarity of vertical signal (if vertical signal polarity is reversed yellow deflection leads are cross connected). Turn off instrument and replace top and bottom covers.

SERVICE NOTE

Supersedes:

None

HP Model 183A/B/C/D Oscilloscope

Improved Alternate Operation When Using HP 180 Series Plug-ins

183A/B Prefixes Below 1204A
183C/D Prefixes Below 1208A

With some HP 180 Series Time Base plug-ins and at certain intensity levels the 183 Gate Amplifier had a tendency to oscillate. This oscillation either showed up visibly as an erratic intensity problem or as erratic alternate operation.

If you encounter this problem it can easily be corrected by installing A13A1 R70, a 1/4 Watt - 330Ω - carbon resistor (HP Part No. 0684-3311) in series with the base of A13A1Q10. This can best be done by lifting the base lead of Q10, installing one end of R70 in the board, and tieing the other end of the resistor to Q10 base lead.

Also when using HP 180 series Vertical Amplifiers in 183 mainframes occasional erratic alternate operation would result, especially at very fast sweep speeds.

This problem can be corrected by installing the following modification on the Gate Board A13A1:

1. Remove R46 and replace with a piece of bus wire.
2. Remove R44 (1000Ω) and replace with a 1/4 Watt 470Ω carbon resistor. (HP Part No. 0684-4711).
3. Remove R45 (1000Ω) and replace with a 1/4 Watt 1200Ω carbon resistor. (HP Part No. 0684-1221).

BW/bw/WO

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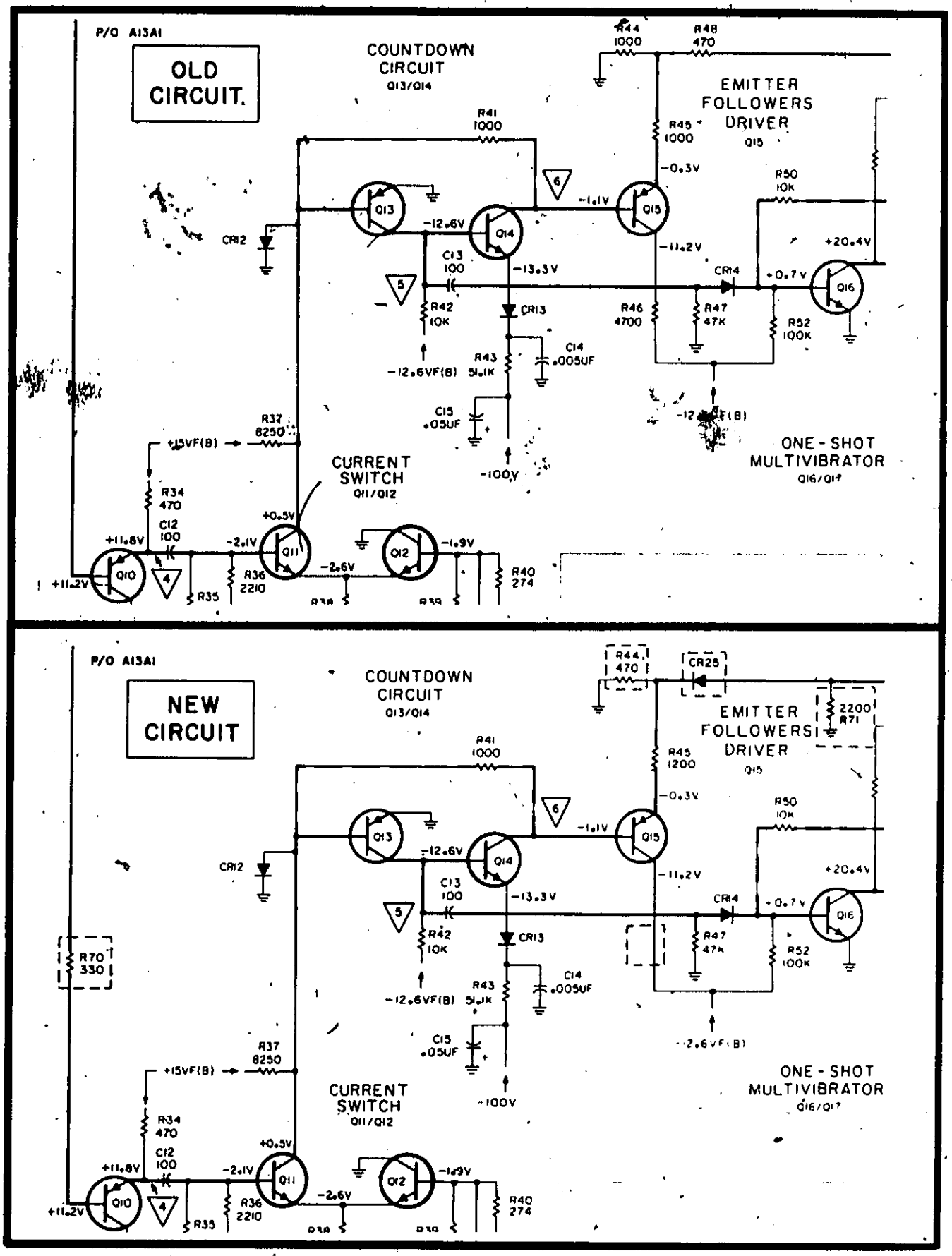
4. Remove R48 (470Ω) and replace with a diode CR25 (HP Part No. 1901-0040). The cathode of the diode should be toward TP3.

5. Add R71, a 1/4 Watt 2200Ω carbon resistor, from the anode of CR25 to ground. This can best be accomplished by physically placing R71 from the anode lead of CR25 to the ground lead of C22.

It is suggested both of these modifications be performed if you intend to use HP 180 Series plug-ins in your 183 mainframes below the above prefixes.

No adjustments are necessary after performing the modifications.

Correct you Operating and Service Manual to reflect these changes.


P/O A13A1
OLD CIRCUIT.
COUNTDOWN CIRCUIT
Q13/Q14
EMITTER FOLLOWERS DRIVER
Q15
CURRENT SWITCH
Q11/Q12
ONE-SHOT MULTIVIBRATOR
Q16/Q17
R44 1000
R46 470
R41 1000
R45 1000
R50 10K
CR12
Q13
Q14
Q15
Q16
-12.6V
-0.3V
-1.1V
-11.2V
+20.4V
+0.7V
C13 100
-13.3V
CR14
CR13
R42 10K
R43 51.1K
C14 .005UF
C15 .05UF
R46 4700
R47 47K
R52 100K
-12.6VF(B)
-100V
R37 8250
+15VF(B)
R34 470
C12 100
+0.5V
-2.1V
+11.8V
+11.2V
Q10
Q11
Q12
R35
R36 2210
-2.6V
-1.9V
R40 274
4
5
6
P/O A13A1
NEW CIRCUIT
COUNTDOWN CIRCUIT
Q13/Q14
EMITTER FOLLOWERS DRIVER
Q15
CURRENT SWITCH
Q11/Q12
ONE-SHOT MULTIVIBRATOR
Q16/Q17
R44 470
CR25
2200 R71
R45 1200
R41 1000
R50 10K
R70 330
R37 8250
R34 470
C12 100
R42 10K
R43 51.1K
C13 100
C14 .005UF
C15 .05UF
R47 47K
R52 100K
R40 274
R36 2210
R35
CR12
CR13
CR14
Q13
Q14
Q15
Q16
Q10
Q11
Q12
-12.6V
-0.3V
-1.1V
-11.2V
+20.4V
+0.7V
-13.3V
-12.6VF(B)
-100V
+15VF(B)
+0.5V
-2.1V
+11.8V
+11.2V
-2.6V
-1.9V
4
5
6

SERVICE NOTE

Supersedes:

None

HP MODEL 183A/B/C/D OSCILLOSCOPES

All Serials

Preferred Replacement for A7R9 and A7R16

A more reliable device has been found for the two 30MΩ resistors used in the High Voltage Power Supply of the above instruments. Should either of these resistors fail in your instrument they should be replaced with the new type, hp Part No. 0698-8018.

Correct your Operating and Service Manual to reflect the new part no.

BW/mh/WO

12/71-8

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SERVICE NOTE

SUPERSEDES

None

HP MODEL 183A/B/C/D OSCILLOSCOPE MAINFRAMES

All Serials

PREFERRED REPLACEMENT FOR A11A1R6

A11A1R6, a 1/2W metal film resistor, in the above instruments was being overstressed with a full 1/2 watt dissipation. The preferred replacement for this resistor is a 1 watt, metal oxide, 2% resistor. HP Part No. 0698-3177.

RMc/meh/WO

/2/72-08

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MANUAL CHANGES

MANUAL CHANGES

MODEL 183C/D

OSCILLOSCOPE

Manual Serials Prefixed: 992--
Manual Printed: JAN 1971

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

Serial Prefix or Number	Make Changes
1109A, 1111A	1
1115A, 1120A	1, 2
1127A	1, 2, 3
1131A (183C only)	1, 2, 3, 4
1134A (183C)	1, 2, 3, 4, 5
1134A (183D)	1, 2, 3, 5
1215A (183C)	1, 2, 3, 4, 5, 6
1242A (183C)	1, 2, 3, 4, 5, 6, 7, 8
1208A (183D)	1, 2, 3, 4, 6, 7
1304A (183D)	1, 2, 3, 4, 6, 7, 8
1331A (183D)	1, 2, 3, 4, 6, 7, 8
1338A (183C)	1 thru 9
1413A (183D)	1, 3, 4, 6, 9
1436A(183D except	1,3,4,6,10
Option 011)	
1436A(183D	1,3,4,6,9
Option 011)	
1441A (183D	1,3,4,6,9
Option 011)	

Serial Prefix or Number	Make Changes

6 SEPTEMBER 1974

Δ= Latest additions to this change sheet.
This change sheet supersedes all prior change sheets for this manual.

Supplement A for
00183-90903

ERRATA

Page 1-3, Table 1-1,
ACCESSORIES FURNISHED: Change Model 10179A to 10178A.

Page 3-2, Paragraph 3-23,
Change last sentence to read "Refer to Paragraph 2-22 through 2-24 and Paragraph 5-3 for instructions on changing scan mode".

Page 5-2, Paragraph 5-16d,
Change last sentence to read "Output amplitude should be −0.0995V to −0.1005V".

Page 6-0, Figure 6-1,
MP17: Change to MP20.

Table 6-2,
A1A1F2: Change to HP Part No. 2110-0067; FUSE: CARTRIDGE 0.3 AMP 250V, Mfr. Code 28480, Mfr. Part No. 2110-0067.
A1S1: Change HP Part No. to 3101-1234, SWITCH: SLIDE DPDT, Mfr. Code 82389, Mfr. Part No. 11A-1242.
A2A1R1: Change to HP Part No. 0698-3151, R: FXD MET FLM 2870 OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0698-3151.
ADD: W2R3, HP Part No. 0684-4711, R: FXD COMP 470 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 4711. (For serial prefix 1111A and below).
A4: Change description to BOARD ASSY: CALIBRATOR; DOES NOT INCLUDE A4U1. (If replacement of Calibrator Board is required, A4U1 must be ordered separately.)
Δ A5A1: Change description to NSR: PART OF A5.
Δ A5A1CR1: Change reference designator to A5CR1.
Δ A5A1CR2: Change reference designator to A5CR2.
A7C2, A7C3, A7C10, A7C11, A7C13, A8A1C11, A8A1C15, A8A1C28, A8A1C29: Change to HP Part No. 0150-0052; C: FXD CER 0.05 UF 20% 400 VDCW (preferred replacement). Mfr. Code 56289, Mfr. Part No. 33C17A.
A7R9, A7R16: Change to HP Part No. 0698-8018, R: FXD FLM 30M 1% 3W, Mfr. Code 28480, Mfr. Part No. 0698-8018.
A8 (00183-69506) ONLY FOR INSTRUMENTS WITH SERIAL PREFIX ABOVE 1215A: Change to HP Part No. 00183-69528, GATE BOARD MODULE (183C ONLY), Mfr. Code 28480, Mfr. Part No. 00183-69528.
A8 (00183-69507) ONLY FOR INSTRUMENTS WITH SERIAL PREFIX ABOVE 1215A: Change to HP Part No. 00183-69529, GATE BOARD MODULE (183D ONLY), Mfr. Code 28480, Mfr. Part No. 00183-69529.
A8A1 FOR INSTRUMENTS WITH SERIAL PREFIX ABOVE 1215A: Change to HP Part No. 00183-66526, BOARD ASSY: GATE, Mfr. Code 28480, Mfr. Part No. 00183-66526.

Table 6-2, (Cont'd)
A8A1C11, A8A1C15, A8A1C28, A8A1C29: Change to HP Part No. 0150-0052, C: FXD CER 0.05 UF 20% 400 VDCW, Mfr. Code 56289, Mfr. Part No. 33C17A.
A8A1C14: Change to HP Part No. 0160-0157, C: FXD MY 0.0047 UF 10% 200 VDCW, Mfr. Code 56289, Mfr. Part No. 192P47292-PTS.
A8A1C16: Change to HP Part No. 0160-0158 and Mfr. Part No. to 192P55629-RTS.
A8A1L1: Change to HP Part No. 9170-0029, CORE: FERRITE BEAD, Mfr. Code 02114, Mfr. Part No. C56-590-65A2/4A.
ADD: L3, HP Part No. 9140-0179, COIL/CHOKE: 22 UH 10%, Mfr. Code 28480, Mfr. Part No. 9140-0179.
MP17: Change description to BUTTON: COVER X1.
MP18: Change description to BUTTON: COVER X10.
MP19: Change description to BUTTON: COVER FREQ.
MP20: Change description to BUTTON: COVER AMPL.
MP21: Change Qty to 2 and change description to BUTTON: COVER BLANK.
MP32: Change HP Part No. to 1490-0968.
MP90: Change HP and Mfr. Part Nos. to 5060-0552.
ADD: MP94, HP Part No. 0905-0331, GSKT: NEOPRENE, Mfr. Code 28480, Mfr. Part No. 0905-0331.
ADD: MP95, HP Part No. 00178A, SCREEN: CONTRAST, Mfr. Code 28480, Mfr. Part No. 00178A.
DELETE: MP77.
V1: Change HP Part No. to 5083-2271.
Add: V1A1R3 and V1A1R4, HP Part No. 0757-0482, R: FXD MET FLM 511K OHM 1% 1/8W, Mfr Code 28480, Mfr Part No. 0757-0482.

Page 7-1, Paragraph 7-11a,
Change HP Part No. to 5083-2270.

Figure 8-12,
On photo: Change CR5 to CR6.
On table: Delete CR5.

Figure 8-4,
In voltage measurement conditions, step a and in waveform measurement conditions, step a and step d (1); change 183A/B to 183C/D.

Figure 8-7,
In voltage measurement conditions, step a and in waveform measurement conditions, step a; change 183A/B to 183C/D.

Figure 8-8,
A2Q1: Locate between A2C9 and A2C11.
A2Q3: Locate between A2R67 and A2R64.
A2Q2: Locate between A2R62 and A2C10.
A2Q4: Locate between A2C15 and A2C10.

Figure 8-11,
In voltage measurement conditions, step a and in waveform measurement conditions, step a; change 183A/B to 183C/D.

ERRATA (Cont'd)

Figure 8-12,
In grid area C-4, change C31 to C30.

Figure 8-13,
At upper left and lower right of schematic change W21J1 and W21J4 to W2J1 and W2J4.
Change designation of A13Q1 to A8Q1.
Change designation of A13Q2 to A8Q2.
Change W21R3 to W2R3, and value to 470.

Figure 8-14,
In waveform measurement conditions step a; change 183A/B to 183C/D.

Figure 8-15,
Wire color (19): Change to (9).
Add: wire color (9) between C7 and C8.
Wire color (29): Change to (5) in two places.
CR5: Change to CR6.

Figure 8-17,
Add: L3 (22 UH) between base of Q2 and A5A1R1.
A4R48: Change value to 220.
A4R46: Change value to 330.
Wire color (902): Change to (903) in two places on board A7.
Grounded side of A1C6: Connect ground bus to ground on chassis.
Unblanking signal from A7 to schematic 4: Show wire color (9).
Wire color (29): Change to (5).
Add: V1A1R3 (511K ohms) from anode of V1A1CR1 to added CRT neck pin.
Add: V1A1R4 (511K ohms) from anode of V1A1CR3 to same CRT neck pin as V1A1R3.

Figure 8-22,
A1A1F2: Change value to 0.3 amp.
A1A1, pin 8: Change wire color (8) to wire color (0).

Figure 8-23,
(Only make this page of corrections for instruments with serial prefix 1242A (183C) or 1304A (183D) and under. Units with higher serial prefix numbers will use the replacement page supplied with this change sheet.)
(98) from A1J3: Change to (908).
(98) through A1F1: Change to (918).
(0) from A1J3: Change to (54).
(967) from A1J3: Change to (98).
(968) from A1S2: Change to (98).
(913) from A1S1: Change to (8).
(908) from A1T1: Change to (98).
(914) from A1T1: Change to (948).
(917) from A1T1: Change to (958).
(908) from A1W1P1: Change to (98).
(917) from A1W1P1: Change to (958).
(914) from A1W1P1: Change to (948).
(98) from A1W1P1: Change to (918)
(958) from A1W1P1: Change to (8).
(98) from pin 4 of W21J2: Change to (918).
(98) from pin 5 of W21J2: Change to (8).
(958) from pin 5 of W21J2: Change to (8).
(29) from A7: Change to (5).
(26) from A7: Change to (2).
(5) from A7 to W21J3, pin E: Change to (97).
(2) from A7: Change to (92).
(2) wire from A5A1: Disconnect from CRT pin 2 Reconnect to A7 on new terminal.
(93) from A5A1: Change to (903).
Wire from CRT pin 2 to W21R1: Designate color (2).

CHANGE 1

Table 6-2,
A1J3: Change HP Part No. to 1251-2357, SOCKET: 3-PIN MALE POWER RECEPTACLE, Mfr. 82389, Mfr. Part No. EAC-301.
A1MP1: Change HP Part No. to 00183-60206, PANEL ASSY: REAR, Mfr. 28480, Mfr. Part No. 00183-60206.
A1MP3: Delete.
Add C2: HP Part No. 0150-0023; C: FXD CER 2000 PF 20% 1000 VDCW, Mfr. 56289, Mfr. Part No. 20C295A2-CDH.

Table 6-2, (Cont'd)
W1: Change to HP Part No. 8120-1538, CABLE ASSY: POWER CORD (183C only), Mfr. 28480, Mfr. Part No. 8120-1538.
Add: W1: HP Part No. 8120-1545; CABLE ASSY: POWER CORD (183D only), Mfr. 28480, Mfr. Part No. 8120-1545.
Figure 8-9,
R91: Change value to 2870 ohms.
Figure 8-13,
Add: C2 from 908 wire on S2 to ground, value 2000 PF.

CHANGE 2

Paragraph 5-39, Steps q and r,
Add: A2A1C1 as a third adjustment.
Table 6-2,
A2A1C1: Change to HP Part No. 0121-0454; VAR AIR 1.7 - 11 PF 250 VDCW, Mfr. 28480, Mfr. Part No. 0121-0454.
A8A1: Change to HP Part No. 00183-66518; BOARD ASSY, Mfr. 28480, Mfr. Part No. 00183-66518.
A8A1CR20, A8A1CR21: Delete.
A8A1R61: Change to HP Part No. 0684-1531; R: FXD COMP 15K OHM 10% 1/4W, Mfr. 01121, Mfr. Part No. CB 1531.
Add: A8A1C31: HP Part No. 0180-0291; C: FXD TANT 1.0 UF +10% 35 VDCW, Mfr. 56289, Mfr. Part No. 150D105X9035A2-DYS.

Table 6-2, (Cont'd)
Add: A8A1VR5: HP Part No. 1902-3024; DIODE: BREAKDOWN 2.87V 5% 400 MW, Mfr. 04713, Mfr. Part No. SZ 10939-26.
W2: Change to HP Part No. 00183-61634; CABLE ASSY: MAIN (183C only), Mfr. Part No. 00183-61634.
W2: Change to HP Part No. 00183-61635; CABLE ASSY: MAIN (183D only), Mfr. 28480, Mfr. Part No. 00183-61635.
DELETE: W2R3.
Figure 8-9,
A2A1C1: Change to variable and value to 1.7 – 11 PF.
Figure 8-13,
DELETE: A8A1CR20, A8A1CR21, W21R3.
A8A1R61: Change value to 15K OHM.
Add: A8A1C31, A8A1VR5, and change wires (905), (946) as shown in Figure 1.

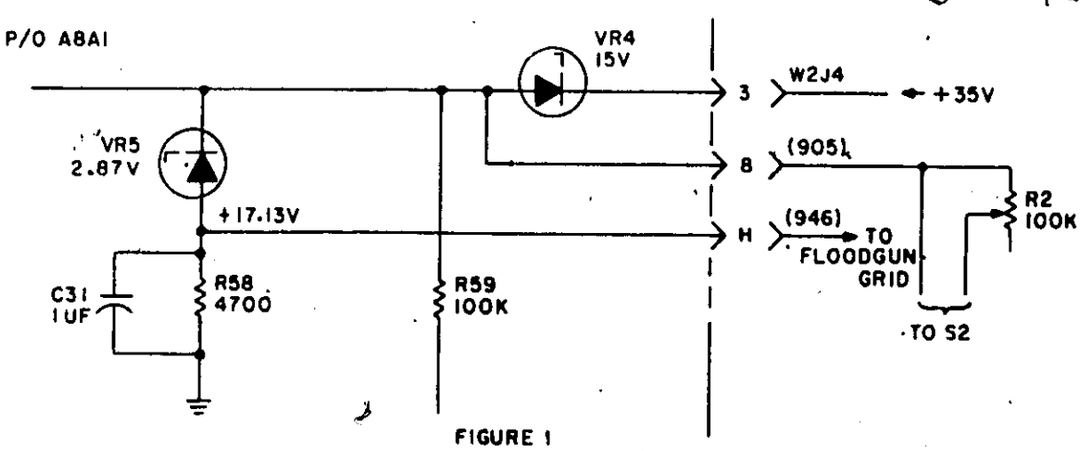


FIGURE 1

CHANGE 3

Table 6-2,
MP66: Change HP Part No. and Mfr. Part No. to 00183-01236.
MP67: Change HP Part No. and Mfr. Part No. to 00183-01236.

Table 6-2, (cont'd)
MP70: Change HP Part No. and Mfr. Part No. to 00183-01237.

CHANGE 4

Table 6-2,
MP78: Change HP Part No. and Mfr. Part No. to 00180-04134.
MP79: Change HP Part No. and Mfr. Part No. to 00180-04136.

Table 6-2, (cont'd)
MP80: Change HP Part No. and Mfr. Part No. to 00183-04112.
MP81: Change HP Part No. and Mfr. Part No. to 00183-04113.

CHANGE 5

Table 6-2,
MP42: Change HP Part No. and Mfr. Part No. to 00183-60107.
MP43: Change HP Part No. and Mfr. Part No. to 00183-60108.
MP82: Change HP Part No. and Mfr. Part No. to 00180-04137.

Figure 8-22,
Change primary circuit wire color codes on Schematic 7 to those shown in Figure 2.

Table 6-2, (cont'd)
MP83: Change HP Part No. and Mfr. Part No. to 00180-64110.
MP84: Change HP Part No. and Mfr. Part No. to 00180-04138.
Page 8-23, figure 8-17,
A6: Connect ground connection (8) wire to chassis ground and delete connection to A5

Figure 8-22, (cont'd)
Delete A1G1 from Schematic 7 as shown in Figure 2.

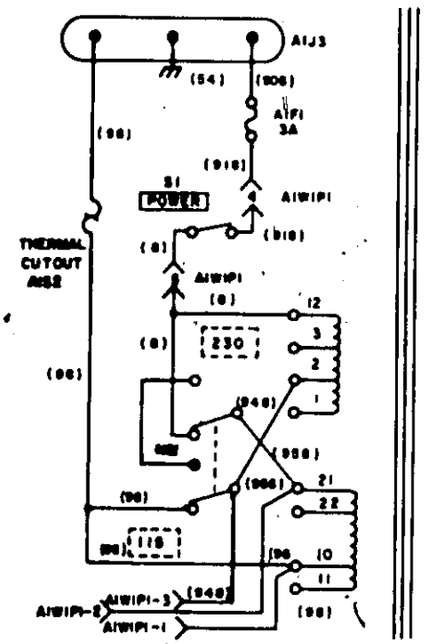


Figure 2.

CHANGE 6

Table 6-2,
A2A1R6: Change to HP Part No. 0698-3177, R: FXD MET FLM 20K OHM 2% 1W, Mfr. Code 28480, Mfr. Part No. 0698-3177.

CHANGE 7

Table 6-2,
Add: A8CR25: HP Part No. 1901-0040, DIODE: SILICON 30 MA 30 WV, Mfr. Code 07263, Mfr. Part No. FDG 1088.
A8A1: Change to HP Part No. 00183-66521.
A8A1R44: Change to HP Part No. 0684-4711, R: FXD COMP 470 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 4711.
A8A1R45: Change to HP Part No. 0684-1221, R: FXD COMP 1.2K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 1221.
Delete: A8A1R46, A8A1R48.
Add: A8A1R70; HP Part No. 0684-3311, R: FXD COMP 330 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 3311.

Table 6-2, (Cont'd)
Add: A8A1R71; HP Part No. 0684-2221; R: FXD COMP 2200 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 2221.
MP1: Change to HP Part No. 5060-0548, KIT: CONTRAST FILTER, Mfr. Code 28480, Mfr. Part No. 5060-0548.
Schematic 4,
R44: Change value to 470.
R45: Change value to 1200.
Delete: R46, R48.
Add: CR25 in place of R48. Connect cathode of CR25 to TP3.
Add: R70 value 330 between base of Q3 and base of Q10.
Add: R71 value 2200 between anode of CR25 and ground.

CHANGE 8

Table 6-2,
A4: Change HP and Mfr. Part Nos. to 00183-66523.

Table 6-2, (Cont'd)
MP64: Change HP and Mfr. Part Nos. to 00183-23703.

CHANGE 9

Page 5-3,
Add: page 5-3a from this change sheet. The procedures on page 5-3a should be performed between procedures on pages 5-3 and 5-4.
Page 5-6, Paragraph 5-39, steps q and r.
Add: A2A1C1 as a third adjustment.
Table 6-2,
A2A1C1: Change to HP Part No. 0121-0454, C: VAR AIR 1.7 – 11 PF 250 VDCW, Mfr. Code 28480, Mfr. Part No. 0121-0454.
A4: Change to HP Part No. 00183-66527, BOARD ASSY: CALIBRATOR, Mfr. Code 28480, Mfr. Part No. 00183-66527.
Delete: A4R55, A4R56, and A4VR4.
Add: A4C21, HP Part No. 0180-0230, C: FXD ELECT 1.0 UF 20% 50 VDCW, Mfr. Code 56289, Mfr. Part No. 150D105X0050A2-DYS.
Add: A4CR4, A4CR5, and A4CR6, HP Part No. 1901-0040, DIODE: SILICON 30 MA 30 WV, Mfr. Code 07263, Mfr. Part No. FDG 1088.

Table 6-2, (Cont'd)
Add: A4Q7, HP Part No. 1853-0086, TSTR: SI PNP, Mfr. Code 80131, Mfr. Part No. 2N5087.
Add: A4Q8, HP Part No. 1854-0215, TSTR: SI NPN, Mfr. Code 80131, Mfr. Part No. 2N3904.
Add: A4Q9, HP Part No. 1853-0086, TSTR: SI PNP, Mfr. Code 80131, Mfr. Part No. 2N5087.
Add: A4Q10, HP Part No. 1853-0240, TSTR: SI PNP, Mfr. Code 04713, Mfr. Part No. SS 1139K
Add: A4R57, HP Part No. 0684-1031, R: FXD COMP 10K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 1031.
Add: A4R59, HP Part No. 0684-1041, R: FXD COMP 100K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 1041.
Add: A4R60, HP Part No. 0684-1031, R: FXD COMP 10K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 1031.
Add: A4R61, HP Part No. 2100-0580, R: VAR CER MET 500K OHM 1/2W, Mfr. Code 28480, Mfr. Part No. 2100-0580.

CHANGE 9 (Cont'd)

Table 6-2, (Cont'd)

Add: A4R62, HP Part No. 0687-1021, R: FXD COMP 1000 OHM 10% 1/2W, Mfr. Code 01121, Mfr. Part No. EB 1021.

A7: Change to HP Part No. 00183-66525, BOARD ASSY: HIGH VOLTAGE REGULATOR, Mfr. Code 28480, Mfr. Part No. 00183-66525.

Add: A7R22, HP Part No. 0698-3553, R: FXD FLM 2.49 MEGOHM 1% 1/2W, Mfr. Code 28480, Mfr. Part No. 0698-3553.

A8A1: Change to HP Part No. 00183-66526, BOARD ASSY: GATE, Mfr. Code 28480, Mfr. Part No. 00183-66526.

A8A1C16: Change to HP Part No. 0160-0157, C: FXD MY 4700 PF 10% 200 VDCW, Mfr. Code 56289, Mfr. Part No. 192P47292-PTS.

A8A1C18: Change to HP Part No. 0160-3450, C: FXD CER 5000 PF 10% 250 VDCW, Mfr. Code 56289, Mfr. Part No. C067B251H502KS25-CD

Delete: A8A1C19.

Add: A8A1C31: HP Part No. 0180-0291, C: FXD TANT 1.0 UF 10% 35VDCW, Mfr. Code 56289, Mfr. Part No. 150D105X9035A2-DYS.

Add: A8A1C33, HP Part No. 0150-0052, C: FXD CER 0.05 UF 20% 400 VDCW, Mfr. Code 56289, Mfr. Part No. 33C17A.

Add: A8A1CR25, HP Part No. 1901-0040, DIODE: SILICON 30 MA 30 WV, Mfr. Code 07263, Mfr. Part No. FDG 1088.

Add: A8A1Q20, HP Part No. 1854-0215, TSTR: SI NPN, Mfr. Code 80131, Mfr. Part No. 2N3904.

Add: A8A1Q21, HP Part No. 1853-0086, TSTR: SI PNP, Mfr. Code 80131, Mfr. Part No. 2N5087.

A8A1R5: Change to HP Part No. 0684-3921, R: FXD COMP 3900 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 3921.

A8A1R44: Change to HP Part No. 0684-4711, R: FXD COMP 470 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 4711.

A8A1R45: Change to HP Part No. 0684-1221, R: FXD COMP 1200 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 1221.

Delete: A8A1R46 and A8A1R48.

A8A1R53: Change to HP Part No. 0757-0273, R: FXD MET FLM 3010 OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0273.

A8A1R54: Change to HP Part No. 0757-0442, R: FXD MET FLM 10.0K OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0442.

A8A1R55: Change to HP Part No. 2100-2216, R: VAR FLM 5K OHM 10% LIN 1/2W, Mfr. Code 28480, Mfr. Part No. 2100-2216.

A8A1R57: Change to HP Part No. 0757-0280, R: FXD MET FLM 1K OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0280.

A8A1R59: Change to HP Part No. 0684-2231, R: FXD COMP 22K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 2231.

Table 6-2, (Cont'd)

Add: A8A1R60, HP Part No. 0757-0465, R: FXD MET FLM 100K OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0465.

A8A1R61: Change to HP Part No. 0757-0435, R: FXD FLM 3920 OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0435.

A8A1R62: Change to HP Part No. 0684-2231, R: FXD COMP 22K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 2231.

Add: A8A1R70, HP Part No. 0684-3311, R: FXD COMP 330 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 3311.

Add: A8A1R71, HP Part No. 0684-2221, R: FXD COMP 2200 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 2221.

Add: A8A1R72, HP Part No. 0757-0477, R: FXD MET FLM 332K OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0477.

Add: A8A1R73: Change to HP Part No. 0757-0438, R: FXD MET FLM 5110 OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0438.

Add: A8A1VR5: HP Part No. 1902-3024, DIODE BREAKDOWN 2.87V 5% 400 MW, Mfr. Code 04713, Mfr. Part No. SZ10939-26.

Delete: C2.

Add: CR1, HP Part No. 1901-0040, DIODE: SILICON 30 MA 30 WV, Mfr. Code 07263, Mfr. Part No. FDG1088.

MP1, Change to HP Part No. 5060-0548, KIT: CONTRAST FILTER, Mfr. Code 28480, Mfr. Part No. 5060-0548.

MP64: Change HP and Mfr. Part Nos. to 00183-23703.

R2: Change to HP Part No. 2100-3233, R: VAR COMP 50K, Mfr. Code 28480, Mfr. Part No. 2100-3233.

Delete: R7.

Add: R8, HP Part No. 0698-0085 R: FXD MET FLM 2610 OHM 1% 1/8W. Mfr. Code 28480 Mfr. Part No. 0698-0085.

W2: Change to HP Part No. 00183-61640, CABLE ASSY: MAIN (183C only), Mfr. Code 28480, Mfr. Part No. 00183-61640.

W2: Change to HP Part No. 00183-61641, CABLE ASSY: MAIN (183D only), Mfr. Code 28480, Mfr. Part No. 00183-61641.

Delete: W2R3.

Page 8-17, Figure 8-5,
Replace with figure 8-5 from this change sheet.

Schematic 1,
Replace with revised schematic 1 from this change sheet.

Schematic 2,
A2A1C1: Change to variable and value of 1.7 to 11 PF

Page 8-21, Figure 8-12,
Replace with figure 8-12 from this change sheet

CHANGE 9 (Cont'd)

Schematic 4,
Replace with revised schematic 4 from this change sheet.
Schematic 5,
Add: A7R22 (2.49M) between A7R12 and ground. Connect wire from junction of A7R12/A7R22 to a new square-pin connector on board A7. Label the square-pin connector "TO A4, PIN Z ON SCHEMATIC 1."
CRT pin T: Change to pin W. Show TO A4R62.
Delete: (957) wire from pin 8 to pin 12 on V1.
Page 8-27, Figure 8-23,
Replace with figure 8-23 from this change sheet.

Δ CHANGE 10

Page 5-3,
Add: page 5-3a from this change sheet. The procedures on page 5-3a should be performed between procedures on pages 5-3 and 5-4.
Page 5-6, Paragraph 5-39, steps q and r.
Add: A2A1C1 as a third adjustment.
Table 6-2,
A2A1C1: Change to HP Part No. 0121-0454, C: VAR AIR 1.7 – 11 PF 250 VDCW, Mfr. Code 28480, Mfr. Part No. 0121-0454.
A4 Change to HP Part No. 00183-66528, BOARD ASSY: CALIBRATOR, Mfr. Code 28480, Mfr. Part No. 00183-66528.
Delete: A4R55, A4R56, and A4VR4,
Add: A4Q8, HP Part No. 1854-0215, TSTR: SI NPN, Mfr. Code 80131, Mfr. Part No. 2N3904.
Add: A4Q9, HP Part No. 1853-0086, TSTR: SI PNP, Mfr. Code 80131, Mfr. Part No. 2N5087.
Add: A4Q10, HP Part No. 1853-0240, TSTR: SI PNP, Mfr. Code 04713, Mfr. Part No. SS 1139K.
Add: A4R59, HP Part No. 0684-1041, R: FXD COMP 100K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 1041.
Add: A4R60, HP Part No. 0684-1031, R: FXD COMP 10K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 1031.
Add: A4R61, HP Part No. 2100-0580, R: VAR CER MET 500K OHM 1/2W, Mfr. Code 28480, Mfr. Part No. 2100-0580.

Table 6-2, (Cont'd)
Add: A4R62, HP Part No. 0687-4021, R: FXD COMP 1000 OHM 10% 1/2W, Mfr. Code 01121, Mfr. Part No. EB 1021.
Add: A4R63, HP Part No. 0757-0464, R: FXD MET FLM 90.9K OHM 1% 1/8W, Mfr Code 28480, Mfr Part No. 0757-0464.
Add: A4VR4, HP Part No. 1902-3357, DIODE: BREAKDOWN 56.2V 5% 400 MW, Mfr Code 28480, Mfr Part No. 1902-3357.
A7: Change to HP Part No. 00183-66525, BOARD ASSY: HIGH VOLTAGE REGULATOR, Mfr. Code 28480, Mfr. Part No. 00183-66525.
Add: A7R22, HP Part No. 0698-3553, R: FXD FLM 2.49 MEGOHM 1% 1/2W, Mfr. Code 28480, Mfr. Part No. 0698-3553.
A8A1: Change to HP Part No. 00183-66526, BOARD ASSY: GATE, Mfr. Code 28480, Mfr. Part No. 00183-66526.
A8A1C16: Change to HP Part No. 0160-0157, C: FXD MY 4700 PF 10% 200 VDCW, Mfr. Code 56289, Mfr. Part No. 192P47292-PTS.
A8A1C18: Change to HP Part No. 0160-3450, C: FXD CER 5000 PF 10% 250 VDCW, Mfr. Code 56289, Mfr. Part No. C067B251H502KS25-CD
Delete: A8A1C19.
Add: A8A1C31: HP Part No. 0180-0291, C: FXD TANT 1.0 UF 10% 35VDCW, Mfr. Code 56289, Mfr. Part No. 150D105X9035A2-DYS.

CHANGE 10 (Cont'd)

Table 6-2, (Cont'd)

Add: A8A1C33, HP Part No. 0150-0052, C: FXD CER 0.05 UF 20% 400 VDCW, Mfr. Code 56289, Mfr. Part No. 33C17A.

Add: A8A1CR25, HP Part No. 1901-0040; DIODE: SILICON 30 MA 30 WV, Mfr. Code 07263, Mfr. Part No. FDG 1088.

Add: A8A1Q20, HP Part No. 1854-0215, TSTR: SI NPN, Mfr. Code 80131, Mfr. Part No. 2N3904.

Add: A8A1Q21, HP Part No. 1853-0086, TSTR: SI PNP, Mfr. Code 80131, Mfr. Part No. 2N5087.

A8A1R5: Change to HP Part No. 0684-3921, R: FXD COMP 3900 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 3921.

A8A1R44: Change to HP Part No. 0684-4711, R: FXD COMP 470 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 4711.

A8A1R45: Change to HP Part No. 0684-1221, R: FXD COMP 1200 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 1221.

Delete: A8A1R46 and A8A1R48.

A8A1R53: Change to HP Part No. 0757-0273, R: FXD MET FLM 3010 OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0273.

A8A1R54: Change to HP Part No. 0757-0442, R: FXD MET FLM 10.0K OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0442.

A8A1R55: Change to HP Part No. 2100-2216, R: VAR FLM 5K OHM 10% LIN 1/2W, Mfr. Code 28480, Mfr. Part No. 2100-2216.

A8A1R57: Change to HP Part No. 0757-0280, R: FXD MET FLM 1K OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0280.

A8A1R59: Change to HP Part No. 0684-2231, R: FXD COMP 22K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 2231.

Add: A8A1R60, HP Part No. 0757-0465, R: FXD MET FLM 100K OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0465.

A8A1R61: Change to HP Part No. 0757-0435, R: FXD FLM 3920 OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0435.

A8A1R62: Change to HP Part No. 0684-2231, R: FXD COMP 22K OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 2231.

Add: A8A1R70, HP Part No. 0684-3311, R: FXD COMP 330 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 3311.

Add: A8A1R71, HP Part No. 0684-2221, R: FXD COMP 2200 OHM 10% 1/4W, Mfr. Code 01121, Mfr. Part No. CB 2221.

Add: A8A1R72, HP Part No. 0757-0477, R: FXD MET FLM 332K OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0477.

Table 6-2, (Cont'd)

Add: A8A1R73: Change to HP Part No. 0757-0438, R: FXD MET FLM 5110 OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0757-0438.

Add: A8A1VR5: HP Part No. 1902-3024, DIODE: BREAKDOWN 2.87V 5% 400 MW, Mfr. Code 04713, Mfr. Part No. SZ10939-26.

Delete: C2.

Add: CR1, HP Part No. 1901-0040, DIODE: SILICON 30 MA 30 WV, Mfr. Code 07263, Mfr. Part No. FDG1088.

MP1, Change to HP Part No. 5060-0548, KIT: CONTRAST FILTER, Mfr. Code 28480, Mfr. Part No. 5060-0548.

MP64: Change HP and Mfr. Part Nos. to 00183-23703.

R2: Change to HP Part No. 2100-3233, R: VAR, COMP 50K, Mfr. Code 28480, Mfr. Part No. 2100-3233.

Delete: R7.

Add: R8, HP Part No. 0698-0085, R: FXD MET FLM 2610 OHM 1% 1/8W, Mfr. Code 28480, Mfr. Part No. 0698-0085.

V1: Change HP Part No. and Mfr. Part No. to 5083-2252.

W2: Change to HP Part No. 00183-61640, CABLE ASSY: MAIN (183C only), Mfr. Code 28480, Mfr. Part No. 00183-61640.

W2: Change to HP Part No. 00183-61641, CABLE ASSY: MAIN (183D only), Mfr. Code 28480, Mfr. Part No. 00183-61641.

Delete: W2R3.

Page 7-1, Paragraph 7-11a,
Change HP Part No. to 5083-2242.

Page 8-17, Figure 8-5,
Replace with figure 8-5 from this change sheet.

Schematic 1,
Replace with revised schematic 1A from this change sheet.

Schematic 2,
A2A1C1: Change to variable and value of 1-7 to 11 PF.

Page 8-21, Figure 8-12,
Replace with figure 8-12 from this change sheet.

Δ CHANGE 10 (Cont'd)

Schematic 4,
Replace with revised schematic 4 from this change sheet.
Schematic 5,
Add: A7R22 (2.49M) between A7R12 and ground.
Connect wire from junction of A7R12/A7R22 to a new square-pin connector on board A7. Label the square-pin connector "TO A4, PIN Z ON SCHEMATIC 1."
CRT pin T: Change to pin W. Show TO A4R62.
Delete: (957) wire from pin 8 to pin 12 on V1.
Page 8-27, Figure 8-23,
Replace with figure 8-23 from this change sheet.

OPTIONS

OPTION X95: Mainframe with blue-gray covers.
Order replacement parts as listed below.

Ref. Desig.	HP Part No.	Description
MP78	5000-8424	Cover, top right
MP79	5000-8425	Cover, top left
MP80	00183-04107	Cover, bottom right
MP81	00183-04108	Cover, bottom left
MP82	5000-0444	Cover, side, rack
MP83	5000-0445	Cover, bottom, rack
MP84	5000-0446	Cover, top, rack
MP90	5060-0551	Kit, rack mount

5-29a. FOCUS ADJUSTMENT.

a. Connect calibrator output (set to 2 kHz) to front-panel external trigger input connector.

b. Select 0.1-usec sweep time on time base plug-in.

c. Set front-panel controls for external trigger.

d. Select normal mode of display presentation.

e. Increase display intensity (using front-panel INT control) for very bright trace.

f. Adjust front-panel FOCUS control for best focused display.

g. Turn down trace intensity for dim trace.

h. Switch to auto mode of sweep display.

i. Readjust INT for barely visible display.

j. Adjust A4R61 on upper left-hand corner of circuit board A4 for best display focus.

k. FOCUS control and A4R61 interact. Repeat steps d through j until best display focus is obtained for both conditions without further adjustment.

5-29b. FLOODGUN ADJUSTMENT.

a. Set rear-panel FLOODGUN MODE switch to PULSED.

b. Connect monitor oscilloscope to TP2 on circuit board assembly A8A1.

c. Set monitor oscilloscope for 5-volt/division vertical sensitivity and 50-usec/division horizontal sensitivity.

d. Set Model 183C/D time base for 0.1-usec division horizontal sensitivity.

e. Adjust Model 183C/D SCALE control to observe waveform on monitor oscilloscope similar to that in figure 5-1a.

f. Adjust A8A1R55 (in lower, right-hand corner of A8A1) for 10-volt pulse (2-division display) as shown in figure 5-1a.

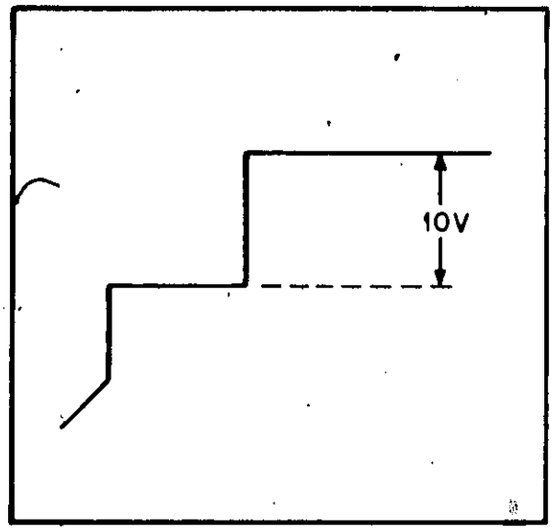
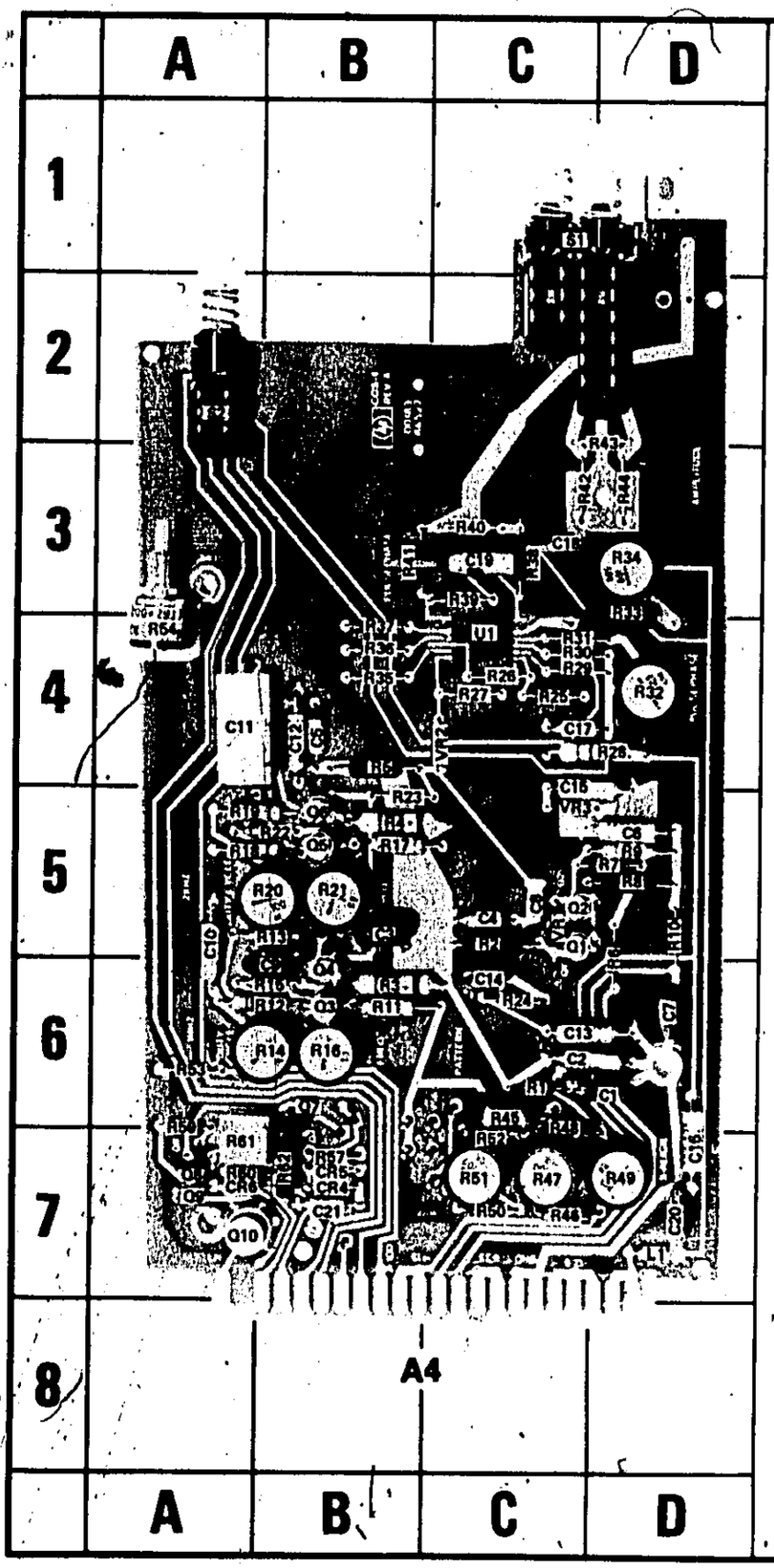


Figure 5-1a. Floodgun Adjustment Waveform



Circuit boards have plated through component holes. This permits soldering from either side of the board.

REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	D-6	R16	B-6
C2	C-6	R17	B-5
C3	B-5	R18	A-5
C4	C-5	R19	A-5
C5	B-4	R20	B-5
C6	D-5	R21	B-5
C7	D-6	R22	B-5
C8	C-5	R23	B-5
C9	B-6	R24	C-6
C10	A-5	R25	C-4
C11	A-4	R26	C-4
C12	B-4	R27	C-4
C13	C-6	R28	D-4
C14	C-6	R29	C-4
C15	C-4	R30	C-4
C16	D-7	R31	C-4
C17	C-4	R32	D-4
C18	C-3	R33	D-3
C19	C-3	R34	D-3
C20	D-7	R35	B-4
C21	B-7	R36	B-4
CR4	B-7	R37	B-4
CR5	B-7	R38	C-3
CR6	A-7	R39	C-3
L1	D-7	R40	C-3
Q1	C-5	R41	B-3
Q2	C-5	R42	C-3
Q3	B-6	R43	D-2
Q4	B-6	R44	D-3
Q5	B-5	R45	C-6
Q6	B-5	R46	C-7
Q7	B-6	R47	C-7
Q8	A-7	R48	C-6
Q9	A-7	R49	D-7
Q10	A-7	R50	C-7
R1	C-6	R51	C-7
R2	C-5	R52	C-7
R3	B-6	R53	A-6
R4	B-5	R54	A-4
R5	B-4	R57	B-7
R6	D-5	R59	A-6
R7	D-5	R60	A-7
R8	D-5	R61	A-7
R9	D-5	R62	B-7
R10	D-5	S1	C-1
R11	B-6	S2	A-2
R12	B-6	U1	C-4
R13	B-5	VR1	C-5
R14	B-6	VR2	C-4
R15	B-6	VR3	C-5

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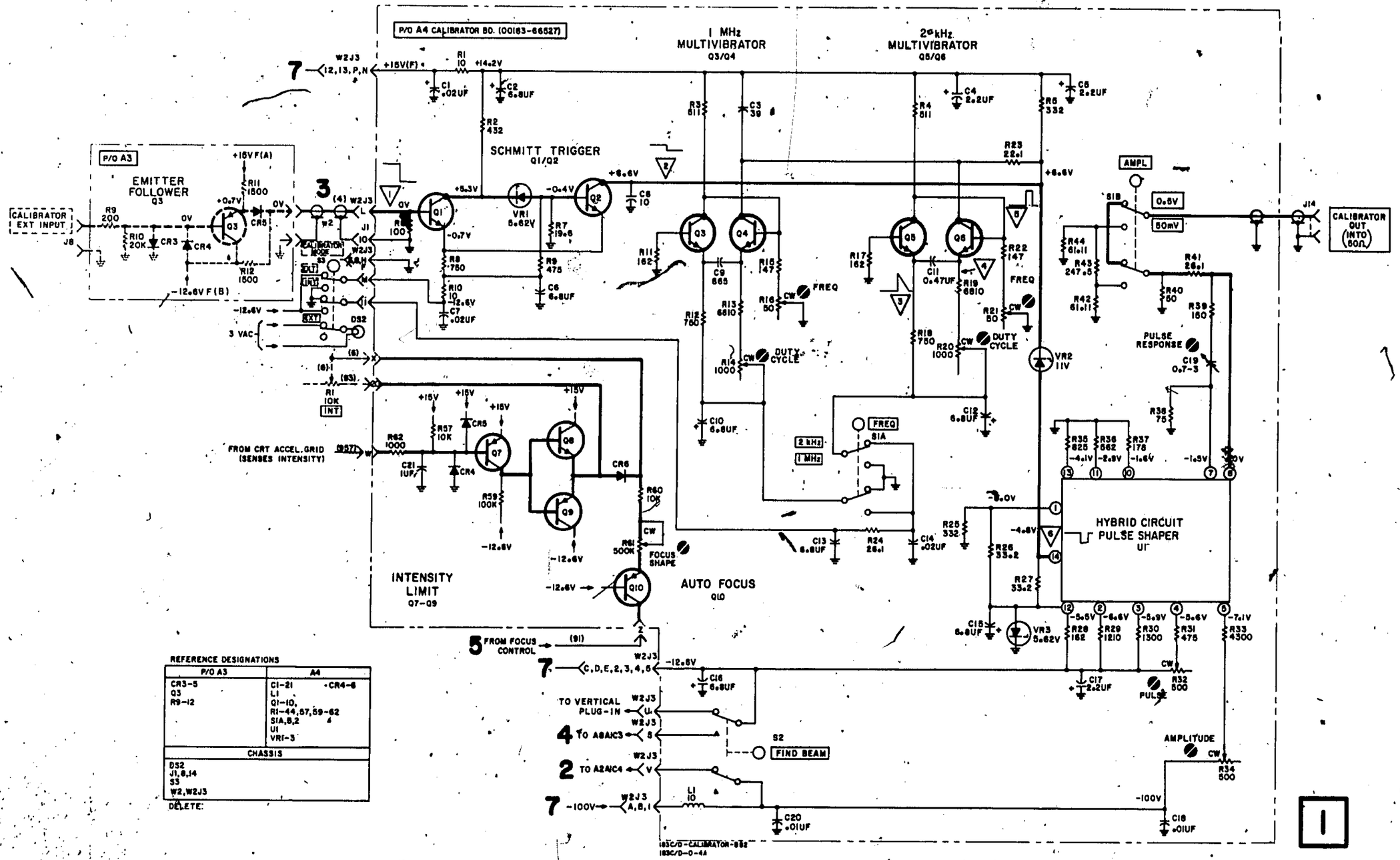
Figure 8-5. Component Locations, Calibrator Board A4



REFERENCE DESIGNATIONS

P/O A3	A4
CR3-5 Q3 R9-12	C1-21 +CR4-6 L1 Q1-10, R1-44,57,59-62 S1A,B,2 4 U1 VR1-3
CHASSIS	
DS2 J1,8,14 S3 W2,W2J3	

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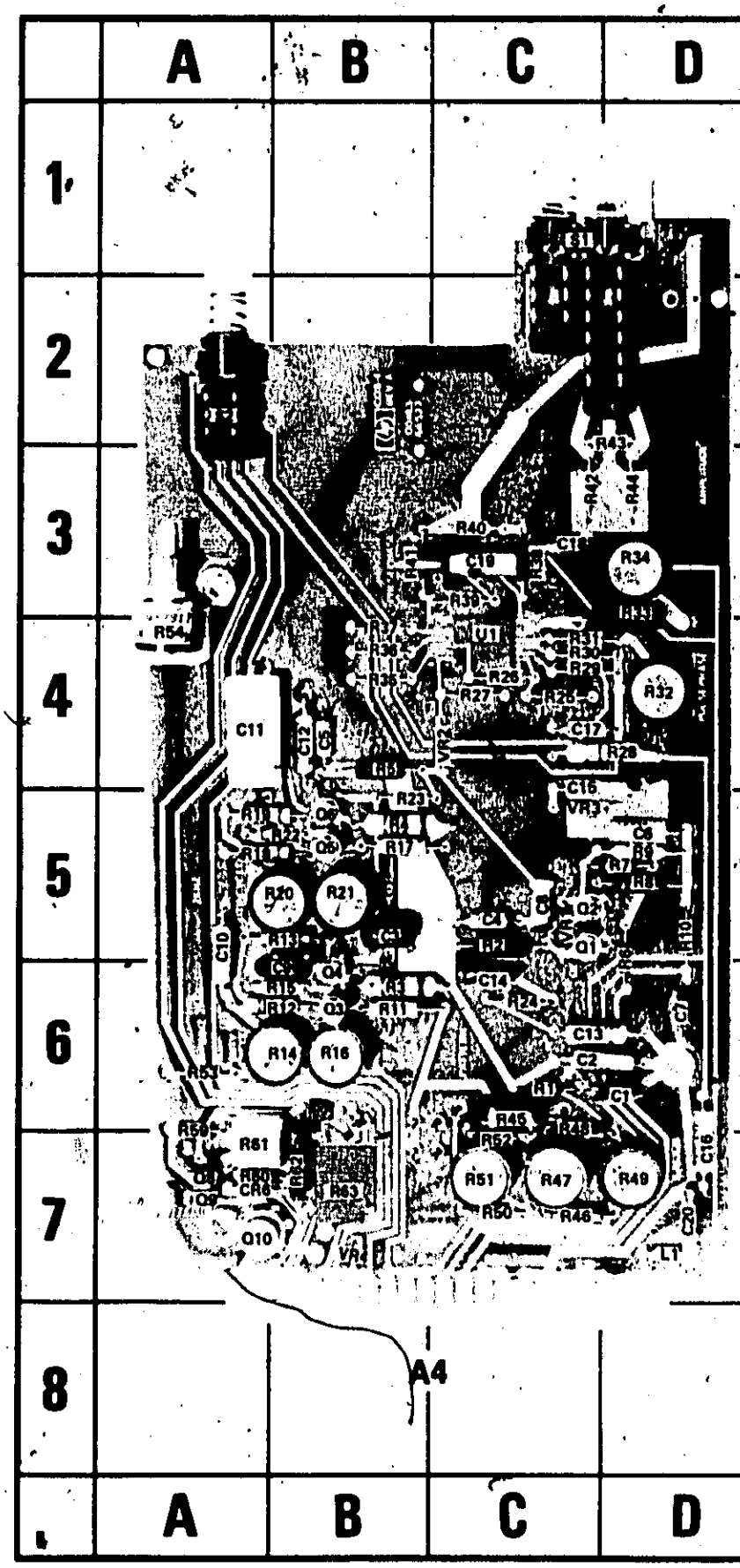
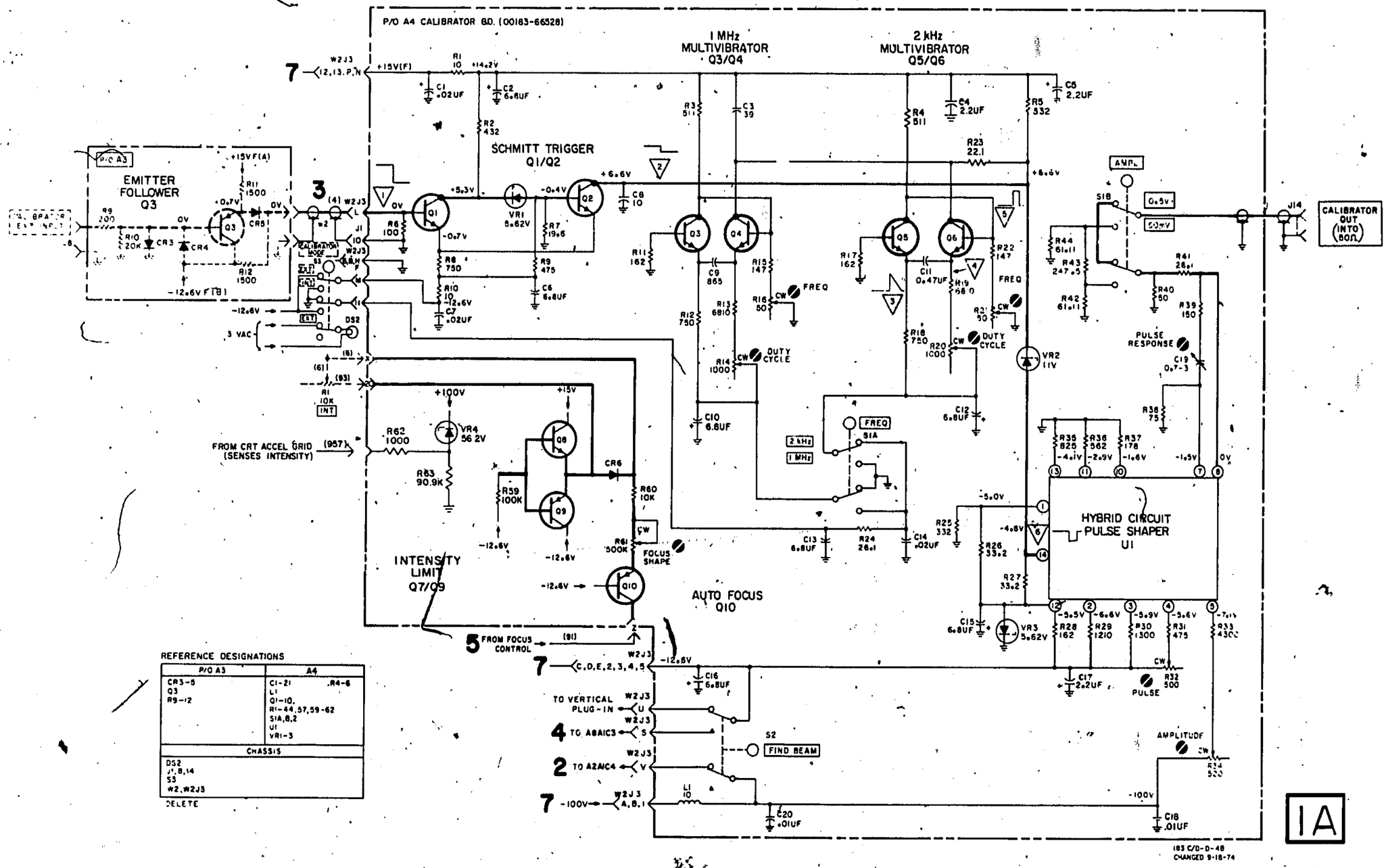
Figure 8-6.
Calibrator Schematic



Circuit boards have plated through component holes. This permits soldering from either side of the board.

REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	D-6	R18	A-5
C2	C-6	R19	A-5
C3	B-5	R20	B-5
C4	C-5	R21	B-5
C5	B-4	R22	B-5
C6	D-5	R23	B-5
C7	D-6	R24	C-5
C8	C-5	R25	C-4
C9	B-6	R26	C-4
C10	A-5	R27	C-4
C11	A-4	R28	D-4
C12	B-4	R29	C-4
C13	C-6	R30	C-4
C14	C-6	R31	C-4
C15	C-4	R32	D-4
C16	D-7	R33	D-3
C17	C-4	R34	D-3
C18	C-3	R35	B-4
C19	C-3	R36	B-4
C20	D-7	R37	B-4
CR6	A-7	R38	C-3
L1	D-7	R39	C-3
Q1	C-5	R40	C-3
Q2	C-5	R41	B-3
Q3	B-6	R42	C-3
Q4	B-6	R43	D-2
Q5	B-5	R44	D-3
Q6	B-5	R45	C-6
Q8	A-7	R46	C-7
Q9	A-7	R47	C-7
Q10	A-7	R48	C-6
R1	C-6	R49	D-7
R2	C-5	R50	C-7
R3	B-6	R51	C-7
R4	B-5	R52	C-7
R5	B-4	R53	A-6
R6	D-5	R54	A-4
R7	D-5	R59	A-6
R8	D-5	R60	A-7
R9	D-5	R61	A-7
R10	D-5	R62	B-7
R11	B-6	R63	B-7
R12	B-6	S1	C-1
R13	B-5	S2	A-2
R14	B-6	U1	C-4
R15	B-6	VR1	C-5
R16	B-6	VR2	C-4
R17	B-5	VR3	C-5
		VR4	B-7

Figure 8-5. Component Locations, Calibrator Board A4



REFERENCE DESIGNATIONS

P/O A3	A4
CR3-5 Q3 R9-12	C1-21 ,R4-6 L1 Q1-10, R1-44,57,59-62 S1A,B,2 U1 VR1-3
CHASSIS	
DS2 J1,8,14 S3 W2,W2J3	

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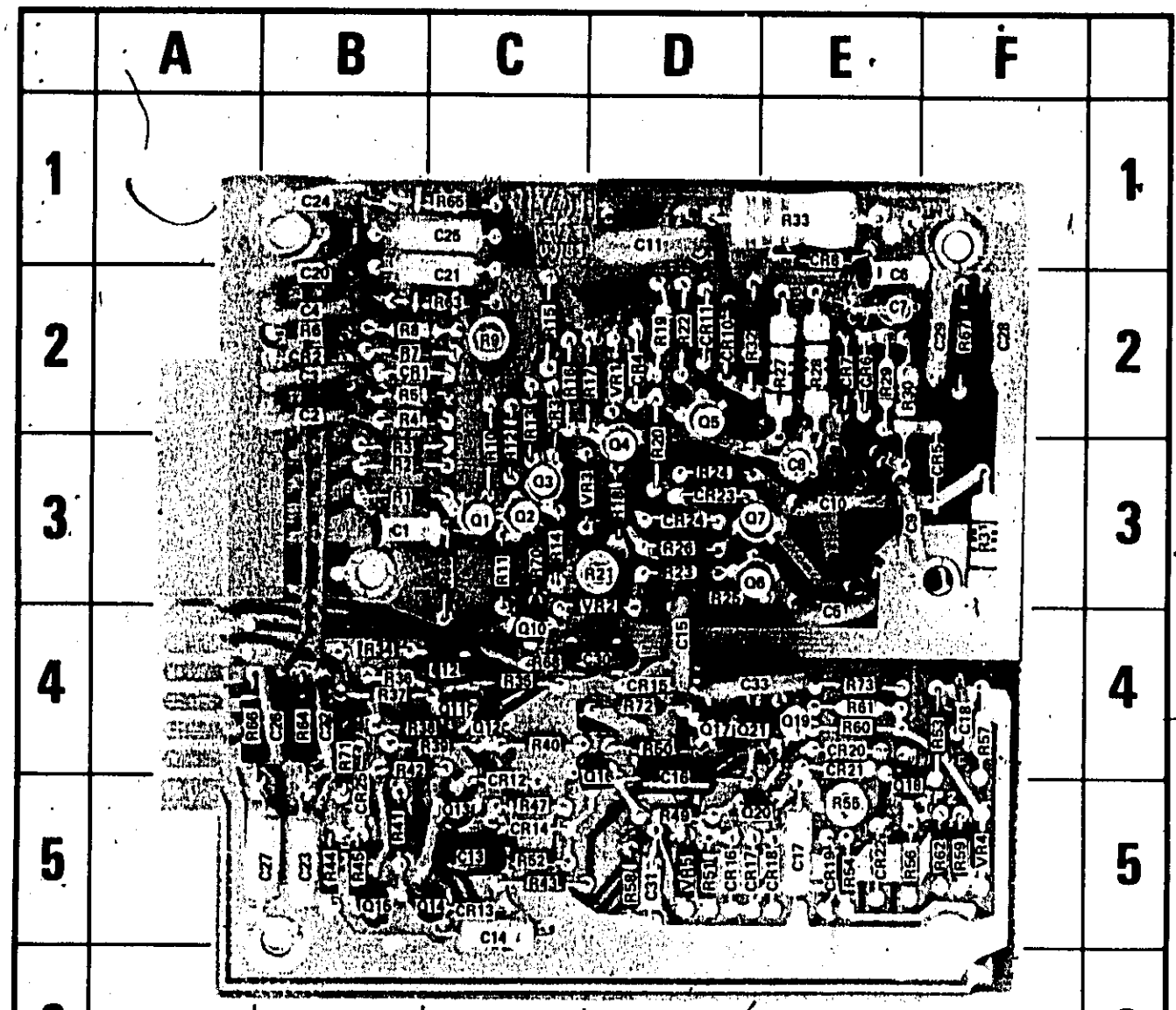
Figure 8-6.
Calibrator Schematic



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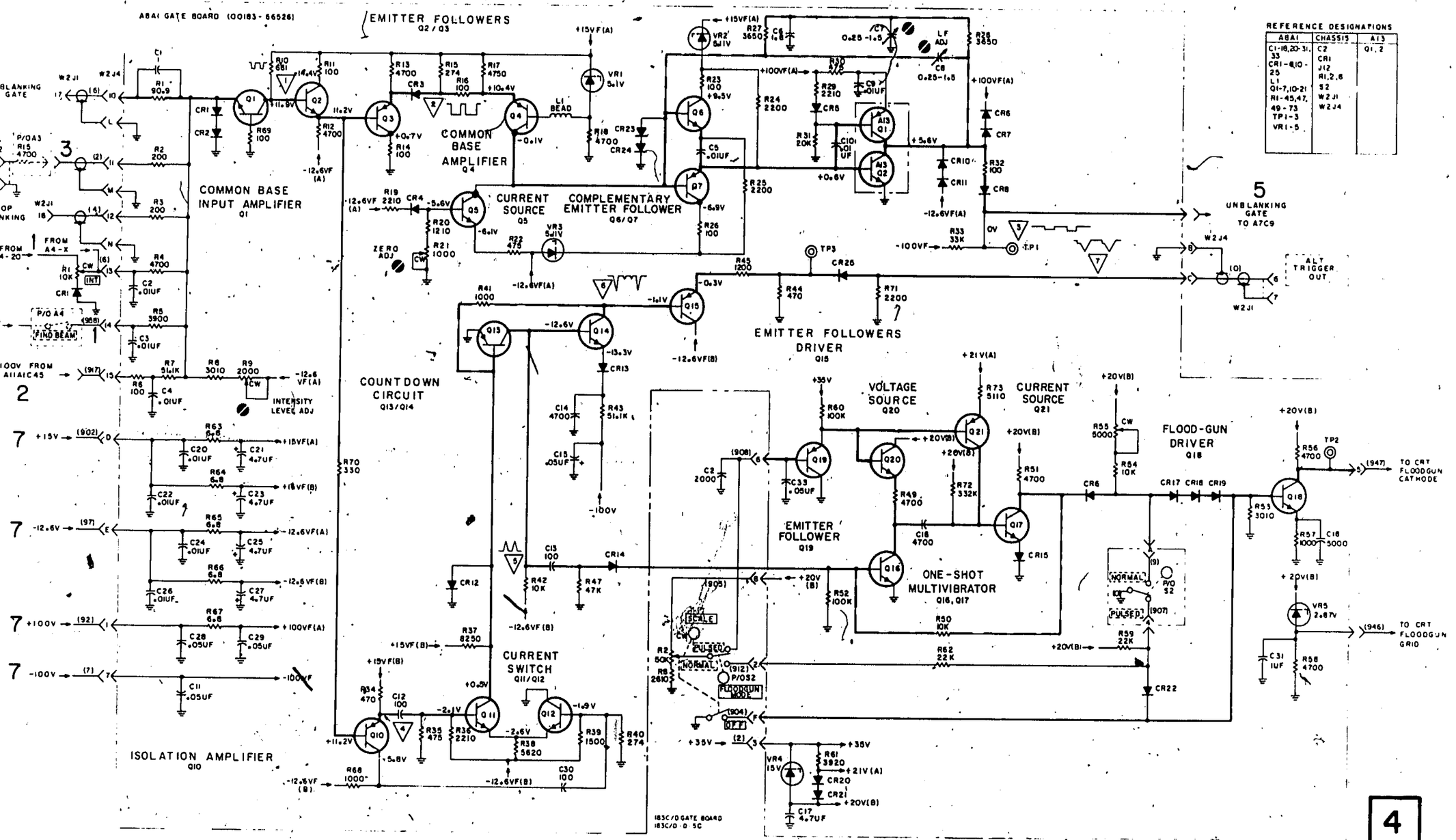
REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-3	C21	C-2	CR8	E-1	Q3	C-3	R3	B-3	R22	D-2	R41	B-5	R61	E-4
C2	B-2	C22	B-4	CR10	D-2	Q4	D-3	R4	B-2	R23	D-3	R42	B-4	R62	F-5
C3	B-2	C23	B-5	CR11	D-2	Q5	D-2	R5	B-2	R24	D-3	R43	C-5	R63	C-2
C4	B-2	C24	B-1	CR12	C-5	Q6	E-3	R6	B-2	R25	D-3	R44	B-5	R64	B-4
C5	E-4	C25	C-1	CR13	C-5	Q7	E-3	R7	B-2	R26	D-3	R45	B-5	R65	C-1
C6	E-2	C26	B-4	CR14	C-5	Q10	C-4	R8	B-2	R27	E-2	R47	C-5	R66	A-4
C7	E-2	C27	B-5	CR15	D-4	Q11	C-4	R9	C-2	R28	E-2	R49	D-5	R67	F-2
C8	E-3	C28	F-2	CR16	D-5	Q12	C-4	R10	C-3	R29	E-2	R50	D-4	R68	C-4
C9	E-3	C29	F-2	CR17	D-5	Q13	C-5	R11	C-3	R30	E-2	R51	D-5	R69	C-3
C10	E-3	C30	D-4	CR18	E-5	Q14	C-5	R12	C-3	R31	F-3	R52	C-5	R70	C-3
C11	D-1	C31	D-5	CR19	E-5	Q15	B-5	R13	C-2	R32	D-2	R53	F-4	R71	B-4
C12	C-4	C33	E-4	CR20	E-4	Q16	D-4	R14	C-3	R33	E-1	R54	E-5	R72	D-4
C13	C-5	CR1	B-2	CR21	E-4	Q17	D-4	R15	C-2	R34	B-4	R55	E-5	R73	E-4
C14	C-5	CR2	B-2	CR22	E-5	Q18	E-5	R16	C-2	R35	C-4	R56	E-5	VR1	D-2
C15	D-4	CR3	C-2	CR23	D-3	Q19	E-4	R17	D-2	R36	B-4	R57	F-4	VR2	D-3
C16	D-4	CR4	D-2	CR24	D-3	Q20	E-5	R18	D-3	R37	B-4	R58	D-5	VR3	C-3
C17	E-5	CR5	F-3	CR25	B-5	Q21	D-4	R19	D-2	R38	B-4	R59	F-5	VR4	F-5
C18	F-4	CR6	E-2	Q1	C-3	R1	B-3	R20	D-3	R39	C-4	R60	E-4	VR5	D-5
C20	B-2	CR7	E-2	Q2	C-3	R2	B-3	R21	D-3	R40	C-4				

Figure 8-12. Component Locations, Gate Amplifier Board



REFERENCE DESIGNATIONS

A8A1	CHASSIS	A13
C1-18,20-31, 33	C2	Q1, 2
CR1-6,10-25	CR1	
L1	J12	
Q1-7,10-21	R1,2,6	
R1-45,47, 49-73	S2	
TP1-3	W2J1	
VR1-5	W2J4	

Figure 8-13.
Gate Amplifier Schematic

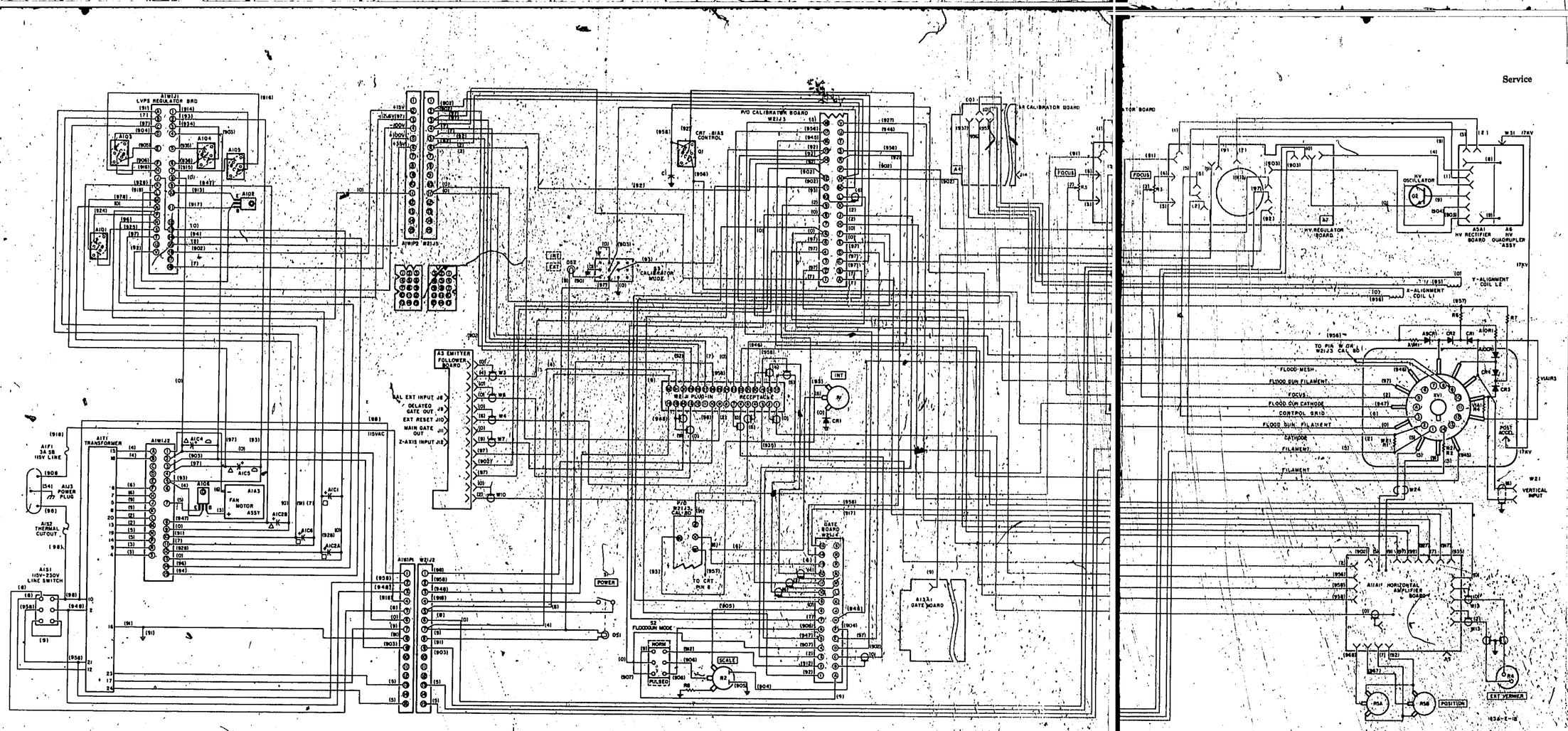


Figure 8-23.
Model 183C/D Wiring Diagram