Errata

Title & Document Type: **183A and 183B Oscilloscope Operating and Service Manual**

Manual Part Number: **00183-90910**

Revision Date: **March 1974**

About this Manual

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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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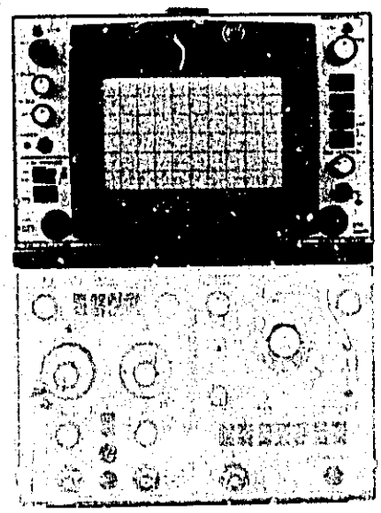
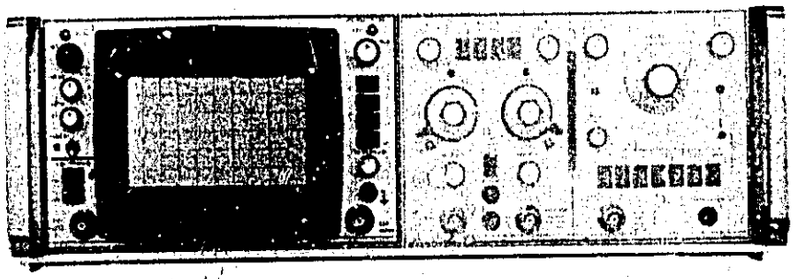
Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

Agilent Technologies

OPERATING AND SERVICE MANUAL

OSCILLOSCOPE
183A/B





HEWLETT hp PACKARD

OPERATING AND SERVICE MANUAL

MODEL 183A/B

OSCILLOSCOPE

Serials Prefixed: 1334A
HP Part Number 00183-90910
Microfiche Part No. 00183-90810

SERIALS PREFIXED: 1334A

Refer to Section VII for instruments with the following serial prefix numbers: **941—, 958—, 965—, 967—, 987—, 988—, 989—, 990—, 1107A, 1108A, 1109A, 1112A, 1113A, 1120A, 1127A, 1134A, 1141A, 1204A, 1211A, 1235A, 1246A, 1251A,** and **1326A.**

Refer to Section VII for instruments with the following standard options: **002, 003, 004, 005, 007, 011,** and **X95.**

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

Manual Part Number 00183-90910.
Microfiche Part Number 00183-90810.

PRINTED: MARCH 1974

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS (Cont'd)

LIST OF TABLES

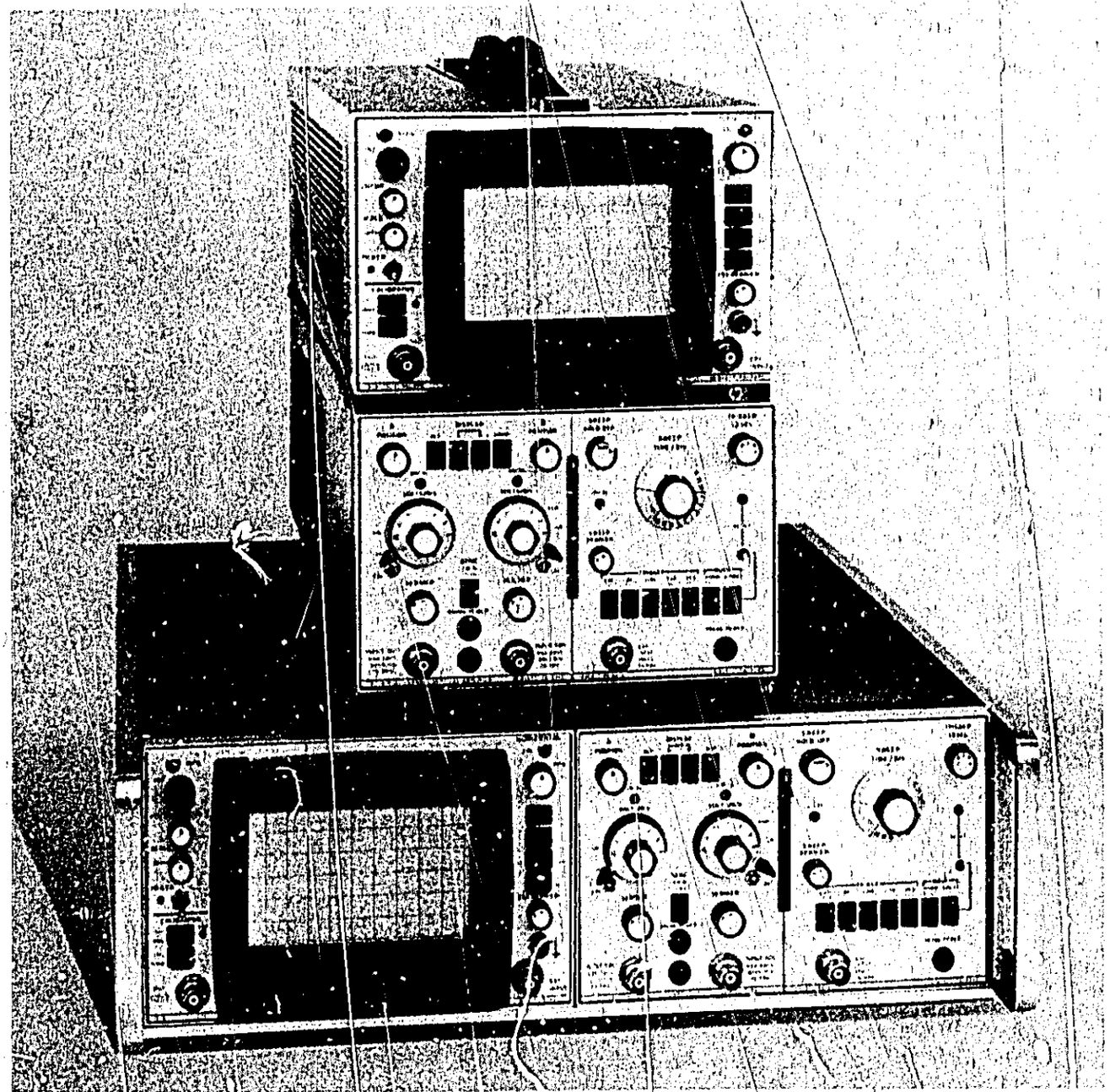


Figure 1-1. Model 183A and 183B Oscilloscopes

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This manual provides operating and servicing information for the HP Models 183A and 183B 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.

NOTE

Throughout the text of this manual, the HP Models 183A and 183B Oscilloscopes shall be called Model 183A/B.

1-3 This section contains a description of the Model 183A/B. 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 readout 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 183A/B is a laboratory oscilloscope that is capable of using various plug-in units. Both models, as shipped from the factory, are intended for bench use. The Model 183B may be rack mounted as described in Section II.

1-6. The Model 183A/B is an X-Y voltage display system with built-in calibrator and power supplies. The basic Model 183A/B is designed for operation from dc to beyond 500 MHz with real-time display. Various plug-in time bases, vertical amplifiers, sampling plug-ins, and time-domain reflectometers provide increased versatility.

1-7. All active components in the Model 183A/B 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 183A/B is equipped for high-speed photography (camera available separately). The internal graticule illumination includes a pulsed flood-gun 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 rise time of less than 1 ns 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-in units. The calibrator may be used as a pulse shaper with less than 1 ns rise time 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 183A/B has aluminized P21 phosphor, an internal graticule to eliminate parallax, and a nonglare safety faceplate.

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 HP 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 183A/B is equipped with a mesh-contrast filter. The filter snaps into place under the light shield to provide greater contrast in high ambient light. A detachable power cord is supplied with each instrument. The Model 183B is supplied with all parts and hardware required 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 which provides front-panel protection for the cabinet model. HP Part No. 5060-0437 provides fornt-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 183A/B 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 instructions to adapt this manual for proper instrument coverage.

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

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.

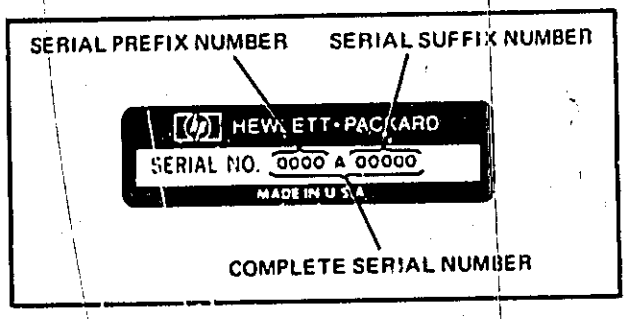


Figure 1-2. Serial Prefix Identification

Table 1-1. Specifications

HORIZONTAL AMPLIFIER

EXTERNAL INPUT:

BANDWIDTH: DC-coupled, dc to 8 MHz, AC-coupled, 2 Hz to 8 MHz.

DEFLECTION FACTOR: 1.0 V/div in X1; 100 mV/div in X10; accuracy ±5% with EXT VERNIER in CAL position. Vernier provides continuous adjustment between ranges and extends deflection factor to 10 V/div.

DYNAMIC RANGE: ±20V.

MAXIMUM INPUT: 350V (dc + peak ac).

INPUT RC: approx 1 megohm shunted by approx 25 pF.

INTERNAL SWEEP
Sweep Magnifier: X10; accuracy ±5%.

OUTPUTS: two emitter-follower outputs on rear panel for main and delayed gates or horizontal and vertical recorder outputs when used with sampling plug-ins. Amplitude approx ±0.75V with 1840A/1841A; outputs will drive impedances as low as 1000 ohms without distortion.

CALIBRATOR

PULSE TIMING:

MODE 1: repetition rate, 2 kHz (0.5 ms period); pulse width, 50 usec.

MODE 2: repetition rate, 1 MHz (1 usec period); pulse width, 100 ns.

ACCURACY (Mode 1 or Mode 2): ±0.5% (+10° to +40°C). ±1% (0°C to +55°C).

AMPLITUDE: negative pulse selectable 50 mV or 500 mV, ±1% (into 50 ohms, ±0.5%).

SOURCE IMPEDANCE: 50 ohms.

PULSE SHAPE (measured with 1 GHz bandwidth sampling oscilloscope):

RISE TIME (Neg): <1 ns.

OVERSHOOT AND RINGING: ±3% max.

FLATNESS (pulse top and baseline with perturbations averaged): ±0.5% after 5 ns.

Table 1-1. Specifications (Cont'd)

EXTERNAL CALIBRATOR INPUT: rear-panel input selectable with rear-panel CALIBRATOR MODE switch. Front-panel light indicates when CALIBRATOR MODE switch is in EXT position. The calibrator shaper network shapes an external negative input which exceeds —0.5V pk. Repetition rate extends to >10 MHz. Input impedance is approx 10K ohms for negative signals.

CATHODE-RAY TUBE AND CONTROLS

TYPE: post accelerator, 20 kV accelerating potential, aluminized P31 phosphor (other phosphors available, see Section VII), safety glass faceplate.

GRATICULE: 6 x 10 div, parallax-free internal graticule with 0.2 div subdivisions on major axes. 1 div = 1 cm. SCALE control illuminates CRT phosphor for viewing and controls the pulsed floodgun to increase photographic writing speed of single-shot transients. Normal or pulsed mode floodgun operation selected by rear panel switch.

BEAM FINDER: pressing FIND BEAM control returns trace to CRT screen regardless of horizontal or vertical position control settings.

INTENSITY MODULATION: approx +2V, dc to 15 MHz will blank trace of normal intensity. +15V blanks any intensity trace. Input R: 4700 ohms.

GENERAL

WEIGHT (without plug-ins):
Model 183A, net, 33 lb (15 kg); shipping, 46 lb (20.9 kg).
Model 183B, net, 35 lb (15.9 kg); shipping, 48 lb (21.8 kg).

ENVIRONMENT: Model 183A/B operates within specifications over the following ranges.

TEMPERATURE: 0°C to +55°C.

HUMIDITY: up to 95% relative humidity from 0°C to +40°C.

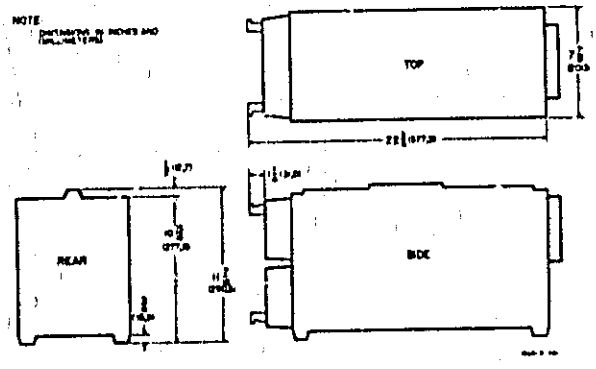
ALTITUDE: up to 15,000 ft.

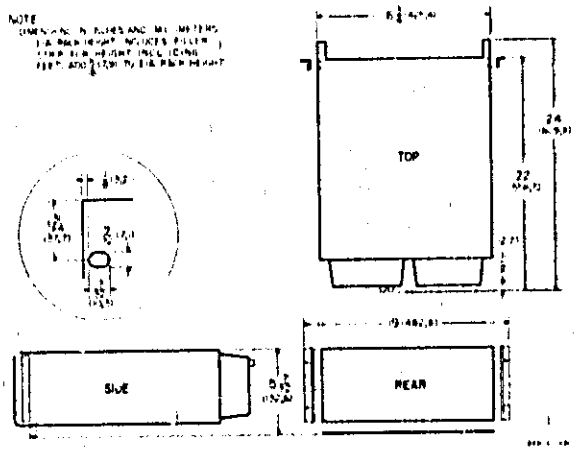
VIBRATION: vibrated in three planes for 15 minutes each with 0.010-inch excursion, 10 to 55 Hz.

POWER: 115V or 230V ±10%, 50 to 400 Hz, approx 115W at normal line voltage with 1830A and 1840A plug-ins installed. Maximum mainframe power 155W at 115V, 60 Hz.

OPTIONS: refer to Section VII for options available.

DIMENSIONS





CABINET: 7-7/8 in. wide, 11-7/16 in. high, 22-3/4 in. deep behind front panel (200 by 290.5 by 577.9 mm).

RACK: 19 in. wide, 5-7/32 in. high, 22 in. deep behind front panel (482.6 by 132.6 by 558.5 mm); 24 in. (609.6 mm) overall depth.

Table 1-2. Reference Designations and Abbreviations

REFERENCE DESIGNATIONS

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		
		MP	MECHANICAL PART				

ABBREVIATIONS

A	AMPERE(S)	F	FARAD(S)	n	NANO (10^{-9})	rfi	RADIO FREQUENCY INTERFERENCE
A	AMPERE TURN(S)	FET	FIELD EFFECT TRANSISTOR(S)	nc	NORMALLY CLOSED	rms	ROOT MEAN SQUARE
ampl	AMPLIFIER(S)	G	GIGA (10^{9})	no.	NORMALLY OPEN	rwv	REVERSE WORKING VOLTAGE
assy	ASSEMBLY	gnd	GROUND(ED)	npn	NEGATIVE-POSITIVE-NEGATIVE	SCR	SILICON CONTROLLED RECTIFIER
ampltd	AMPLITUDE			ns	NANOSECOND	sec	SECOND(S)
bd	BOARD(S)	H	HENRY(IES)	p	PICO (10^{-12})	std	STANDARD
bp	BANDPASS	hr	HOUR(S)	pc	PRINTED (ETCHED) CIRCUIT(S)	trmr	TRIMMER
c	CENTI (10^{-2})	HP	HEWLETT-PACKARD	pk	PEAK	u	MICRO (10^{-6})
C	CARBON	Hz	HERTZ	pnp	POSITIVE-NEGATIVE-POSITIVE	usec	MICROSECOND
ccw	COUNTERCLOCKWISE	if.	INTERMEDIATE FREQ.	p/o	PART OF	V	VOLTS
coax.	COAXIAL	intl	INTERNAL	p-p	PEAK-TO-PEAK	var	VARIABLE
coef	COEFFICIENT	k	KILO (10^{3})	prgm	PROGRAM	w/	WITH
com	COMMON	lb	POUND(S)	prv	PEAK INVERSE VOLTAGE(S)	w/o	WITHOUT
CRT	CATHODE-RAY TUBE	lpf	LOW PASS FILTER(S)	ps	PICOSECOND	wiv	WORKING INVERSE VOLTAGE
cw	CLOCKWISE	m	MILLI (10^{-3})	pwv	PEAK WORKING VOLTAGE		
d	DECI (10^{-1})	M	MEGA (10^{6})	rf	RADIO FREQUENCY		
dB	DECIBEL	ms	MILLISECOND				
ext	EXTERNAL						

INSTALLATION

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains instructions for performing an initial inspection of the Model 183A/B. 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, 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. The Model 183A/B requires either a 115V or 230V ±10%, single phase, 50 to 400 Hz power source capable of delivering 155W. If operation is desired at 100/200V or 125/250V ±10%, the power transformer must be rewired. Refer to Section IV and the LVPS schematic in Section VIII for wiring information.

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.* If the instrument is to be operated on 230 Vac, set the rear-panel VOLTS AC switch to 230. Change fuse A1F1 to A1F2: 1-1/2 AMP slow-blow, HP Part No. 2110-0059 (supplied with the instrument).

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.* Both the Model 183A and the Model 183B, as shipped from the factory, are intended for bench use. The Model 183B may be rack mounted as described in paragraph 2-15.

2-15. *RACK MOUNTING.* A kit for converting the Model 183B to a rack-mount configuration is supplied with each instrument. Instructions for making the conversion are 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 povided with kit). Large notch of flange should be positioned at bottom of instrument.

2-16. INSTRUMENT COOLING.

2-17. The Model 183A/B 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.

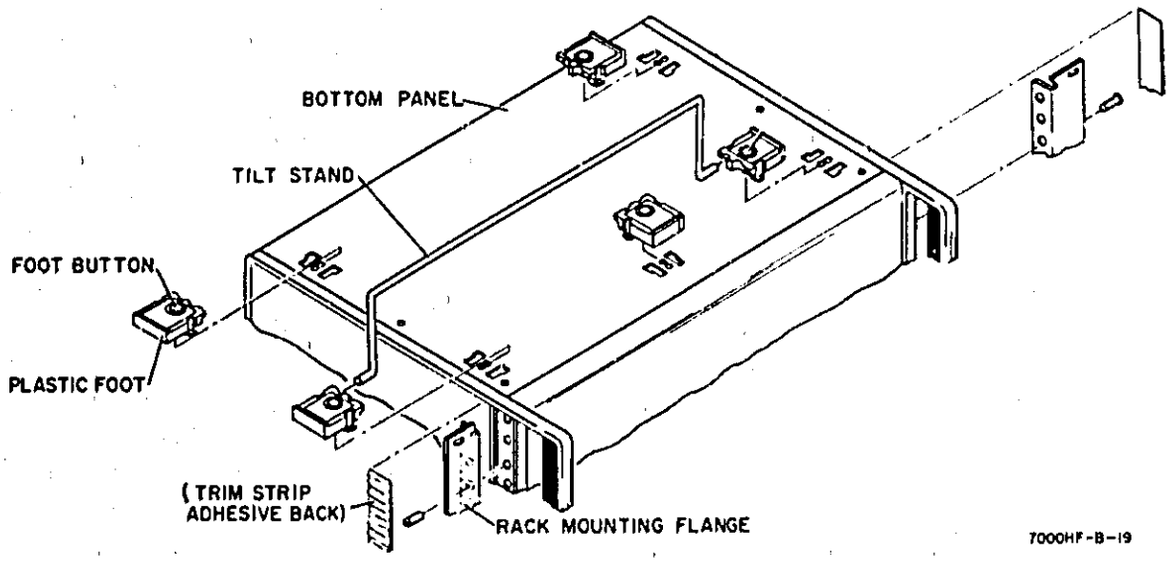


Figure 2-1. Bench/Rack-mount Conversion

2-18. CONTRAST FILTER AND LIGHT 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 that 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. INSTRUMENT COMPATIBILITY.

2-22. The Model 183A/B 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.

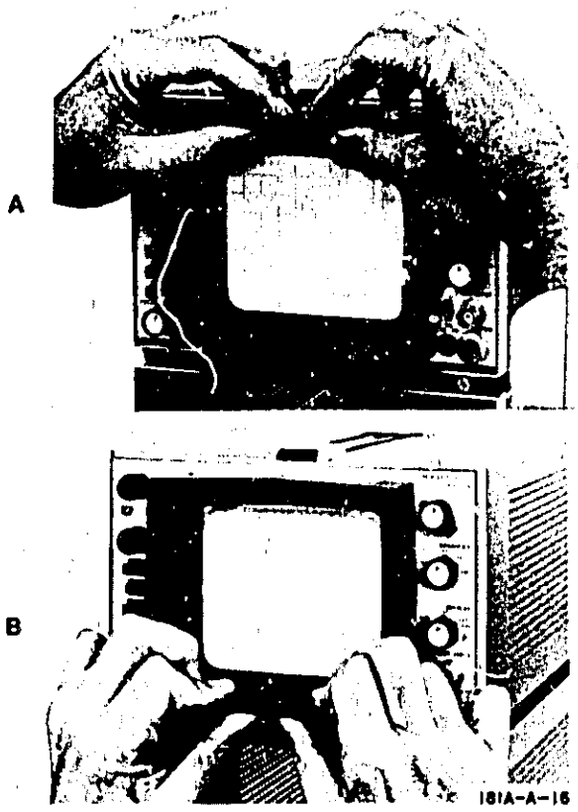


Figure 2-2. Light Shield Removal

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 were designed to meet specifications.

f. Model 1810A: all serial prefixes were designed to meet specifications.

g. Model 1815 series: serial prefixes 979— or above have been factory modified.

h. Model 1820 series: all serial prefixes were designed to meet specifications.

i. Model 1830 series: all serial prefixes were designed to meet specifications.

NOTE

The 1830 series vertical amplifiers were not designed to operate with the 1820 series time bases.

j. Model 1840 series: all serial prefixes were designed to meet specifications.

k. To make X-Y phase-shift measurements up to 100 kHz using 180-series vertical plug-ins, place a 110 pF capacitor across A11A1C25 using pads provided in the A11A1 board. The capacitor should be removed when using 183-series vertical plug-ins for X-Y phase measurements.

2-23. 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 183A/B should be adjusted according to instructions in the applicable operating and service manual.

2-24. CLAIMS.

2-25. 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.

2-26. REPACKING FOR SHIPMENT.

2-27. If the Model 183A/B 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.

2-28. Use the original shipping carton and packing material. If the original packing material is not available, any 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 of tightly packed, industry-approved, shock-absorbing material, such as extra-firm polyurethane 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

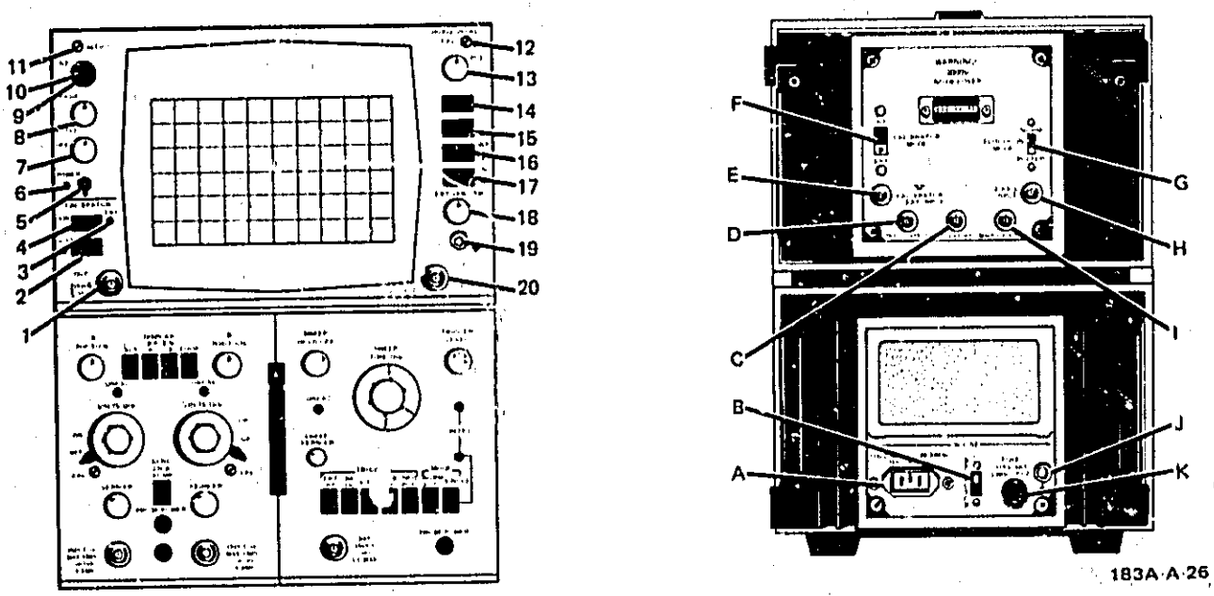


Figure 3-1. Front- and Rear-panel Controls and Connectors

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 ground to oscilloscope.
20. HORIZONTAL EXT INPUT: Input jack for external horizontal signals.

A. 50-400 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 phorphor 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. 115V LINE 3A S.B.: Line fuse for 115-Vac operation.

SECTION III

OPERATION

3-1. INTRODUCTION.

3-2. This section contains a description of the controls and connectors, internal switches, and floodgun operation.

3-3. The Model 183A/B is a general-purpose oscilloscope with plug-in capabilities. Power required for the plug-in units is supplied from the mainframe. The plug-in units must be locked together before installation in the mainframe. Refer to the appropriate plug-in manual for installation instructions.

3-4. CONTROLS AND CONNECTORS.

3-5. Figure 3-1 shows the locations of controls and connectors and gives a brief description of their functions. The following paragraphs describe some of the functions in greater detail.

3-6. FRONT PANEL.

3-7. 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.

3-8. 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.

3-9. 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.

3-10. 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 VII).

3-11. INT. The intensity control adjusts the brightness of the trace on the CRT phosphor. 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

Although an intensity limit circuit is incorporated in the instrument, use only enough intensity to provide comfortable viewing. When the instrument is not in use, rotate the INT control maximum counterclockwise.

3-12. 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.

3-13. 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.

3-14. 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 is color coded to correspond to the front-panel markings.

3-15. 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 100 mV/div in the X10 range.

3-16. REAR PANEL.

3-17. 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 183A/B and the control settings employed determine what output signals are available.

3-18. 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-volts peak input with a repetition rate of <10 kHz and a pulse width >100 ns. Other external trigger voltages must be calculated. The input resistor (located in the plug-in) is 51.1 ohms 1/8W.

3-19. INTERNAL SWITCHES.

3-20. 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 the Model 183A, and removing the plug-ins on the Model 183B.

3-21. 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, which increases the accuracy of the phase measurement. Setting the switch to the BW position restores full bandwidth.

3-22. NORM/CAL. In the CAL position, the input impedance at the HORIZONTAL EXT INPUT jack is 50 ohms. The calibrator output may be fed into the HORIZONTAL EXT INPUT jack to provided 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.

3-23. USING THE MODEL 183A/B AS A SIGNAL SOURCE.

3-24. The CALIBRATOR OUT, MAIN GATE OUT, and DELAYED GATE OUT can be used as signal sources. The plug-in units used in the Model 183A/B, and the control settings employed, determine the output signals available. The following paragraphs describe the signals obtainable from these outputs.

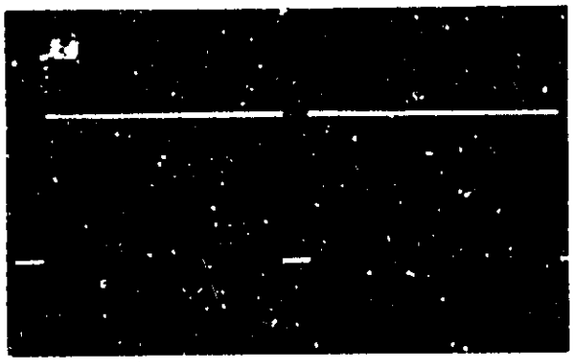
3-25. CALIBRATOR OUT.

3-26. The calibrator in the Model 183A/B can be used as a pulse generator that provides an output pulse with less than 1 ns rise time 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 the 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 SWEEP HOLD OFF. The pulse width is adjusted with the SWEEP VERNIER.

3-27. 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).

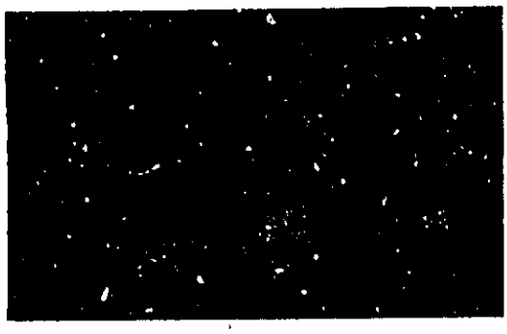
3-28. MAIN GATE OUT/DELAYED GATE OUT.

3-29. The MAIN GATE OUT and DELAYED GATE OUT can be used as pulse generators (with time base



183A-A-13

Figure 3-2. Scale Illumination, Normal Floodgun Mode



183A-A-14

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

plug-in installed). Either output will provide a —0.7-volt pulse with a rise time of about 25 ns. Pulse periods can be adjusted with the TIME/DIV selector and adjusted between ranges with the SWEEP HOLD OFF. Pulse widths can be adjusted with the SWEEP VERNIER.

3-30. FLOODGUN OPERATION.

3-31. The phosphor on the 183A/B can be illuminated by an internal CRT floodgun. The floodgun has two modes of operation, NORMAL and PULSED. Operation is selected by a rear-panel switch. In the NORMAL mode scale illumination is continuous, and 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.

3-32. 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 effects of film post-fogging and phosphor excitation. The time period for the CRT floodgun is determined by the SCALE control setting.

3-33. NORMAL FLOODGUN OPERATION (Repetitive Sweeps).

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

b. Adjust Model 183A/B 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 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.

3-34. PULSED FLOODGUN OPERATION (Single Transient).

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

b. Adjust Model 183A/B and plug-in controls for desired trace display using 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 controls using a low repetition rate signal or single-shot display obtained in single-sweep while repeatedly pressing RESET pushbutton. Trigger time base by repetitive signal.

d. Adjust SCALE control. Setting depends on type of CRT phosphor, camera light-gathering characteristics, and type of film used. Typical setting for P31 phosphor, 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 SCALE control pointer.

e. Check floodgun operation by allowing time base to trigger in single sweep while observing CRT screen through 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 fog level on film for a medium grey background as illustrated in figure 3-3. If necessary, readjust SCALE control for proper post-fogging on film. Counterclockwise rotation gives a darker background.

NOTE

This 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 photograph is taken. Otherwise, residual light from the phosphor (from phosphor excitation by ambient light) will cause film overexposure 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

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. This section contains functional descriptions keyed to an overall block diagram of the instrument, 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 VII.

4-3. OVERALL DESCRIPTION.

4-4. The Model 183A/B 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 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, high voltage regulator, and the plug-in modules. A high voltage power supply generates the potential for the CRT. Figure 4-9 is a block diagram of the overall instrument showing the various circuits of the Model 183A/B.

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 183A/B. 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 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 183A/B 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 183A and right rear of the Model 183B.

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-volts 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 50 to 400 Hz.

4-10. The LVPS provides regulated output of +100, −100, +35, +15, and −12.6 volts dc. A separate zener-regulated output of −12.6 volts dc operates the

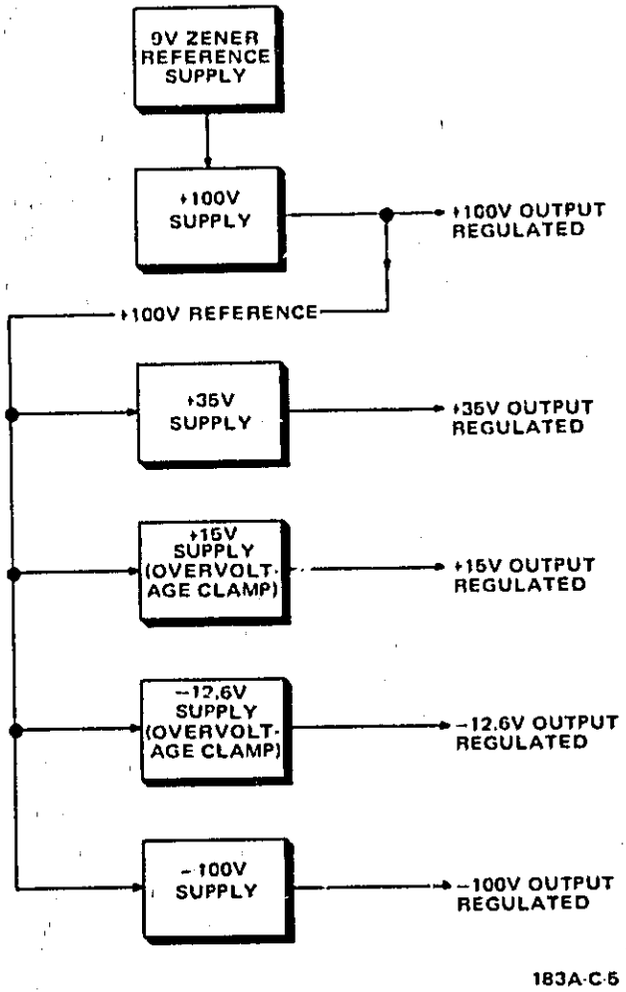


Figure 4-1. Block Diagram, LVPS

cooling blower. The LVPS provides 60-cycle 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 4-1) 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 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 4-2. 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 difference voltage is applied to the driver circuit that controls the series regulator. Excessive current will also cause the driver transistor to limit the series regulator output. Figure 4-3 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 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

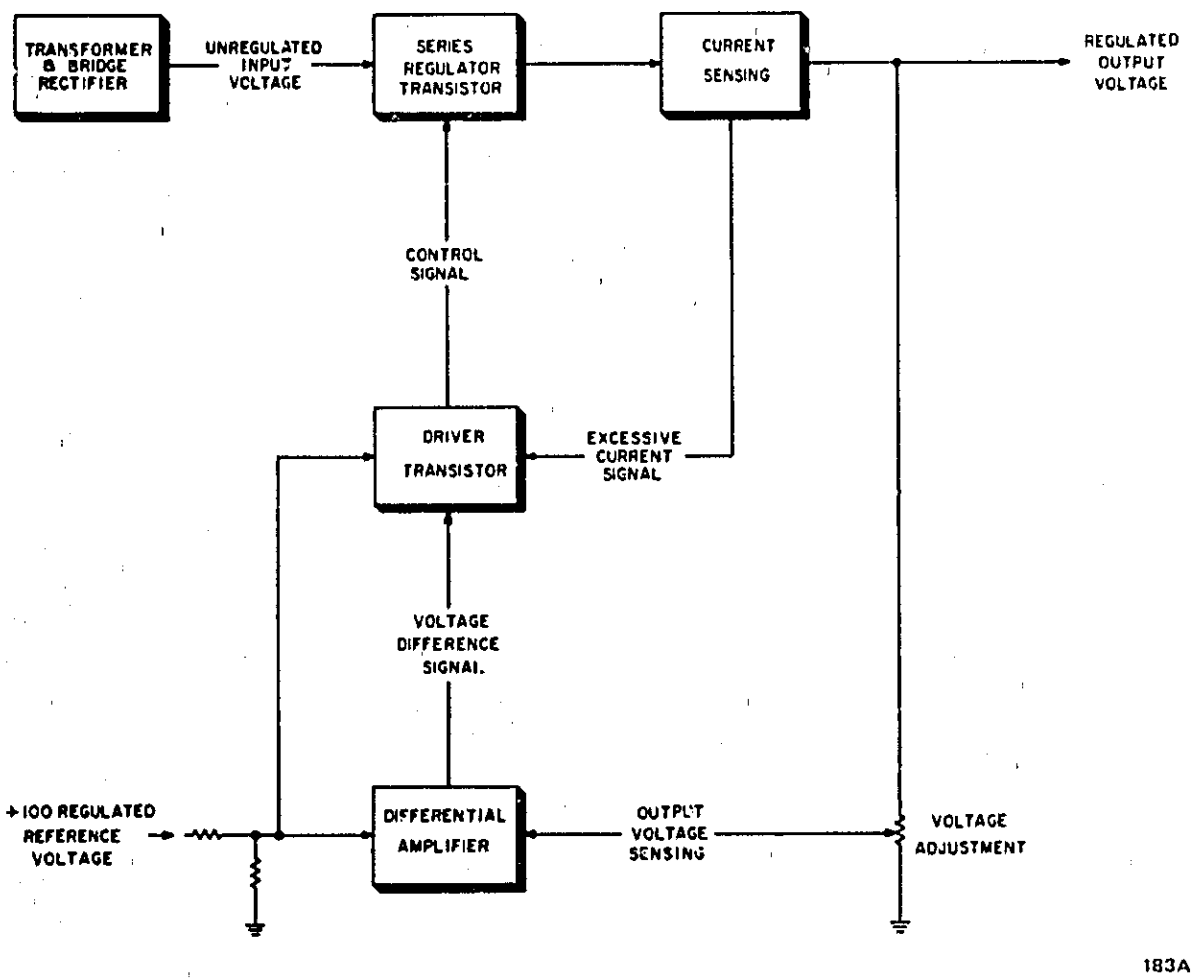


Figure 4-2. Block Diagram, Typical Low Voltage Power Supply

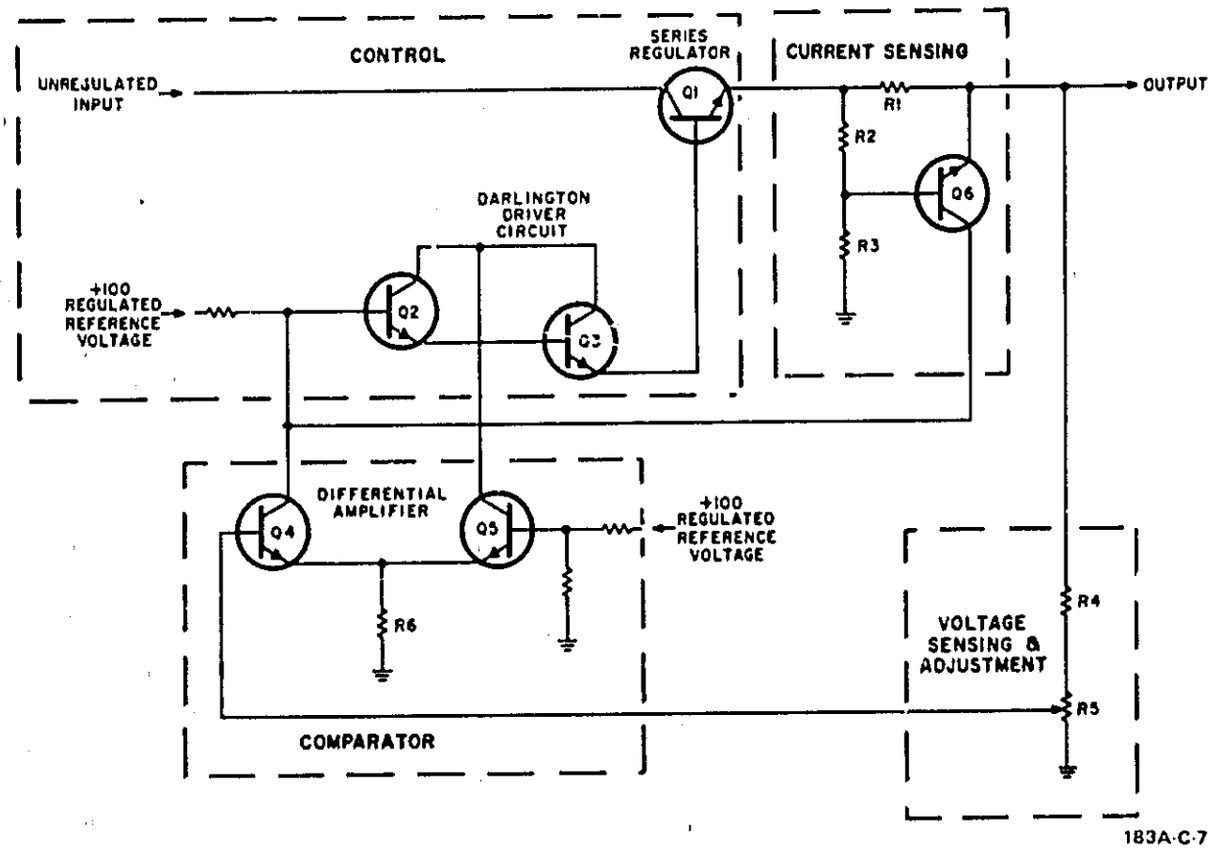


Figure 4-3. Simplified Power Supply Control Circuit

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 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 commutated 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.

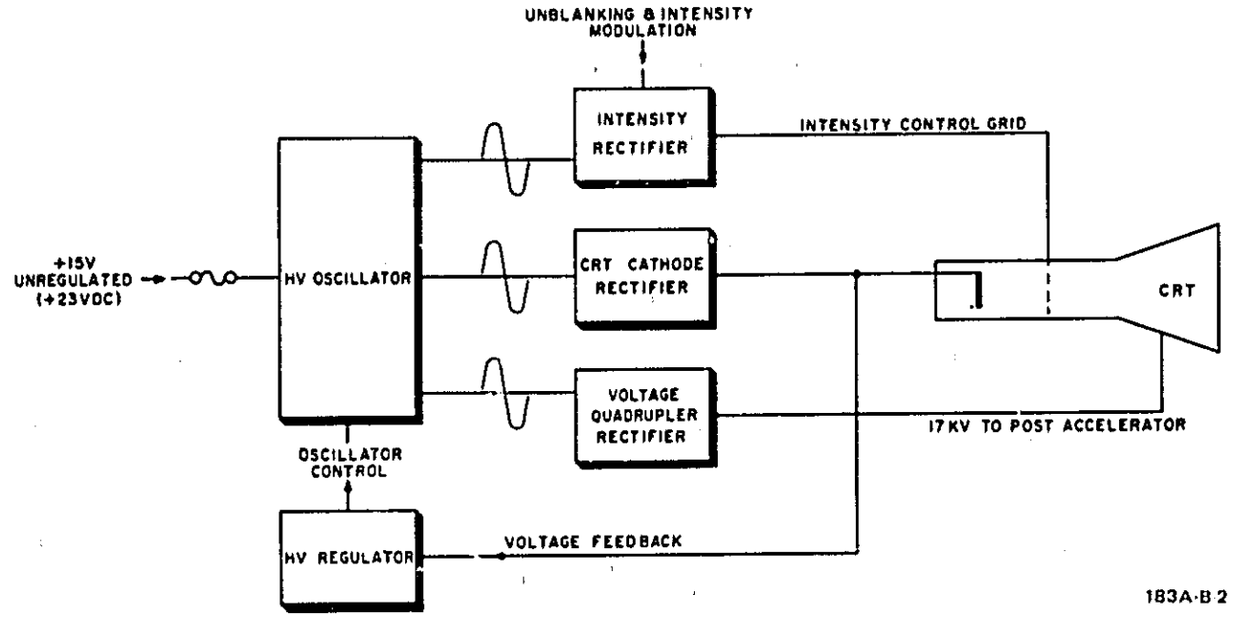


Figure 4-4. Block Diagram, HVPS

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

4-21. Figure 4-4 is a block diagram of the HVPS. Three voltages are produced by the supply for operation of the CRT. The CRT in the Model 183A/B requires a total of 20 kilovolts potential between anode and cathode. The +17 kilovolts supplied to the anode and the —3000 volts supplied to the cathode provide the required potential. Unblanking and intensity modulation from the gate amplifier are used to modulate the —3100 volts generated in the HVPS for 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 also couples 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 A7Q3 (FET) senses voltage from a 30:1 voltage divider across the cathode supply output.

4-24. At turn on, 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 even 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 go 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 oscillations applied to the secondary circuit is controlled by the voltage divider and regulator which vary the dc bias applied to the 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 quardrupler (voltage multiplier) is used to produce the 17 kilovolts required for the CRT anode voltage. Each capacitor stage of the quadrupler 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 quadrupler output is half-wave rectified 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.

4-27. The CRT retrace-blanking and trace-intensification signals are supplied from the gate amplifier

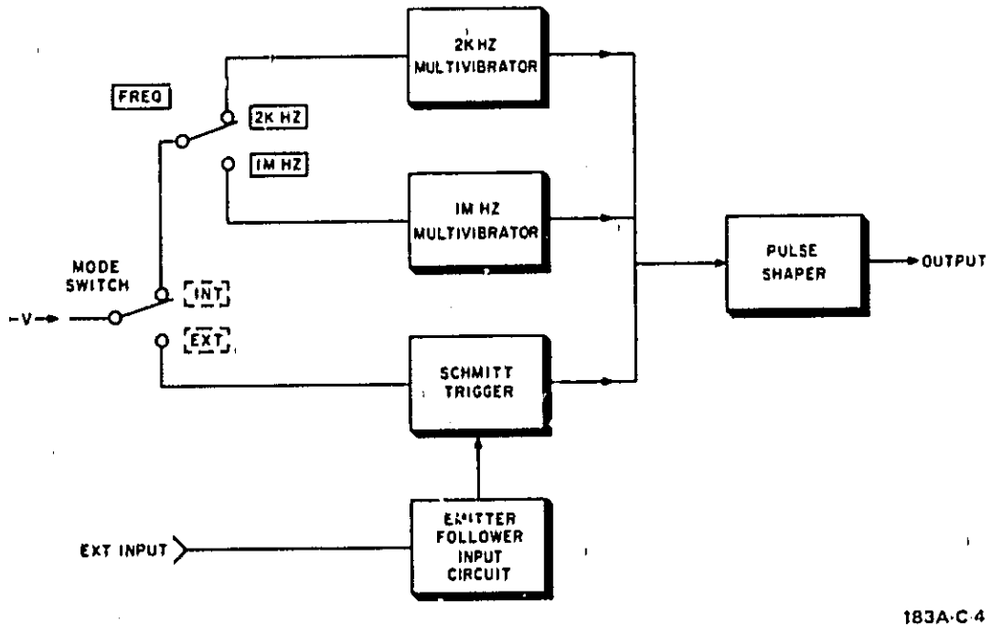


Figure 4-5. Block Diagram, Calibrator

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 a cutoff to an 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 4-5) provides two modes of operation: internal and external. These modes are selected by the CALIBRATOR MODE switch. In both modes calibration signals are shaped to provide a clean pulse output of predetermined rise time 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 switch transistors (eight) are on 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 rise time. 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 position removes enabling voltage from the internal multivibrators and applies it to a 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

External signals 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 Schmitt trigger circuit turns on and remains on for the duration of the external pulse. The Schmitt trigger output pulse has a rise time of about 3 to 4 nanoseconds and about 0.5-volt amplitude.

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 4-5, 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 AMPL 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 is in the INT position, the Schmitt trigger

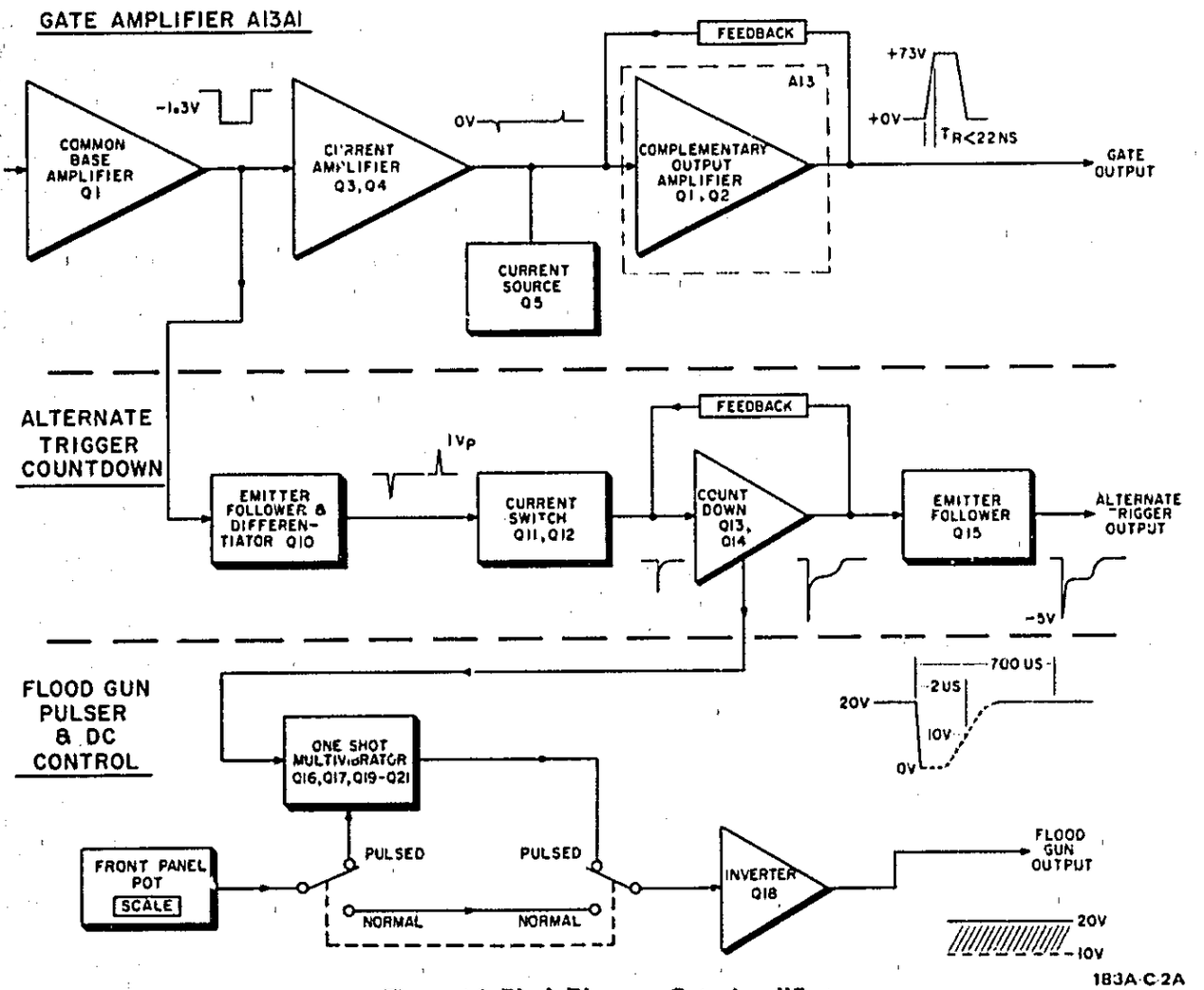


Figure 4-6. Block Diagram, Gate Amplifier

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 1. When power is applied, one of the transistors will begin to turn on. If A4Q3 turns on first, the current will flow through A4R3, A4Q3, 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 183A/B 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, the intensity potentiometer, R1, 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 portion of the FIND BEAM switch may be disconnected when using sensitive phosphors in the CRT. Figure 4-6 is a block diagram showing functions and signal paths for the gate amplifier, alternate trigger circuit, and CRT flood gun 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 ampifier supplies switched intensity control determined by the vertical plug in signals. The Model 1830A vertical amplifier does not require intensity modulation for chop blanking since the speed of switching between channels is fast enough to prevent the phosphor from emitting light. In those vertical plug-in units that require intensity blanking in the chop mode, the 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 circuits.

4-44. When using an 1801A, 1802A, 1804A, 1805A, 1806A, 1807A, or 1808A, 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 sweep periods s orter 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, 1834A, or 1835A, 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. The Z AXIS INPUT connector provides a means for external control of the 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 A13A1Q1 is used. The common-base configuration presents a low impedance to the input current and a voltage output of about —1.3 volts. To prevent capacitive loading of the collector on A13A1Q1, two emitter-followers (A13A1Q2 and A13A1Q3) are used for impedance matching. The output of A13A1Q3 drives a common-base amplifier and a voltage-clamp circuit. The voltage clamp at the emitter of A13A1Q3 is a fast switching, hot-carrier diode, A13A1CR3. 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 A13AQ3.

4-49. Emitter-followers A13A1Q6 and A13Q7 drive complementary pair A13Q1 and A13Q2. A feedback path from the gate amplifier output to the input of A13A1Q6 and A13A1Q7 establishes the gain of the output section and provides compensation adjustment. The 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, A13A1Q11 and A13A1Q13 are off and A13A1Q12 and A13A1Q14 are conducting. The collector current of A13A1Q14 flowing through A13A1R37 and A13A1R41 does not cause enough voltage drop to turn on A13A1Q13. A13A1CR12 clamps the base of A13A1Q13 at +700 mV.

4-51. The alternate-trigger input circuit is driven by the emitter of A13A1Q2 and is isolated from the gate amplifier circuit by isolation amplifier A13A1Q10. The signal at the emitter of A13A1Q10 is approximately a 1.3-volt negative pulse. The negative pulse is differentiated by A13A1C12 and A13A1R35. 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 A13A1Q11. The signal at the collector of A13A1Q10 is a positive pulse and is differentiated by A13A1C30 and A13A1R68. The negative spike from the differentiator is used to turn off A13A1Q12.

4-52. When A13A1Q11 turns on, the current through A13A1Q11 and A13A1Q14 combines and flows through A13A1R37. The voltage drop across A13A1R37 is now sufficient to turn on A13A1Q13. When A13A1Q13 turns on, its collector potential will go toward ground and A13A1Q14 conducts heavier. The emitter potential of A13A1Q14 goes toward ground and A13A1C14 discharges through A13A1Q14 and A13A1R41. A13A1Q13 does not turn off until A13A1C14 discharges. When A13A1Q13 turns off, the collector voltage of A13A1Q13 goes to —12.6 volts and turns off A13A1Q14. A13A1Q14 will remain off until its emitter is —13.3 volts as determined by the RC time constant of A13A1C14 and A13A1R43 (approximately 30 usec). If another positive spike turns on A13A1Q11 before A13A1Q14 turns on, the base voltage of A13A1Q13 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 183A/B-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 FLOODGUN MODE switch is placed in NORM position, the phosphor illumination is continuous, controlled by the SCALE potentiometer. A13A1Q18 drives the CRT floodgun and is biased on in the normal mode. The bias at A13A1Q18 base is controlled by the setting of SCALE potentiometer R2. 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 (A13A1Q16 and A13A1Q17) 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 A13A1Q18 to provide a low-impedance negative output pulse to the CRT floodgun. The width of the pulse is controlled by the voltage source, A13A1Q20 (controls the amplitude of multivibrator voltage swing) and the current source, A13A1Q21 (controls the current that charges the timing capacitor A13A1C16). The setting of the scale potentiometer, R2, biases the emitter follower, A13A1Q19, which in turn biases A13A1Q20 and A13A1Q21. The pulse amplitude on the output of A13A1Q17 is constant.

4-56. INTENSITY LIMIT CIRCUIT. The voltage applied to the intensity control, R1, is controlled by A4Q7, A4Q8, and A4Q9 on the calibrator board, A4. In normal operation A4C21 is charged to +15V volts through A4R57 and A4Q7 is turned off. A4Q9 is turned on by —12.6 volts through A4R59 and supplies a negative voltage to the intensity control, R1. The CRT accelerator grid determines if there is an increase in intensity, and when the intensity is great enough A4C21 is discharged through A4R62 to turn A4Q7 on. With A4Q7 on, the base voltage of A4Q8 and A4Q9 is raised to a positive value and the voltage on the intensity control, R1, becomes positive thus limiting the intensity.

4-57. The intensity control, R1, provides one of the inputs to the gate amplifier. The intensity limit circuit on the calibrator board senses the intensity from the CRT accelerator grid and controls the voltage applied to R1 to prevent CRT burns.

4-58. CATHODE-RAY TUBE (CRT).

4-59. The CRT used in the Model 183A/B is designed to provide a nominal 3-volt-per-centimeter low-frequency deflection factor. The total transit time for one electron through the deflection structure is about 2 nanoseconds. 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.

4-60. The portions of the helices that are closest to the electron beam act as the deflecting plates with the remainder or 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

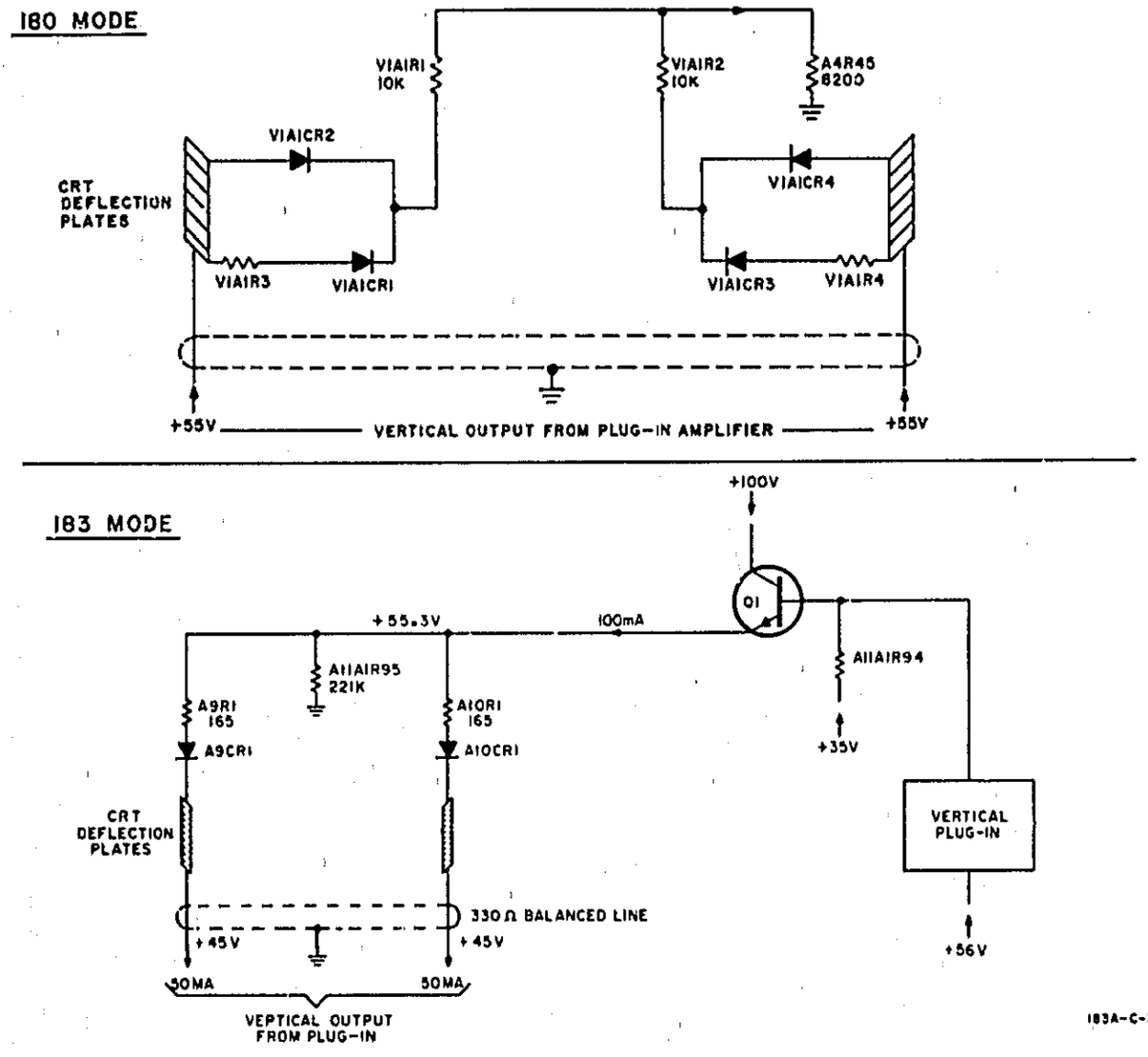


Figure 4-7. Simplified Schematic, CRT Termination Circuit

plates, about 100 picoseconds. Multiple pairs of plates are combined into one structure, driven as a constant-impedance transmission line of 2 nanoseconds total delay. The deflection structure matches the impedance of the plug-in vertical amplifier and interconnecting transmission line.

4-61. CRT AUTOFOCUS.

4-62. CRT focus is controlled by a bias voltage supplied from the focus potentiometer, R3, to the CRT. Autofocus circuitry on the calibrator board senses the intensity level on R1 and adjusts the voltage on R3 to compensate for changes in intensity.

4-63. THEORY OF OPERATION, CRT AUTOFOCUS. The focus control, R3, is part of a voltage divider from 3 kV on the CRT cathode to A7R12 and A7R22 on the high voltage regulator board. A4Q10, which operates as a common base amplifier, senses the intensity setting on R1 and applies an inverted compensating voltage at the junction of A7R12 and A7R22. A4R61 is adjusted to permit the beam to stay in focus as the intensity is varied over its range.

4-64. CRT TERMINATION.

4-65. 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 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 183A/B that is controlled by voltage supplied from the plug-in being used.

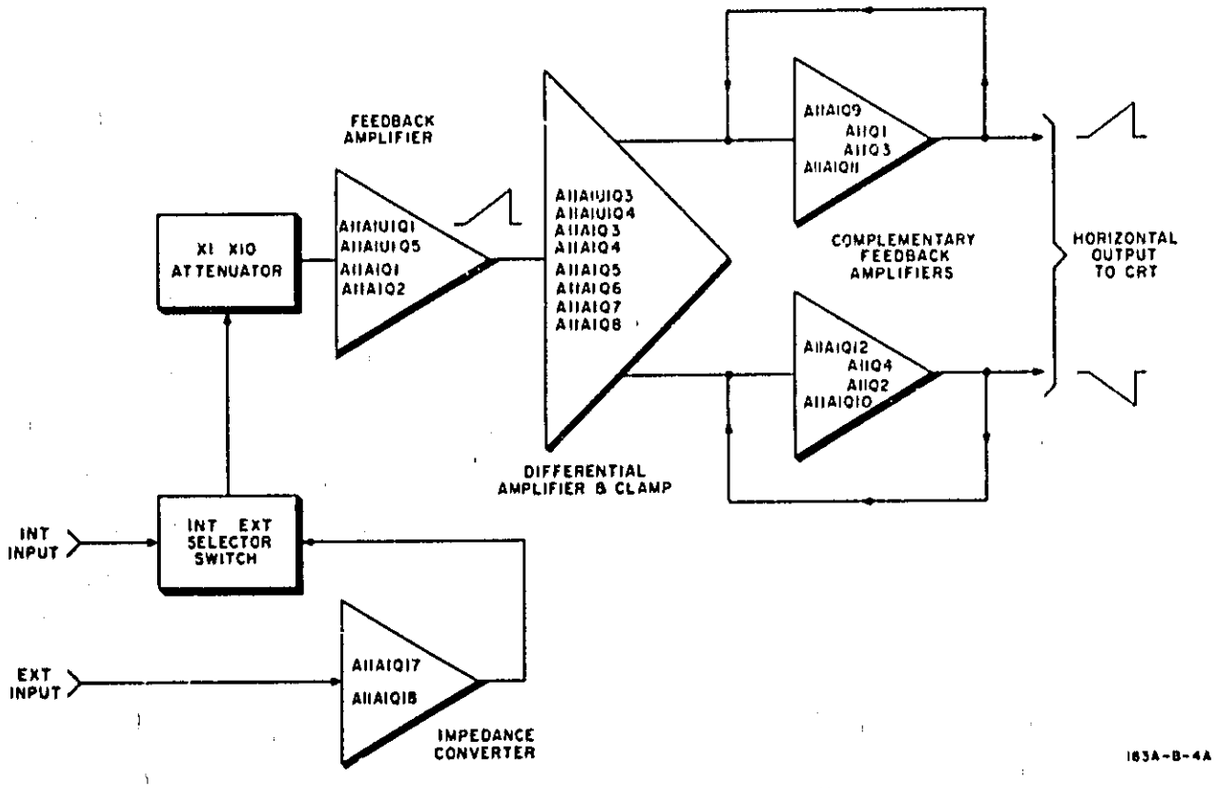


Figure 4-8. Block Diagram, Horizontal Amplifier

4-66. THEORY OF OPERATION, CRT TERMINATION CIRCUIT.

4-67. Figure 4-7 is a simplified schematic of the CRT termination circuit. Two modes of operation are shown in the figure: the 180-series mode (capacitive loading of vertical output), and the 183-series mode (transmission line termination). Refer to schematic 5. The following paragraphs describe the operation of each mode.

4-68. CRT TERMINATION - 180 MODE. As shown in the 180 mode of figure 4-7, 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 V1A1CR2 at one plate and V1A1CR3 and V1A1CR4 at the other. With the diodes forward biased, the deflection plates within the CRT are effectively shunted out and appear as a capacitive load to the vertical output amplifier. High impedance resistor V1A1R1 and V1A1R2 provide a dc current path for the diodes.

4-69. CRT TERMINATION - 183 MODE. When the termination circuit is operating in the 183 mode shown in figure 4-7, a current of approximately 100 mA is supplied from CRT bias-control transistor Q1. The current flows through resistors A9R1 and A10R1, diodes A9CR1 and A10CR1, and through each deflection plate to the output of the vertical amplifier. A9R1 and A10R1 form a balanced load that terminates the vertical amplifier into 330 ohms.

4-70. PATTERN/X ALIGN/Y ALIGN. Although the CRT is well shielded, stray electromagnetic or electrostatic fields may affect the spot shape and trace linearity. Slight differences in construction may also present variations in trace alignment. Two electromagnetic deflection coils are mounted around the neck of the CRT for trace alignment. A dc voltage applied to the coils corrects the alignment in the horizontal and vertical planes. Pattern shape and spot size are adjustable by control of the dc voltage applied to the horizontal plate shield of the CRT. Refer to Section V for adjustment procedures.

4-71. HORIZONTAL AMPLIFIER.

4-72. Figure 4-8 is a block diagram of the horizontal amplifier. The horizontal amplifier is used with an internal or external signal source. Internal signals are obtained from the time-base plug-in unit. External signals are applied to an impedance converter through a front-panel jack. External-signal input impedance is 1 megohm shunted by approximately 25 pF. The input to the impedance converter is a source-follower field-effect transistor. The FET provides a high input impedance to prevent signal loading.

4-73. HORIZONTAL X1 and X10 switches control a precision attenuator for both internal or external modes of operation. The switches select either X1 or X10 signal attenuation. The norm-cal switch and the bw-phase switch are mounted on the horizontal amplifier circuit board. When the norm-cal switch is in norm position, external signals are connected through the impedance converter to the horizontal amplifier. With the switch in cal position, external signals bypass the impedance converter and connect directly to the horizontal amplifier. The calibrator signal can be applied to HORIZONTAL EXT INPUT for calibrating the horizontal amplifier. The impedance of the external input to the horizontal amplifier is 50 ohms in the cal mode, providing the proper loading for the calibrator output. When in phase position, the bw-phase switch decreases the bandwidth of the impedance converter and reduces the phase shift between the X-and Y- amplifiers, allowing more accurate phase measurements.

4-74. THEORY OF OPERATION, HORIZONTAL AMPLIFIER. (See schematic 2).

4-75. External signals are applied to the high impedance input of FET A11A1Q17. The input coupling may be either ac (through capacitor A11A1C18) or direct for dc. The output of the FET is amplified by emitter-follower A11A1Q18. External-balance potentiometer A11A1R90 is adjusted for 0 volts 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 input signal provides horizontal positioning.

4-76. The attenuator output is coupled to the complementary-feedback amplifier composed of A11A1Q1, A11A1Q2, and two transistors of integrated circuit A11A1U1. The base bias on feedback amplifier A11A1U1Q5 is adjusted with dc-balance potentiometer A11A1R17 to avoid dc shift when the attenuator is switched. The output of the feedback amplifier drives differential amplifiers A11A1U1Q4 and A11A1U1Q3. The signal applied to A11A1U1Q3 is adjusted by A11A1R24 to control the gain of the differential pair for horizontal calibration.

4-77. The output of the differential amplifier is coupled through zener diodes A11A1VR1 and A11A1VR2 providing a dc-level shift. The output from differential amplifiers A11A1Q3 and A11A1Q4 is amplified by emitter-followers A11A1Q5 and A11A1Q6, providing a low impedance to drive the final differential current switch stages.

4-78. The output amplifiers are complementary-feedback amplifiers that convert the current signals to an amplified voltage output. The current-limiting action of differential pair A11A1Q7 and A11A1Q8 and resistors A11A1R46 and A11A1R47 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 A11A1Q7 and A11A1Q8 is reduced, limiting the output to between +10 and +40 volts. The reduced voltage prevents the trace from being driven off the CRT face.

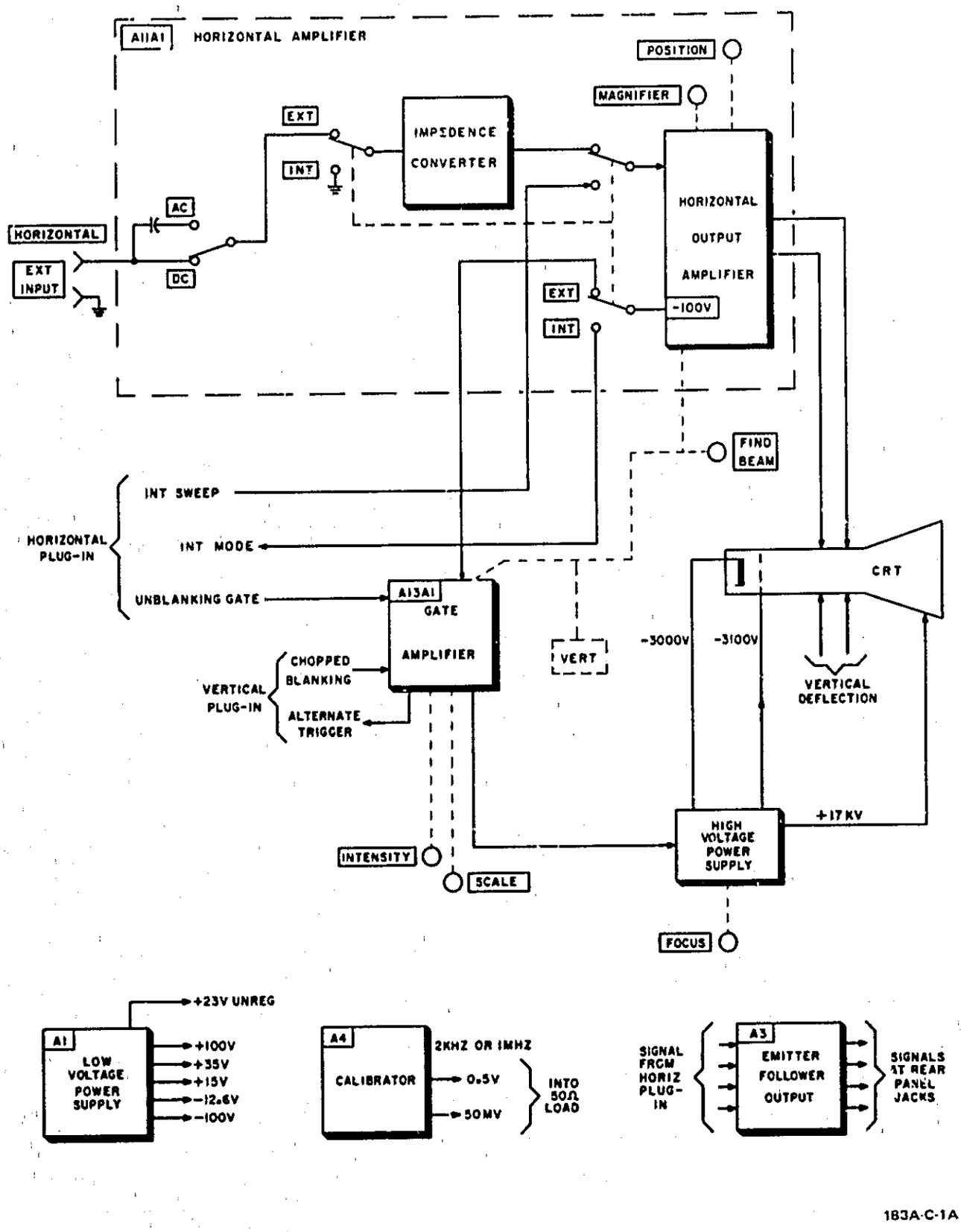


Figure 4-9. Overall Block Diagram

PERFORMANCE CHECK

SECTION V

PERFORMANCE CHECK AND ADJUSTMENTS

5-1. INTRODUCTION.

5-2. This section contains step-by-step procedures for checking instrument specifications as given in table 1-1. A table (performance check record) is provided at the end of the performance checks for recording measurements obtained when the instrument is initially checked. This original record can be used for comparison with measurements taken at a later date. The procedures for making all internal adjustments are covered in paragraphs 5-21 through 5-41. Photographs showing the locations of all internal adjustment controls are presented in figure 5-5.

5-3. TEST EQUIPMENT.

5-4. Test equipment required for procedures in this section is listed in table 5-1. Equivalent test equipment may be substituted provided it meets the required characteristics listed in the table. For best results, use recently calibrated test equipment.

5-5. PERFORMANCE CHECK.

5-6. The following subparagraphs describe procedures that determine whether the instrument is operating within specifications listed in table 1-1. This check can be used as part of an incoming inspection, a periodic operational test, or to check calibration after repairs or adjustments.

5-7. During the initial performance checks, enter results in the Performance Check Record provided. Remove the record from the manual and file for future reference. Be sure to include the instrument serial number in the record for identification.

5-8. Do each performance check in the sequence listed. Succeeding steps are dependent upon control settings and results of previous steps.

5-9. WARM-UP.

5-10. Set the VOLTS AC switch to the appropriate setting (115 or 230 Vac). Install Model 1830A and Model 1840A plug-ins. Turn power on and allow 15 minutes for instrument warm-up.

5-11. CALIBRATOR RESPONSE CHECK.

5-12. This check requires a pulse generator, sampling oscilloscope, and accessories. See figure 5-1 for interconnection of equipment.

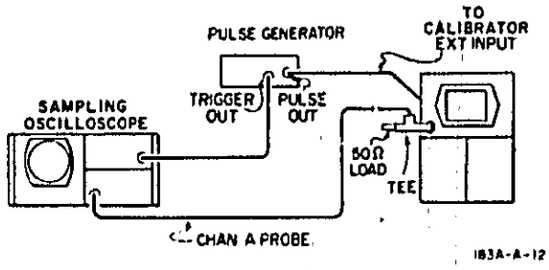


Figure 5-1. Calibrator Response Test Setup

a. Connect 50-ohm tee directly to CALIBRATOR OUT connector. Terminate tee with 50-ohm load. Connect sampling oscilloscope channel A probe to tee.

b. Connect sampling oscilloscope time base to pulse generator trigger output for external triggering.

c. Set pulse generator output for approximately 100 kHz and —1.0V amplitude.

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

e. Connect pulse generator output to CALIBRATOR EXT INPUT.

f. Set CALIBRATOR AMPL switch to 50 mV.

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

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

i. Measure rise time of pulse. Rise time between 10% and 90% amplitude of pulse should be less than 1 ns.

j. 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.

k. 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%.

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 square wave 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 Phase Adjust
Monitor Oscilloscope	HP 180A 1801A 1820B	20 MHz bandwidth, 50V pk capability	Intensity Adjust
50:1 Divider Probe	HP 10002C	Use with monitor oscilloscope	Performance Check and Adjustments
Time-mark Generator	HP 226A	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	K05-3440A	1000:1 divider probe Use with Digital Voltmeter	High Voltage Power Supply Adjust
Vertical Plug-in	HP 1830A	Display 500 MHz	Horizontal Linearity Adjust
Horizontal Plug-in	HP 1840A	10 ns sweep time	Horizontal Linearity Adjust

7000-A-19

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

m. Set CALIBRATOR AMPL switch to 0.5V.

n. Recheck rise times as in step i. Rise time should be less than 1 ns.

o. 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.

p. Disconnect equipment.

5-13. CALIBRATOR AMPLITUDE CHECK.

5-14. The amplitude check requires a digital voltmeter and a dc power supply.

a. Connect digital voltmeter to CALIBRATOR OUT connector.

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

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

d. Apply —1.0 Vdc to CALIBRATOR EXT INPUT on rear panel (—12.6V from mainframe can be used).

e. Set CALIBRATOR AMPL switch to 50 mV. Digital voltmeter should indicate from —0.0990V to —0.1010V. Calibrator output is effectively open circuited (high impedance of digital voltmeter) and output amplitude is twice panel markings.

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

5-15. CALIBRATOR DUTY CYCLE AND FREQUENCY CHECK.

5-16. The duty-cycle check requires a digital voltmeter. The frequency check requires an electronic counter.

a. Set CALIBRATOR MODE switch (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 connector. Output amplitude should be —0.0995V to —0.1005V.

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

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

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

h. Change CALIBRATOR FREQ switch to 1 MHz. Frequency should be between 995 kHz and 1005 kHz.

i. Disconnect test equipment.

5-17. HORIZONTAL AMPLIFIER BANDWIDTH CHECK.

5-18. The bandwidth check requires a constant amplitude signal generator.

a. On Model 183A/B, set HORIZONTAL INT/EXT switch to EXT.

b. Set EXT VERNIER to CAL detent.

c. Press HORIZONTAL X1 switch.

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 183A/B.

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.

5-19. HORIZONTAL MAGNIFIER CHECK.

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

b. Set Model 183A/B controls:

CALIBRATOR AMPL	50 mV
CALIBRATOR FREQ	2 kHz
HORIZONTAL INT/EXT	EXT
HORIZONTAL X1	press
HORIZONTAL EXT VERNIER	CAL (detent)
normal-cal	cal (figure 5-5)

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

d. Press HORIZONTAL X10 pushbutton.

e. Readjust HORIZONTAL POS to observe two bright dots. 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.

5-20. This completes the performance checks of the Model 183A/B Oscilloscope. Record the information obtained from the preceding steps on the Performance Check Record included in this section. Retain the record for future reference.

5-21. ADJUSTMENT PROCEDURE.

5-22. Procedures for adjusting the Model 183A/B Oscilloscope are given in the following subparagraphs. Perform the adjustments in the sequence presented. Succeeding steps may be dependent on settings and adjustments of previous steps.

WARNING

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

5-23. Remove the covers on the Model 183A/B by removing the attaching screws and lifting the covers free. Install plug-in units into the mainframe. Turn power on and allow 15 minutes for instrument warm-up.

5-24. LOW VOLTAGE POWER SUPPLY ADJUSTMENT.

5-25. Connect the digital voltmeter to each test point listed in table 5-2 and make the adjustments indicated. The +100V must be adjusted first. See figure 5-5 at the end of this section for potentiometer location.

Table 5-2. Low Voltage Power Supply Adjustments

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

5-26. HIGH VOLTAGE POWER SUPPLY ADJUSTMENT.

WARNING

Due to the presence of very high voltage, use an insulated adjustment tool when making the following adjustment.

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

b. Remove heat sink on rear of display portion of instrument by removing four screws. Set heat sink on top of Model 183A. Let heat sink hang down on Model 183B.

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

d. Adjust A7R10 for —3000 ±3V.

5-27. 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 5-5) using 50:1 divider probe.

d. Adjust A13A1R21 zero adj. 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 A13A1R9 intensity level adj. for gate-pulse amplitude of 0.5V.

h. Set HORIZONTAL INT/EXT switch to EXT.

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

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

k. Set HORIZONTAL INT/EXT switch to INT.

l. Set time base plug-in horizontal TIME/DIV switch for 0.05 usec/div.

m. Adjust display INT control for a 40V gate pulse.

n. Adjust A13A1C7 LF adj. and A13A1C8 HF adj. for minimum overshoot and undershoot.

PERFORMANCE CHECK RECORD
Model 183A/B

Instrument Serial Number _____ Date _____

Check			Specification	Measured
CALIBRATOR	RESPONSE	50 mV: rise time flat top (after 5 ns) overshoot	 <1 ns 0.5% <3%	
CALIBRATOR	RESPONSE	0.5V: rise time flat top (after 5 ns) overshoot	 <1 ns 0.5% <3%	
CALIBRATOR	AMPLITUDE 50 mV		±1%	
CALIBRATOR	AMPLITUDE 0.5V		±1%	
CALIBRATOR	DUTY CYCLE	(2 kHz) (1 MHz)	−0.0995V to −0.1005V −0.0995V to −0.1005V	
CALIBRATOR	FREQUENCY	2 kHz	1990 Hz to 2010 Hz	
CALIBRATOR	FREQUENCY	1 MHz	995 kHz to 1005 kHz	
HORIZONTAL	BANDWIDTH		≥7.1 div	
HORIZONTAL	MAGNIFIER		10 ±0.5 div	

o. Remove power from instrument.

p. Reinstall heat sink.

5-28. 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.

5-29. 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 R61 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.

5-30. FLOODGUN ADJUSTMENT.

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

b. Connect monitor oscilloscope to TP2 on circuit board assembly A13A1.

c. Set monitor oscilloecope for 5 V/div vertical sensitivity and 50 usec/div horizontal sensitivity.

d. Set Model 183A/B time base for 0.1 usec/div horizontal sensitivity.

e. Adjust Model 183A/B SCALE control to observe waveform on monitor oscilloscope similar to that in figure 5-2.

f. Adjust A13A1R55 in lower, right-hand corner of A13A1 for 10V pulse (2-division display) as shown in figure 5-2.

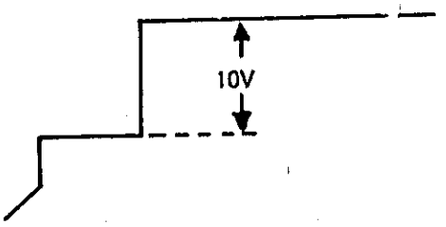


Figure 5-2. Floodgun Adjustment Waveform

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

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

b. On Model 183A/B, set HORIZONTAL INT/EXT switch to INT.

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

d. Adjust A4R49 X-align, so horizontal trace is parallel with middle horizontal graticule line on CRT.

5-32. 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. Set signal generator for approximately 50 MHz and exactly 6 divisions of amplitude on Model 183A/B CRT.

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

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

5-33. 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. Set signal generator for approximately 50 MHz and exactly 6 divisions of amplitude on Model 183A/B CRT.

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

e. Disconnect signal generator.

5-34. CALIBRATOR RESPONSE ADJUSTMENT.

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

b. Terminate tee with 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 rise time of pulse. Rise time 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 response for optimum rise time 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 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 —0.990V to —1.010V. If voltage measured is not as specified, readjust A4R34 according to step f.

h. Disconnect digital voltmeter.

5-36. CALIBRATOR DUTY CYCLE AND FREQUENCY ADJUSTMENT.

a. Verify calibrator amplitude is correct.

b. Connect digital voltmeter to CALIBRATOR OUT with tee connector.

c. Connect electronic counter to CALIBRATOR OUT.

d. Set CALIBRATOR MODE switch to INT.

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

f. Set CALIBRATOR AMPL switch to 0.5V.

g. Adjust A4R20 2 kHz duty cycle for digital voltmeter indication of —99.5 mV to —100.5 mV.

h. Adjust A4R21 2 kHz freq. until frequency is between 1990 Hz and 2010 Hz.

i. Repeat steps g and h for optimum results.

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

k. Adjust A4R14 1 MHz duty cycle for digital voltmeter indication of —99.5 mV to —100.5 mV.

l. Adjust A4R16 1 MHz freq. until frequency is between 995 kHz and 1005 kHz.

m. Repeat steps k and l for optimum results.

n. Disconnect electronic counter and digital voltmeter.

5-37. HORIZONTAL AMPLIFIER BALANCE ADJUSTMENT.

a. Set Model 183A/B controls:

HORIZONTAL INT/EXT ..... EXT
norm-cal ..... norm (figure 5-5)

b. Disconnect vernier coaxial cable (figure 5-5) 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 A11A1R17 dc bal to position spot at center of CRT.

e. Reconnect vernier coaxial cable.

f. Press HORIZONTAL X1 switch.

g. Adjust A11A1R90 ext dc bal to position spot to center of CRT.

5-38. HORIZONTAL AMPLIFIER GAIN ADJUSTMENT.

a. Set Model 183A/B controls:

HORIZONTAL EXT
VERNIER ..... CAL (detent)
HORIZONTAL INT/EXT ..... EXT
HORIZONTAL X1 ..... press
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.

5-39. HORIZONTAL AMPLIFIER FREQUENCY RESPONSE ADJUSTMENT.

a. Leave equipment connected as in paragraph 5-38.

b. Set Model 183A/B controls:

norm-cal switch ..... norm
HORIZONTAL X10 ..... press

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

d. Adjust A11A1C21 ext comp for best dot shape (no tails).

5-40. HORIZONTAL AMPLIFIER LINEARITY ADJUSTMENT.

a. Set Model 183A/B controls:

HORIZONTAL INT/EXT ..... INT
HORIZONTAL X1 ..... press

b. Set plug-in time base controls for external ac triggering and 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 to 100 MHz (10 ns).

d. Adjust time base TRIGGER LEVEL for stable presentation.

e. Adjust Model 183A/B HORIZONTAL POS control 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.

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 10 ns/div sweep range.

h. Press HORIZONTAL X10 switch.

i. Set time-mark generator to 500 MHz (2 ns).

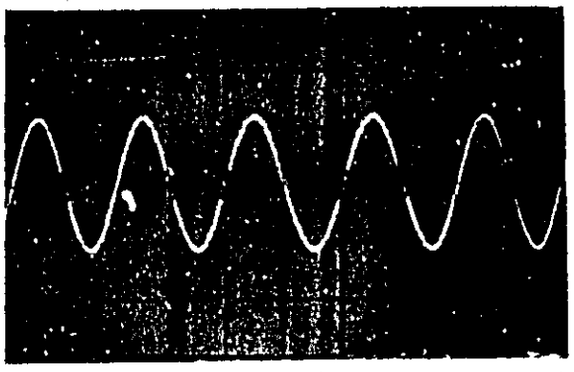
j. Adjust trigger level on time base for stable presentation.

k. Adjust HORIZONTAL POS control on Model 183A/B 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 5-3.

n. position next negative slope to intersect second graticule line at center horizontal line. The fifth negative slope of the display should intersect the tenth graticule line ±5% (±2 minor divisions).



183-A-15A

Figure 5-3. Horizontal Linearity Waveform

NOTE

Use the middle 8 horizontal divisions when checking or adjusting timing on fastest two sweep speeds magnified.

o. Make horizontal measurements of waveform over any 2-division interval within center 8 divisions. Two adjacent positive or two adjacent negative slopes of display should be 2 cm apart, ±5% of

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

Figure 5-4. Horizontal Phase Adjustment Setup

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

1. Pre s 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 poin' selected will remain at center screen.

q. If measurements indicate that sweep is not within tolerance in steps n, o, and p, adjust A11A1C1, A11A1C14, and A11A1C15 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 A11A1C1, A11A1C14, and A11A1C15 is necessary for either sweep speed, recheck both speeds. It may be necessary to compromise setting of A11A1C14 and A11A1C15 at 1 ns/div and 2 ns/div.

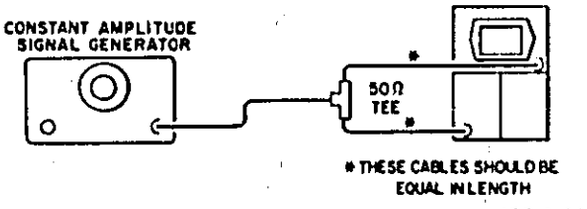
5-41. HORIZONTAL AMPLIFIER PHASE ADJUSTMENT.

a. Set Model 183A/B controls:

HORIZONTAL X1	press
bw-phase switch	phase
norm-cal 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 5-4.



183 A-11

Figure 5-4. Horizontal Phase Adjustment Set-up

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

e. Set HORIZONTAL INT/EXT switch to INT.

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

g. Set HORIZONTAL INT/EXT switch to EXT.

h. Observe display and adjust A11A1C25 phase adj. for best diagonal line with no elliptical pattern.

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

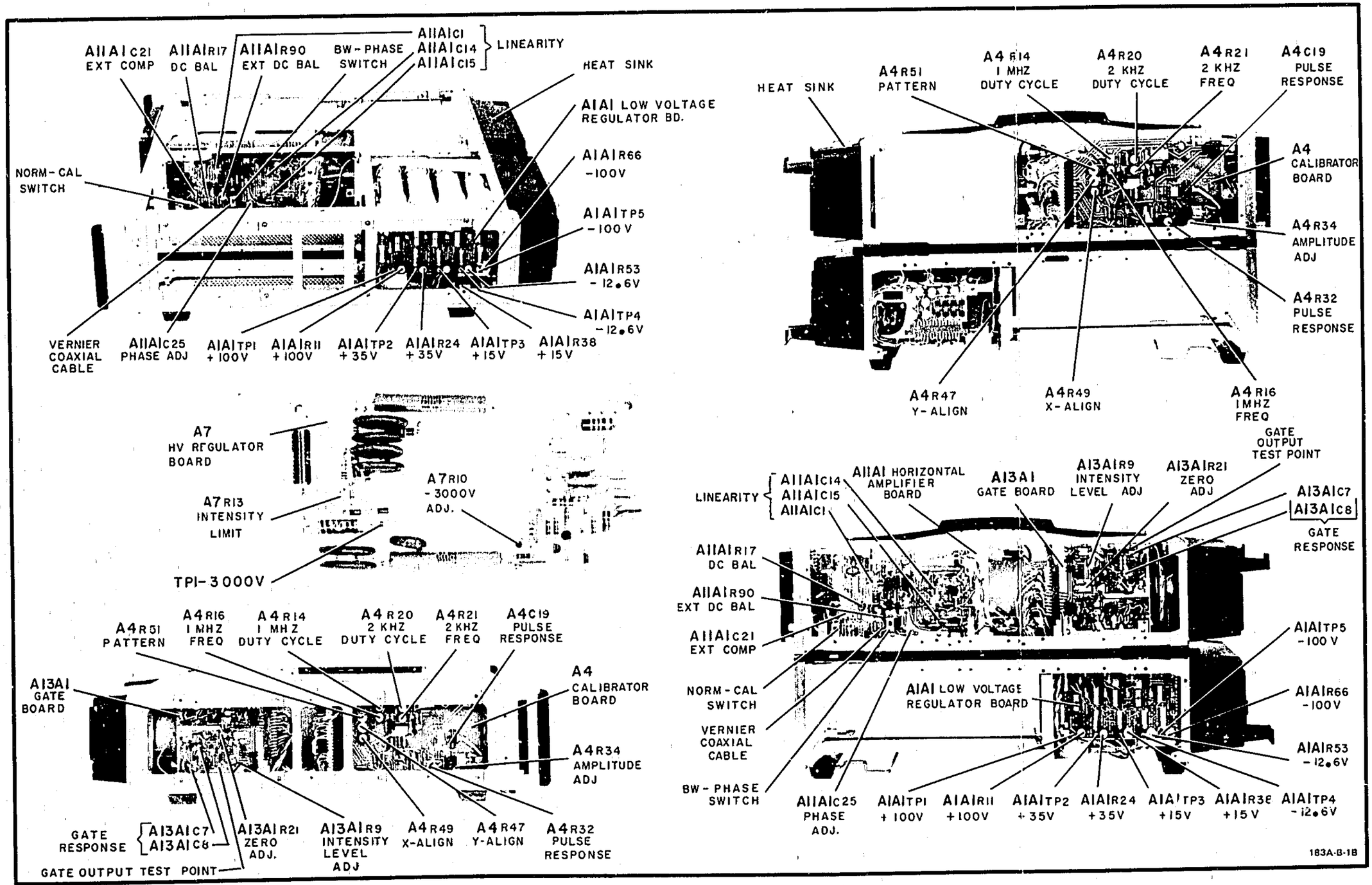


Figure 5-5.
Adjustment Locations
5-9/(5-10 blank)

PARTS LIST

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 designation and includes the manufacturer and manufacturer's part number. Table 6-3 contains the list of manufacturers' codes. Figures 6-1 and 6-2 identify components located on the chassis.

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)	H	HENRY(IES)	NPN	NEGATIVE-POSITIVE-NEGATIVE	RWV	REVERSE WORKING VOLTAGE
ASSY	ASSEMBLY	HG	MERCURY				
		HP	HEWLETT-PACKARD	NSR	NOT SEPARATELY REPLACEABLE	S-B	SLOW-BLOW
BD	BOARD(S)	HZ	HERTZ			SCR	SILICON CONTROLLED RECTIFIER
BH	BINDER HEAD						
BP	BANDPASS	IF	INTERMEDIATE FREQ.			SE	SELENIUM
		IMPG	IMPREGNATED	OBD	ORDER BY DESCRIPTION	SEC	SECOND(S)
C	CENTI (10^{-2})	INCD	INCANDESCENT			SECT	SECTION(S)
CAR	CARBON	INCL	INCLUDE(S)	OH	OVAL HEAD	SI	SILICON
CCW	COUNTERCLOCKWISE	INS	INSULATION(ED)	OX	OXIDE	SIL	SILVER
CER	CERAMIC	INT	INTERNAL			SL	SLIDE
CMO	CABINET MOUNT ONLY			P	PEAK	SP	SINGLE POLE
COAX	COAXIAL	K	KILO (10^{3})	PC	PRINTED (ETCHED) CIRCUIT(S)	SPL	SPECIAL
COEF	COEFFICIENT	KG	KILOGRAM			ST	SINGLE THROW
COMP	COMPOSITION			PF	PICOFARADS	STD	STANDARD
CONN	CONNECTOR(S)	LB	POUND(S)	PHL	PHILLIPS		
CRT	CATHODE-RAY TUBE	LH	LEFT HAND	PIV	PEAK INVERSE VOLTAGE(S)	TA	TANTALUM
CW	CLOCKWISE	LIN	LINEAR TAPER			TD	TIME DELAY
		LOG	LOGARITHMIC TAPER	PNP	POSITIVE-NEGATIVE-POSITIVE	TFL	TEFLON
D	DECI (10^{-1})	LPF	LOW-PASS FILTER(S)			TGL	TOGGLE
DEPC	DEPOSITED CARBON	LVR	LEVER	P/O	PART OF	THYR	THYRISTOR
DP	DOUBLE POLE			PORC	PORCELAIN	TI	TITANIUM
DT	DOUBLE THROW	M	MILLI (10^{-3})	POS	POSITION(S)	TNLDIO	TUNNEL DIODE(S)
		MEG	MEGA (10^{6})	POT	POTENTIOMETER(S)	TOL	TOLERANCE
ELECT	ELECTROLYTIC	MET FILM	METAL FILM	P-P	PEAK-TO-PEAK	TRIM	TRIMMER
ENCAP	ENCAPSULATED	MET OX	METAL OXIDE	PRGM	PROGRAM		
EXT	EXTERNAL	MFR	MANUFACTURER	PS	POLYSTYRENE		
		MINAT	MINIATURE	PWV	PEAK WORKING VOLTAGE	U	MICRO (10^{-6})
F	FARAD(S)	MOM	MOMENTARY				
FET	FIELD-EFFECT TRANSISTOR(S)	MTG	MOUNTING			V	VOLTS
		MY	MYLAR	RECT	RECTIFIER(S)	VAR	VARIABLE
FH	FLAT HEAD			RF	RADIO FREQUENCY	VDCW	DC WORKING VOLT(S)
FIL H	FILLISTER HEAD	N	NANO (10^{-9})	RFI	RADIO FREQUENCY INTERFERENCE		
FXD	FIXED	N/C	NORMALLY CLOSED			W	WATT(S)
		NE	NEON	RH	ROUND HEAD OR RIGHT HAND	W/	WITH
G	GIGA (10^{9})	N/O	NORMALLY OPEN			WIV	WORKING INVERSE VOLTAGE
GE	GERMANIUM	NOP	NEGATIVE POSITIVE ZERO (ZERO TEMPERATURE COEFFICIENT)	RMO	RACK MOUNT ONLY	W/O	WITHOUT
GL	GLASS			RMS	ROOT MEAN SQUARE	WW	WIREWOUND
GRD	GROUNDED						

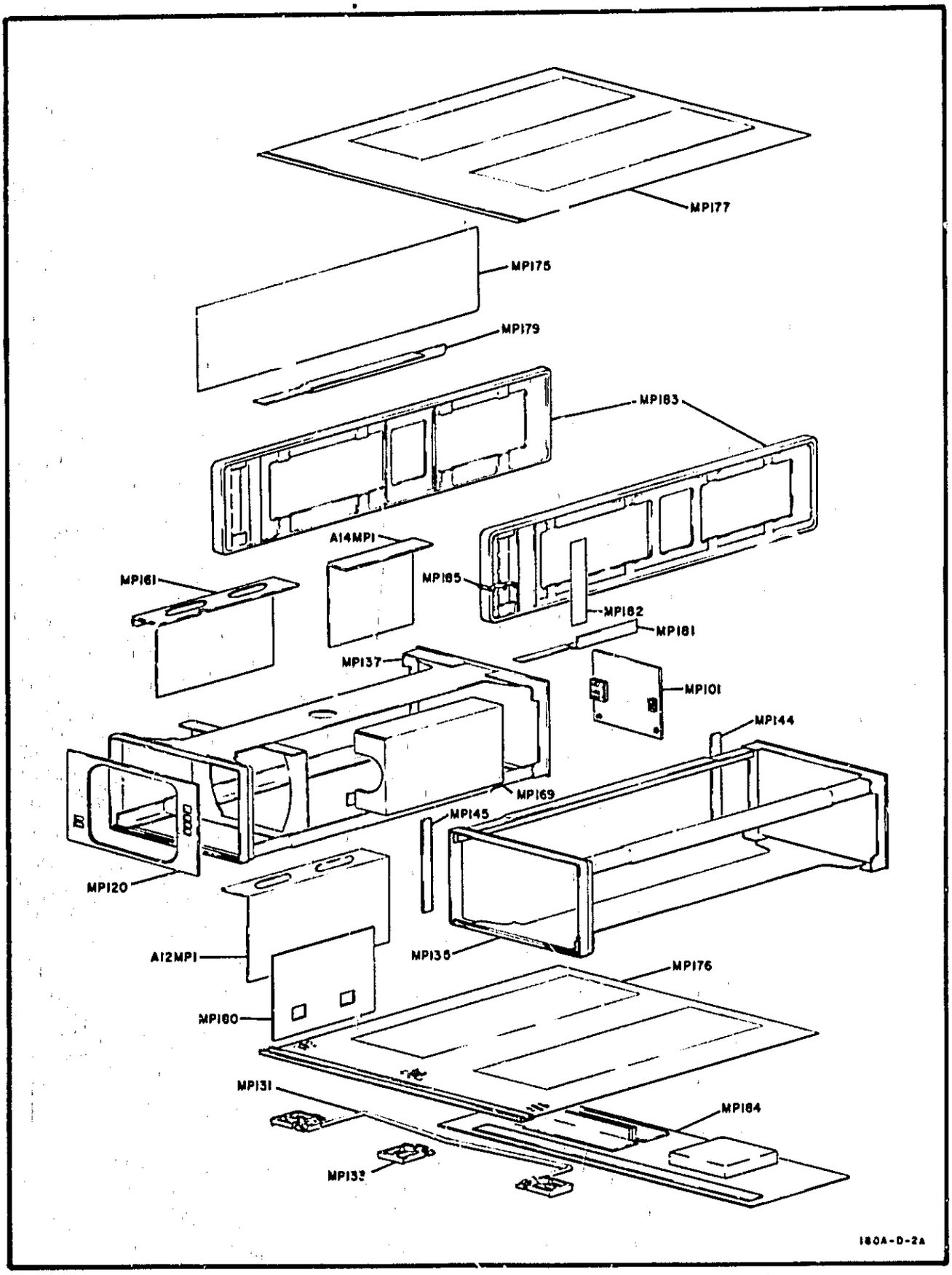


Figure 6-1. Model 183A/B Illustrated Parts Breakdown (Sheet 1 of 3)

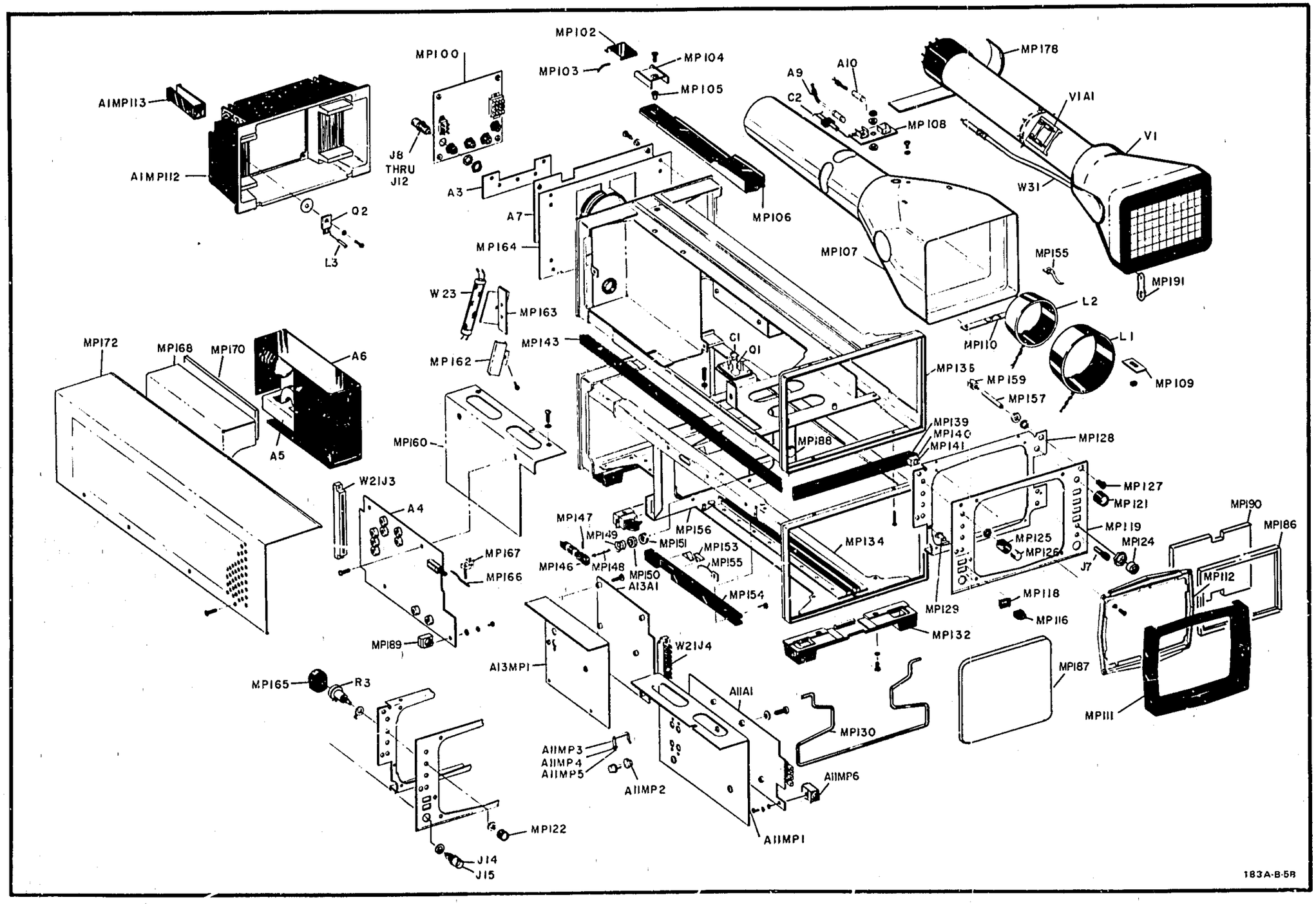


Figure 6-1.
Model 183A/B Illustrated Parts Breakdown (Sheet 2 of 3)

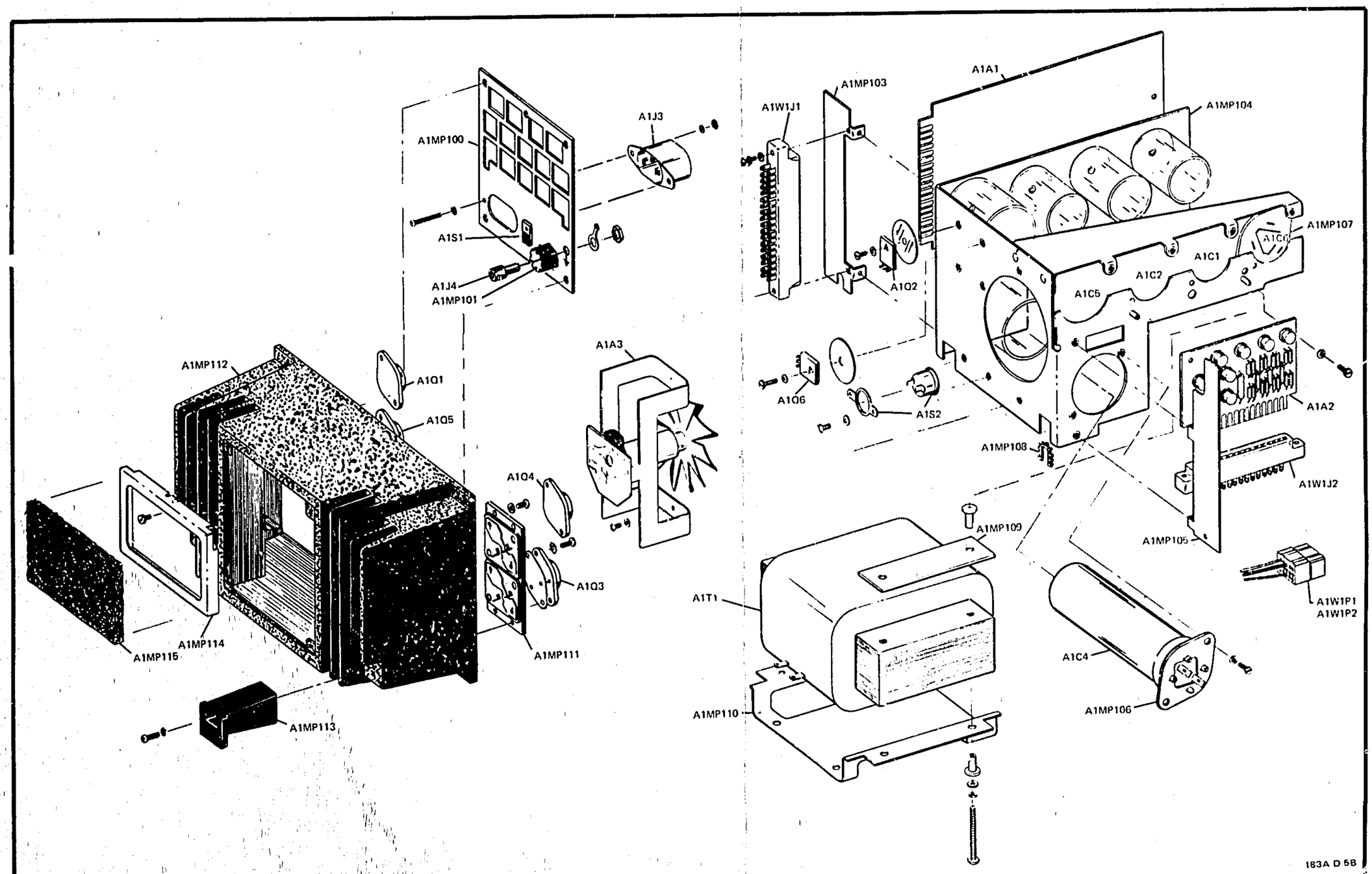


Figure 6-1. Model 183A/B Illustrated Parts Breakdown (Sheet 3 of 3)

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	(NOT AVAILABLE AS ASSEMBLY)		ASSY: LOW VOLTAGE PWR SUPPLY MODULE		
A2			NOT ASSIGNED		
A3	00183-66502		BOARD ASSY:EMITTER FOLLOWER	28480	00183-66502
A4	00183-66527		BOARD ASSY, CALIBRATOR (LESS A4U1)	28480	00183-66527
A5	00183-61102		HIGH VOLTAGE RECTIFIER	28480	00183-61102
A6	00183-61101		QUADRUPLER ASSY:HIGH VOLTAGE	28480	00183-61101
A7	00183-66525		BOARD ASSY,HIGH VOLTAGE REGULATOR	28480	00183-66525
A8			NOT ASSIGNED		
A9	00183-61501		RESISTOR ASSY:CRT TERMINATION (CONSISTS OF NSR PARTS A9CR1EA9AR1).	28480	00183-61501
A10	00183-61501		RESISTOR ASSY:CRT TERMINATION (CONSISTS OF NSR PARTS A10CR1EA10AR1)	28480	00183-61501
A11	00183-66523		HORIZONTAL AMPLIFIER MODULE (183A ONLY)	28480	00183-66523
A12	00183-66522		HORIZONTAL AMPLIFIER MODULE (183B ONLY)	28480	00183-66522
A13	00183-66528		GATE BOARD MODULE (183A ONLY)	28480	00183-66528
A14	00183-66521		GATE BOARD MODULE (183B ONLY)	28480	00183-66521
C1	0160-2146	1	CAPACITOR-FXD .020F+80-20% 150WVDC	28480	0160-2146
C2	0180-0265	1	CAPACITOR-FXD 10UF+75-10% 150VDC AL	56289	300105G150AA2
C3			NOT ASSIGNED		
CR1	1901-0040		DIODE: SWITCHING, 30V MAX VRM 50MA	28480	1901-0040
DS1	2140-0016	2	LAMP, INCAND, BULB T-1, 5V	71744	683
DS2	2140-0016		LAMP, INCAND, BULB T-1, 5V	71744	683
F1	5080-9671	1	FUSE PULSOR, 230V	28480	5080-9671
J1			THRU		
J6			NOT ASSIGNED		
J7	1510-0038	5	BINDING-POST: SINGLE 1/4-32	28480	1510-0038
J8	1250-0083		CONNECTOR-COAXE BNC: 50 OHM FEMALE	24931	28JR-130-1
J9	1250-0083		CONNECTOR-COAXE BNC: 50 OHM FEMALE	24931	28JR-130-1
J10	1250-0083		CONNECTOR-COAXE BNC: 50 OHM FEMALE	24931	28JR-130-1
J11	1250-0083		CONNECTOR-COAXE BNC: 50 OHM FEMALE	24931	28JR-130-1
J12	1250-0083		CONNECTOR-COAXE BNC: 50 OHM FEMALE	24931	28JR-130-1
J13			NOT ASSIGNED		
J14	1250-0818	2	CONNECTOR-COAXE BNC: 50 OHM FEMALE	80545	31-2221-1022
J15	1250-0818		CONNECTOR-COAXE BNC: 50 OHM FEMALE	80545	31-2221-1022
L1	5000-0435	1	COIL:ALIGNMENT Z AXIS	28480	5060-0435
L2	00191-66004	1	COIL:ALIGNMENT, Y AXIS	28480	00191-66004
L3	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
MP1			THRU		
MP55			NOT ASSIGNED		
MP100	00183-00207	1	PANEL ASSY:REAR DISPLAY (183A ONLY)INCLUDES 52 AND 53.	28480	00183-00207
MP101	00183-00206	1	PANEL ASSY:REAR DISPLAY (183B ONLY)INCLUDES 52 AND 53.	28480	00183-00206
MP102	0180-0721	2	INSERT:KLEPER (183A ONLY)	28480	0180-0721
MP103	00183-00103	2	SPRING:INSERT (183A ONLY)	28480	00183-00103
MP104	00180-2231	2	KEEPER:HANDLE (183A ONLY)	28480	00180-2231
MP105	0180-2471	1	SPACER:HANDLE (183A ONLY)	28480	0180-2471
MP106	5040-0459	1	HANDLE (183A ONLY)	28480	5040-0459
MP107	00183-00603	1	SHIELD:CRT	28480	00183-00603
MP108	00183-61201	1	BRACKET ASSY:RESISTOR	28480	00183-61201
MP109	00180-01218	2	BRACKET:ALIGNMENT COIL	28480	00180-01218
MP110	00180-09105	2	CLIP:CACUNE	28480	00180-09105
MP111	5040-0444	1	SHIELD:LIGHT,BLACK NYLON	28480	5040-0444
MP112	5020-0476	1	BEZEL:CRT	28480	5020-0476
MP113	00183-67402	1	BUTTON: COVER X1	28480	00183-67402
MP114	00183-67403	1	BUTTON: COVER X10	28480	00183-67403
MP115	00183-67404	1	BUTTON: COVER FREQ.	28480	00183-67404
MP116	00183-67405	1	BUTTON: COVER AMPL.	28480	00183-67405
MP117	00183-67406	2	BUTTON: COVER BLANK	28480	00183-67406
MP118	0370-0451	6	BEZEL:PUSHBUTTON KNOB BLK NYLON	28480	0370-0451
MP119	00183-00208	1	PANEL:FRONT (183A ONLY)	28480	00183-00208
MP120	00183-00209	1	PANEL:FRONT (183B ONLY)	28480	00183-00209
MP121	00180-67402	1	KNOB ASSY, POSITION	28480	00183-67402
MP122	00183-67407	2	KNOB ASSY:FOCUS/SCALE)	28480	00183-67407
MP123			NOT ASSIGNED		
MP124	01803-67407	1	KNOB ASSY,HORIZ. EXT. /VERNIER	28480	01803-67407

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
MP125	0370-0346	1	KNOB:RANGE/PER 0.540" DIA	28480	0370-0346
MP126	00180-67405	1	KNOB:FINE PER (FINE BEAM)	28480	00180-67405
MP127	1490-0968	2	BUSHING, PANEL, 1/4-32 THD STAINLESS (CAL)	28480	1490-0968
MP128	00183-00203	1	PANEL:SUB	28480	00183-00203
MP129	1450-0404	2	LENS: CLEAR (FOR DS-1 & DS-2)	28480	1450-0404
MP130	1490-0710	1	WIREFORM (183A ONLY)	28480	1490-0710
MP131	1490-0030	1	WIREFORM (183B ONLY)	28480	1490-0030
MP132	5040-0445	2	FOOT:RUBBER (183A ONLY)	28480	5040-0445
MP133	5060-0767	5	FOOT ASSY:FM (183B ONLY)	28480	5060-0767
MP134	00183-60106	1	CHASSIS ASSY:POWER (183A ONLY)	28480	00183-60106
MP135	00183-60102	1	CHASSIS ASSY:POWER (183B ONLY)	28480	00183-60102
MP136	00183-60107	1	CHASSIS ASSY, DISPLAY (183A ONLY)	28480	00183-60107
MP137	00183-60108	1	CHASSIS ASSY, DISPLAY (183B ONLY)	28480	00183-60108
MP138	5020-0553	1	SPACER:REAR (183A ONLY)	28480	5020-0553
MP139	5020-0551	1	SPACER:FRONT (183A ONLY)	28480	5020-0551
MP140	00180-44701	1	SPACER:TRADEMARK (183A ONLY)	28480	00180-44701
MP141	7120-1254	1	PLATE, INFO, HP LOGO: ABS BASE (183A ONLY)	28480	7120-1254
MP142	5020-0552	1	SPACER:SIDE (RIGHT) (183A ONLY)	28480	5020-0552
MP143	00183-04703	1	SPACER:SIDE, LEFT (183A ONLY)	28480	00183-04703
MP144	5000-0469	1	SPACER:REAR (183B ONLY)	28480	5000-0469
MP145	00183-04702	1	SPACER:FRONT FRAME (183B ONLY)	28480	00183-04702
MP146	5040-0463	2	HANGER:PROBE (183A ONLY)	28480	5040-0463
MP147	0380#	2	PIN:SPRING 0.094" DIA (183A ONLY)	00287	0380#
MP148	5020-0499	2	HINGE:PROBE HANGER (183A ONLY)	28480	5020-0499
MP149	1460-0706	2	SPRING: COMPRESSION: CYLINDER (183A ONLY)	28480	1460-0706
MP150	3050-0441	2	WASHER: DOME PL PRPHY: DOME PL PRPHY: 4 (183A ONLY)	28480	3050-0441
MP151	1000-X9-ST-CD	2	RETAINER, RING, .094 DIA, CAD PLT STL (183A ONLY)	97464	1000-X9-ST-CD
MP152	0403-0129	1	GUIDE: PC BOARD, PLUG IN (RIGHT) (DOES NOT INCL. VERT. CONTS. OR SPRING)	28480	0403-0129
MP153	0363-0006	2	CONTACT, ELEC, PER HP DWG C-0363-0006-1 (REQUIRED FOR LEFT GUIDE ONLY)	28480	0363-0006
MP154	0403-0128	1	GUIDE: PC BOARD, PLUG IN (LEFT) (DOES NOT INCLUDE SPRING)	28480	0403-0128
MP155	00180-09140	3	CLIP:CHEUNG (ONE REQUIRED FOR EACH GUIDE)	28480	00180-09140
MP156	00183-01208	1	BRACKET:CONNECTOR	28480	00183-01208
MP157	00183-23703	2	SHAFT:HORIZONTAL CAL	28480	00183-23703
MP158	00183-23703		SHAFT: ASTIGMATISM	28480	00183-23703
MP159	1490-0841	2	DRIVE, SFT CPLR .127 ID .281 OD .375 L	28480	1490-0841
MP160	00183-01236	1	BRACKET, CALIBRATOR (183A AND 183B)	28480	00183-01236
MP161			NOT ASSIGNED		
MP162	00183-01234	1	BRACKET:CLAMP	28480	00183-01234
MP163	00183-01211	1	BRACKET: VERTICAL CABLE (183B ONLY)	28480	00183-01211
MP163	00183-01237	1	BRACKET: VERTICAL CABLE (183A ONLY)	28480	00183-01237
MP164	00183-60205	1	PANEL ASSY:REAR CRT	28480	00183-60205
MP165	5040-0453	1	COVER:POTENTIOMETER:FOCUS)	28480	5040-0453
MP166	00183-23704	1	SHAFT:BEAMFIND	28480	00183-23704
MP167	00183-23201	1	COUPLER:BEAMFIND	28480	00183-23201
MP168	00183-04103	1	COVER:HIGH VOLTAGE (183A ONLY)	28480	00183-04103
MP169	00183-04104	1	COVER:HIGH VOLTAGE (183B ONLY)	28480	00183-04104

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
MP170	00183-05401	1	INSULATOR:HIGH VOLTAGE	28480	00183-05401
MP171	00180-04134	1	COVER: TOP RIGHT, OLIVE GRAY (183A ONLY)	28480	00180-04134
MP172	00180-04136	1	COVER: TOP LEFT, OLIVE GRAY (183A ONLY)	28480	00180-04136
MP173	00183-04112	1	COVER, BOTTOM, RIGHT, OLIVE GRAY (183A ONLY)	28480	00183-04112
MP174	00183-04113	1	COVER, BOTTOM, LEFT, OLIVE GRAY (183A ONLY)	28480	00183-04113
MP175	00180-04137	2	COVER: SIDE (RACK), OLIVE GRAY (183B ONLY)	28480	00180-04137
MP176	00180-04110	1	COVER ASSY: BOTTOM, OLIVE GRAY (183E ONLY)	28480	00180-04110
MP177	00180-04138	1	COVER: TOP (RACK), OLIVE GRAY (183B ONLY)	28480	00180-04138
MP178	4342-0046	1	FELT STRIP:BLK 0.047" THICK	85471	3455
MP179	00180-01217	2	BRACKET:COVER (283B ONLY)	28480	00180-01217
MP180	00183-01217	1	BRACKET:SHIELD (183B ONLY)	28480	00183-01217
MP181	00183-01222	1	BRACKET:COVER (183B ONLY)	28480	00183-01222
MP182	5000-0051	2	TRIM STRIP (183B ONLY)	28480	5000-0051
MP183	5060-0431	2	FRAME ASSY:SIDE (183B ONLY)	28480	5060-0431
MP184	5060-8743	1	KIT:RACK MOUNT, SHEMINT GRAY (183B ONLY)	28480	5060-8743
MP185	00180-88702	1	KIT, PHONE HANGER (183B ONLY)	28480	00180-88702
MP186	0905-0331	1	GASKET, NEOPRENE, CRT	28480	0905-0331
MP187	5060-8548	1	KIT:CONTRAST FILTER	28480	5060-8548
MP188	0360-0070	1	PLUG, HOLE PLASTIC FOR 0.625" DIA		207-400301-00
MP189	00183-24701		SUPPORT:BNC	28480	00183-24701
MP190	5020-8728	1	SHIELD, CRT SAFETY	28480	5020-8728
MP191	00183-01230	1	GROUND:CRT MASK	28480	00183-01230
Q1	1854-0417		TRANSISTOR NPN SI PD=60W	28480	1854-0417
Q2	1854-0320		TRANSISTOR NPN SI PD=83.5W FT=4MHZ	28480	1854-0320
R1	2100-1904	1	RESISTOR: VAR; CONT; 10K 20% CC (INTENSITY)	28480	2100-1904
R2	2100-3233	1	RESISTOR, VAR, 50K 20% SPST SW 50K OHM (SCALE)	28480	2100-3233
R3	2100-2921	1	RESISTOR: VAR; CONT; 5M 20% CC (FOCUS)	28480	2100-2921
R4	2100-2922	1	RESISTOR, VAR, 15K 20% PC SPST SW (EXT VERNIER-HORIZONTAL)	28480	2100-2922
R4S1			NSR PART OF R4, (POWER)		
R5	2100-2927	1	RSVAR COMP 2 X 100K OHM 2% LIN (HORIZONTAL POSITION)	28480	2100-2927
R6			NOT ASSIGNED		
R7			NOT ASSIGNED		
R8	0698-0085	1	RESISTOR-FXD 2.61K 1% .125W F TUBULAR	16299	C4-1/8-TO-2611-F
S1	3101-1258	1	SWITCH: TGL; SPDT 2A/250VAC ON-NONE-ON	09353	7101-1
S2	3101-0070	1	SWITCH: SLD LPDT NS; .5A 125VAC/DC	79727	GF-126-0000
S3	3101-0936	1	SWITCH: SLD 4PDT NS; .5A 125VAC/DC	82389	50212L
V1	5083-2073	1	CATHODE RAY TUBE STD.(P31 PHOSPHOR)SEE SECT VII FOR SPECIAL PHOSPHOR.	28480	5083-2073
V1A1	00183-69519	1	CRT TERMINATION(SUPPLIED ON ALL CRTS)	28480	00183-69519
V1A1CR1			N.S.P.		
V1A1CR2			N.S.P.		
V1A1CR3			N.S.P.		
V1A1CR4			N.S.P.		
V1A1R1	C757-0442	2	RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-TO-1002-F
V1A1R2	0757-0442		RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-TO-1002-F
V1A1R3	C757-0482		RESISTOR-FXD 511K 1% .125W F TUBULAR	28480	0757-0482
V1A1R4	C757-0482		RESISTOR-FXD 511K 1% .125W F TUBULAR	28480	0757-0482
W2C	8120-1538	1	CABLE: UNSHLD 3-COND 18AWG (POWER CORD) (183A ONLY)	70903	KH 7146
W2C	8120-1545	1	CABLE: UNSHLD 3-COND 18AWG (POWER CORD) (183B ONLY)	70903	KH 7171
W21	00183-61640	1	CABLE ASSY, MAIN (183A ONLY)	28480	00183-61640
W21E1	1251-2410	2	CONTACT, CONN, U/W UTILITY SER, MALE	27264	1560-T
W21J1	1251-0137	2	CONNECTOR, 32-CONT, FEM, BLUE RIBBON	71785	28-4200-325
W21J2	1251-2412	4	CONNECTOR, 15-CONT, MALE, UTILITY (REFERENCE W21E1)	28480	1251-2412
W21J3	1251-0334		CONNECTOR, PC EDGE, 18-CONT, SOLDER EYE	71785	251-18-30-261
W21J4	1251-0135		CONNECTOR, PC EDGE, 15-CONT, SOLDER EYE	71785	251-15-30-261
W21J5	1251-2412		CONNECTOR, 15-CONT, MALE, UTILITY (REFERENCE W21E1)	28480	1251-2412

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
W21MP1	1200-0408	2	COVER:CRT SOCKET	28480	1200-0408
W21R1	C683-1045	2	RESISTOR-FXD 100K 5% .25W CC TUBULAR	01121	CB1045
W21R2	0811-1667	2	RESISTOR-FXD 1.2 OHM 5% 2W PW TUBULAR	75042	RWW2-1R2-J
W21R3			NOT ASSIGNED		
W21W1	CC183-61605	1	CABLE:COAX, CALIBRATOR EXT INPUT	28480	00183-61605
W21W2	CC183-61607	1	CABLE:COAX, EXT RESET	28480	00183-61607
W21W3	00183-61608	1	CABLE:COAX, ALT. TRIGGER	28480	00183-61608
W21W4	C0183-61609	1	CABLE:COAX, DELAYED GATE	28480	00183-61609
W21W5	CC183-61610	1	CABLE:COAX, MAIN GATE	28480	00183-61610
W21W6	CC183-61611	1	CABLE:COAX, GATE FROM PLUG-IN	28480	00183-61611
W21W7	C0183-61612	1	CABLE:COAX, YELLOW	28480	00183-61612
W21W8	C0183-61613	1	CABLE:COAX, REC-Z AXIS INPUT	28480	00183-61613
W21XV1	1200-0037	2	SOCKET, ELEC, TUBE 14-CONT CRT PKG	28480	1200-0037
W22	00183-61641	1	CABLE ASSY, MAIN (183B ONLY)	28480	00183-61641
W22E1	1251-2410		CONTACT, CONN, U/W UTILITY SER, MALE	27264	1560-T
W22J1	1251-0137		CONNECTOR, 32-CONT, FEM, BLUE RIBBON	71785	2a-4233-325
W22J2	1251-2412		CONNECTOR, 15-CONT, MALE, UTILITY (REFERENCE W22E1)	28480	1251-2412
W22J3	1251-0334		CONNECTOR, PC EDGE, 36 CONT, SOLDER EYE	71785	251-18-30-261
W22J4	1251-0156		CONNECTOR, PC EDGE, 15-CONT, SOLDER EYE	71785	251-15-30-261
W22J5	1251-2412		CONNECTOR, 15-CONT, MALE, UTILITY (REFERENCE W22E1)	28480	1251-2412
W22MP1	1200-0408		COVER:CRT SOCKET	28480	1200-0408
W22R1	C683-1045		RESISTOR-FXD 100K 5% .25W CC TUBULAR	01121	CB1045
W22R2	0811-1667		RESISTOR-FXD 1.2 OHM 5% 2W PW TUBULAR	75042	RWW2-1R2-J
W22R3			NOT ASSIGNED		
W22W1	CC183-61619	1	CABLE: COAX, CALIBRATOR EXT INPUT	28480	00183-61619
W22W2	00183-61615	1	CABLE: COAX, EXT. RESET	28480	00183-61615
W22W3	C0183-61618	1	CABLE: COAX, ALT. TRIGGER	28480	00183-61618
W22W4	CC183-61616	1	CABLE:COAX DELAYED GATE	28480	00183-61616
W22W5	CC183-61617	1	CABLE: COAX, MAIN GATE	28480	00183-61617
W22W6	C0183-61620	1	CABLE: COAX, GATE FROM PLUG IN	28480	00183-61620
W22W7	CC183-61614	1	CABLE: COAX, YELLOW	28480	00183-61614
W22W8	CC183-61606	1	CABLE:COAX REC-Z AXIS INPUT	28480	00183-61606
W22XV1	1200-0037		SOCKET, ELEC, TUBE 14-CONT CRT PKG	28480	1200-0037
W23	C0183-61625	1	CABLE:VERTICAL INPUT, BLUE	28480	00183-61625
W24	00183-61621	1	CABLE:HORIZONTAL OUTPUT (183A ONLY)	28480	00183-61621
W25	CC183-61625	1	CABLE:HORIZONTAL OUTPUT (183B ONLY)	28480	00183-61625
W26	CC183-61622	1	CABLE:COAX, EXT VERNIER CONTROL TO RD	28480	00183-61622
W27	CC183-61623	1	CABLE:COAX, EXT VERNIER CONTROL TO BD	28480	00183-61623
W28	CC183-61624	1	CABLE ASSY:HIGH VOLTAGE	28480	00183-61624
W29	CC183-61626	1	CABLE:COAX, HORIZONTAL INPUT (183A ONLY)	28480	00183-61626
W30	CC183-61627	1	CABLE:COAX, HORIZONTAL INPUT (183B ONLY)	28480	00183-61627
W31			LEAD ASSY, HIGH VOLTAGE SUPPLIED W/V1. NOT SEPARATELY REPLACEABLE.		
XDS1	CC183-67701	2	BASE:PILOT LIGHT	28480	00183-67701
XDS2	CC183-67701		BASE:PILOT LIGHT	28480	00183-67701
A1			ASSY, LOW VOLTAGE POWER SUPPLY MODULE		
A1C1	0180-2314	2	C:FXD ELECT 500 UF +50-10% 180VDCW	00853	505-1612-02
A1C2	C180-2312	1	C:FXD ELECT 350/300 UF 60/140 VDCW	00853	505-1613-02
A1C3			NOT ASSIGNED		
A1C4	C180-2313	2	C:FXD ELECT 6000 UF +75-10% 30VDCW	28480	0180-2313
A1C5	C180-2313		C:FXD ELECT 6000 UF +75-10% 30VDCW	28480	0180-2313
A1C6	0180-2314		C:FXD ELECT 500 UF +50-10% 180VDCW	00853	505-1612-02
A1F1	2110-0029	1	FUSE: 3A 125V SLO-BLO	71400	MDX-3
A1F2			NOT ASSIGNED		
A1J1			NOT ASSIGNED		
A1J2			NOT ASSIGNED		
A1J3	1251-2357	1	CONNECTOR, AC PWR, MP-9 MALE FLANGE	82389	EAC301
A1J4	1510-0038	2	BINDING-POST: SINGLE:3/4-32 THRU	28480	1510-0038
A1MP1			NOT ASSIGNED		
A1MP99			NOT ASSIGNED		
A1MP100	CC183-60206	1	PANEL: REAR POWER (INCLUDES A1S1)	28480	00183-60206
A1MP101	1400-0084	1	FUSEHOLDER: EXTR POST: BAY CAP: 15A	28480	1400-0084
A1MP102			NOT ASSIGNED		

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
A1MP103	00183-01212	1	BRACKET:PLUG	28480	00183-01212
A1MP104	00183-61204	1	BRACKET ASSY:CAPACITOR	28480	00183-61204
A1MP105	00183-01231	1	BRACKET:POWER PUCULL	28480	00183-01231
A1MP106	1520-0001	2	INSULATOR, CAP, .062 THK USED FOR A1C4 AND A1C5.	28480	1520-0001
A1MP107	1520-0002	3	INSULATOR, CAP, .062 THK USED FOR A1C1, A1C2, & A1C6.	28480	1520-0002
A1MP108	0400-0018	2	GROMMET:CHANNEL U-SHAPED	95987	WG-101
A1MP109	00183-01228	2	BRACKET:SHIM	28480	00183-01228
A1MP110	00183-01210	1	BRACKET:BLOWER TRANSFORMER	28480	00183-01210
A1MP111	00183-61203	2	BRACKET ASSY:REGULATOR	28480	00183-61203
A1MP112	00183-21101	2	HEAT SINK	28480	00183-21101
A1MP113	0340-0447	4	FOOT:PLAN(LONG) FOR 183B ONLY	28480	0340-0447
A1MP114	00183-02301	1	HOLDER:FILTER	28480	00183-02301
A1MP115	3150-0100	1	FILTER, FLAN	28480	3150-0100
A1Q1	1854-0417	3	TRANSISTOR NPN SI PD=80W	28480	1854-0417
A1Q2	1854-0320	3	TRANSISTOR NPN SI PD=83.5W FT=4MHZ	28480	1854-0320
A1Q3	1854-0063	2	TRANSISTOR NPN 2N3055 SI PD=115W	28480	1854-0063
A1Q4	1854-0063		TRANSISTOR NPN 2N3055 SI PD=115W	28480	1854-0063
A1Q5	1854-0417		TRANSISTOR NPN SI PD=80W	28480	1854-0417
A1Q6	1854-0320		TRANSISTOR NPN SI PD=83.5W FT=4MHZ	28480	1854-0320
A1S1	3101-1234	1	SWITCH: SLE OPDT NS; 6A 250VAC	82389	11A-1242A
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
A1W1E1	1251-2411	1	CONTACT, CONN, W/W UTILITY SER, FEM	27264	1561-T
A1W1J1	1251-0334	3	CONNECTOR, PC EDGE, 16-CONT, SOLDER EYE	71785	251-16-33-261
A1W1J2	1251-0159	3	CONNECTOR, PC EDGE, 15-CONT, SOLDER EYE	71785	251-15-30-261
A1W1P1	1251-2405	2	CONNECTOR, 15-CONT, FEM, UTILITY (REFERENCE A1W1E1)	27264	1625-16R-1
A1W1	1251-2405		CONNECTOR, 15-CONT, FEM, UTILITY (REFERENCE A1W1E1)	27264	1625-16R-1
A1A1	00183-66505	1	BOARD ASSY:LOW VOLTAGE REGULATOR	28480	00183-66509
A1A1C1	0180-0054	1	CAPACITOR-FXD; 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A1A1C2	0160-0161	5	CAPACITOR-FXD .01UF+-10% 200WVDC	56289	292P10392
A1A1C3	0180-0085	2	CAPACITOR-FXD; 100UF+50-10% 150VDC AL	56289	30D106F150DD2
A1A1C4	0160-0161		CAPACITOR-FXD .01UF+-10% 200WVDC	56289	292P10392
A1A1C5	0180-0045	1	CAPACITOR-FXD; 20UF+75-10% 50VDC AL	56289	30D206G050CC2
A1A1C6	0160-0161		CAPACITOR-FXD .01UF+-10% 200WVDC	56289	292P10392
A1A1C7	0180-0059	2	CAPACITOR-FXD; 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A1A1C8	0160-0161		CAPACITOR-FXD .01UF+-10% 200WVDC	56289	292P10392
A1A1C9	0180-0058		CAPACITOR-FXD; 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A1A1C10	0160-0161		CAPACITOR-FXD .01UF+-10% 200WVDC	56289	292P10392
A1A1C11	0180-0089		CAPACITOR-FXD; 100UF+50-10% 150VDC AL	56289	30D106F150DD2
A1A1CR1	1884-0082	2	THYRISTOR, SCR, JEDEC 2N4441	04713	2N4441
A1A1CR2	1884-0082		THYRISTOR, SCR, JEDEC 2N4441	04713	2N4441
A1A1CR3	1901-0026	5	DIODE: PWR RECT; 200V MAX VRM 750MA	04713	SR1358-8
A1A1CR4	1901-0026		DIODE: PWR RECT; 200V MAX VRM 750MA	04713	SR1358-8
A1A1F1	2110-0012	1	FUSE: .5A 250V	71400	AGC 1/2
A1A1F2	2110-0067	1	FUSE: .3A 250V	71400	AGC 3/10
A1A1F3	2110-0002	2	FUSE: 2A 250V	71400	AGC-2
A1A1F4	2110-0002		FUSE: 2A 250V	71400	AGC-2
A1A1F5	2110-0004	2	FUSE: .25A 250V	71400	AGC-1/4
A1A1Q1	1855-0062	1	TRANSISTOR: J-FET N-CHAN, D-MODE SI	28480	1855-0062
A1A1Q2	1854-0035	2	TRANSISTOR NPN 2N3053 SI PD=1W	04713	2N3053
A1A1Q3	1854-0035		TRANSISTOR NPN 2N3053 SI PD=1W	04713	2N3053
A1A1R1	C761-0037	1	RESISTOR-FXD 390 OHM 5% 1W MO TUBULAR	24546	FP32-1-T00-391-J
A1A1R2	C757-0946	2	RESISTOR-FXD 8.2K 2% .125W F TUBULAR	24546	C4-1/8-T0-8201-G
A1A1R3	C757-0924	2	RESISTOR-FXD 1K 2% .125W F TUBULAR	24546	C4-1/8-T0-1001-G
A1A1R4	C757-0976	1	RESISTOR-FXD 150K 2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A1A1R5	C757-0940	1	RESISTOR-FXD 4.7K 2% .125W F TUBULAR	24546	C4-1/8-T0-4701-G
A1A1R6	C757-0465	5	RESISTOR-FXD 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A1A1R7	C811-1676	3	RESISTOR-FXD 0.8 OHM 5% 2W PW TUBULAR	75042	HW2-6R8-J
A1A1R8	C757-0281	1	RESISTOR-FXD 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A1A1R9	C761-0028	1	RESISTOR-FXD 12K 5% 1W MO TUBULAR	24546	FP32-1-T00-1202-J
A1A1R10	C757-0437	2	RESISTOR-FXD 4.75K 1% .125W F TUBULAR	24546	C4-1/8-T0-4751-F
A1A1R11	2100-1772	4	RESISTOR, VAR, TRMR, 500 OHM 5% 4W	28480	2100-1772
A1A1R12	C757-0765	7	RESISTOR-FXD 51.1K 1% .25W F TUBULAR	24546	C5-1/4-T0-5112-F
A1A1R13	C761-0038	1	RESISTOR-FXD 5.6K 5% 1W MO TUBULAR	24546	FP32-1-T00-5601-J
A1A1R14	0684-2241	4	RESISTOR-FXD 220K 10% .25W CC TUBULAR	01121	CH2241
A1A1R15	C757-0924		RESISTOR-FXD 1K 2% .125W F TUBULAR	24546	C4-1/8-T0-1001-G
A1A1R16	C757-0963	1	RESISTOR-FXD 43K 2% .125W F TUBULAR	24546	C4-1/8-T0-4302-G
A1A1R17	C757-0764	1	RESISTOR-FXD 33.2K 1% .25W F TUBULAR	24546	C5-1/4-T0-3322-F
A1A1R18	C757-0444	3	RESISTOR-FXD 12.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1212-F
A1A1R19	C757-0942	1	RESISTOR-FXD 5.6K 2% .125W F TUBULAR	24546	C4-1/8-T0-5601-G

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
A1A1R20	0757-0455	1	RESISTOR-FXD 36.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-3652-F
A1A1R21	0811-1676		RESISTOR-FXD 6.8 OHM 5% 2W PW TUBULAR	75042	HWH2-6R8-J
A1A1R22	0757-0427	8	RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A1A1R23	0757-0436	5	RESISTOR-FXD 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A1A1R24	2100-1772		RESISTOR, VAR, TRMR, 500 OHM 5% WW	28480	2100-1772
A1A1R25	0757-0444		RESISTOR-FXD 12.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1212-F
A1A1R26	0687-3321	1	RESISTOR-FXD 3.3K 10% .5W CC TUBULAR	01121	EB3321
A1A1R27	0761-0005	1	RESISTOR-FXD 2.2K 5% 1W MO TUBULAR	24546	FP32-1-2201-J
A1A1R28	0684-2241		RESISTOR-FXD 220K 10% .25W CC TUBULAR	01121	CB2241
A1A1R29	0757-0911	2	RESISTOR-FXD 300 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-301-G
A1A1R30	0757-0952	1	RESISTOR-FXD 15K 2% .125W F TUBULAR	24546	C4-1/8-T0-1502-G
A1A1R31	0757-0428	3	RESISTOR-FXD 47.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-4752-F
A1A1R32	0757-0438	4	RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A1A1R33	0757-0930	2	RESISTOR-FXD 1.8K 2% .125W F TUBULAR	24546	C4-1/8-T0-1801-G
A1A1R34	0757-0444		RESISTOR-FXD 12.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1212-F
A1A1R35	0811-1340	2	RESISTOR-FXD 1 OHM 5% 5W PW TUBULAR	56289	243E1R05
A1A1R36	0757-0427		RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A1A1R37	0757-0436		RESISTOR-FXD 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A1A1R38	2100-1772		RESISTOR, VAR, TRMR, 500 OHM 5% WW	28480	2100-1772
A1A1R39	0757-0439	1	RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A1A1R40	0687-1021	2	RESISTOR-FXD 1K 10% .5W CC TUBULAR	01121	EB1021
A1A1R41	0757-0858	2	RESISTOR-FXD 82 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-82R0-G
A1A1R42	0761-0039	1	RESISTOR-FXD 680 OHM 5% 1W MO TUBULAR	24546	FP32-1-T00-681-J
A1A1R43	0684-2241		RESISTOR-FXD 220K 10% .25W CC TUBULAR	01121	CB2241
A1A1R44	0757-0911		RESISTOR-FXD 300 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-301-G
A1A1R45	0757-0946		RESISTOR-FXD 8.2K 2% .125W F TUBULAR	24546	C4-1/8-T0-8201-G
A1A1R46	0757-0435	2	RESISTOR-FXD 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A1A1R47	0757-0765		RESISTOR-FXD 51.1K 1% .25W F TUBULAR	24546	C5-1/4-T0-5112-F
A1A1R48	0757-0932	1	RESISTOR-FXD 2.2K 2% .125W F TUBULAR	24546	C4-1/8-T0-2201-G
A1A1R49	0757-0288	1	RESISTOR-FXD 9.09K 1% .125W F TUBULAR	30983	MF4C1/8-T0-9091-F
A1A1R50	0811-1340		RESISTOR-FXD 1 OHM 5% 5W PW TUBULAR	56289	243E1R05
A1A1R51	0757-0427		RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A1A1R52	0757-0283	2	RESISTOR-FXD 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A1A1R53	2100-1772		RESISTOR, VAR, TRMR, 500 OHM 5% WW	28480	2100-1772
A1A1R54	0757-0436		RESISTOR-FXD 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A1A1R55	0757-0858		RESISTOR-FXD 82 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-82R0-G
A1A1R56	0684-2241		RESISTOR-FXD 220K 10% .25W CC TUBULAR	01121	CB2241
A1A1R57	0757-0930		RESISTOR-FXD 1.8K 2% .125W F TUBULAR	24546	C4-1/8-T0-1801-G
A1A1R58	0757-0972	1	RESISTOR-FXD 100K 2% .125W F TUBULAR	24546	C4-1/8-T0-1002-G
A1A1R59	0757-0788		RESISTOR-FXD 47.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-4752-F
A1A1R60	0757-0765		RESISTOR-FXD 51.1K 1% .25W F TUBULAR	24546	C5-1/4-T0-5112-F
A1A1R61	0757-0956	1	RESISTOR-FXD 22K 2% .125W F TUBULAR	24546	C4-1/8-T0-2202-G
A1A1R62	0757-0465		RESISTOR-FXD 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A1A1R63	0811-1676		RESISTOR-FXD 6.8 OHM 5% 2W PW TUBULAR	75042	HWH2-6R8-J
A1A1R64	0757-0317	1	RESISTOR-FXD 1.33K 1% .125W F TUBULAR	24546	C4-1/8-T0-1331-F
A1A1R65	0757-0427		RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A1A1R66	2100-1773	1	RESISTOR, VAR, TRMR, 1K OHM 5% WW	28480	2100-1773
A1A1R67	0757-0788		RESISTOR-FXD 47.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-4752-F
A1A1TP1	1251-0206	6	CONNECTOR:1-CONT SKT .04 DIA;WHT TFE	98291	SKT-400
A1A1TP2	1251-0206		CONNECTOR:1-CONT SKT .04 DIA;WHT TFE	98291	SKT-400
A1A1TP3	1251-0206		CONNECTOR:1-CONT SKT .04 DIA;WHT TFE	98291	SKT-400
A1A1TP4	1251-0206		CONNECTOR:1-CONT SKT .04 DIA;WHT TFE	98291	SKT-400
A1A1TP5	1251-0206		CONNECTOR:1-CONT SKT .04 DIA;WHT TFE	98291	SKT-400
A1A1U1	1821-0002	6	IC:LIN;TRANSISTOR ARRAY	02735	CA3045
A1A1U2	1821-0002		IC:LIN;TRANSISTOR ARRAY	02735	CA3045
A1A1U3	1821-0002		IC:LIN;TRANSISTOR ARRAY	02735	CA3045
A1A1U4	1821-0002		IC:LIN;TRANSISTOR ARRAY	02735	CA3045
A1A1U5	1821-0002		IC:LIN;TRANSISTOR ARRAY	02735	CA3045
A1A1VR1	1902-0049	4	DIODE; ZENER; 6.19V VZ; .4W MAX PD	28480	1902-0049
A1A1VR2	1902-1216	1	DIODE; ZENER; 9V VZ; .5W MAX PD	12954	1N938A
A1A1VR3	1902-0049		DIODE; ZENER; 6.19V VZ; .4W MAX PD	28480	1902-0049
A1A1VR4	1902-0049		DIODE; ZENER; 6.19V VZ; .4W MAX PD	28480	1902-0049
A1A1VR5	1902-3222	1	DIODE; ZENER; 17.4V VZ; .4W MAX PD	04713	SZ 10939-251
A1A1VR6	1902-0049		DIODE; ZENER; 6.19V VZ; .4W MAX PD	28480	1902-0049
A1A1VR7	1902-3203	3	DIODE; ZENER; 14.7V VZ; .4W MAX PD	04713	SZ 10939-230
A1A1XF1	2110-0265	13	FUSEHOLDER; CLIP TYPE	28480	2110-0265
A1A1XU1	1200-0768	5	SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	91506	314-AG5D-3R
A1A1XU2	1200-0768		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	91506	314-AG5D-3R
A1A1XU3	1200-0768		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	91506	314-AG5D-3R
A1A1XU4	1200-0768		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	91506	314-AG5D-3R
A1A1XU5	1200-0768		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	91506	314-AG5D-3R
A1A2	00183-66513	1	BOARD ASSY;LOW VOLTAGE RECTIFIER	28480	00183-66513
A1A2CR1	1901-0045	8	DIODE; PWR RECT; 100V MAX VRM 750MA	28480	1901-0045
A1A2CR2	1901-0045		DIODE; PWR RECT; 100V MAX VRM 750MA	28480	1901-0045
A1A2CR3	1901-0045		DIODE; PWR RECT; 100V MAX VRM 750MA	28480	1901-0045
A1A2CR4	1901-0045		DIODE; PWR RECT; 100V MAX VRM 750MA	28480	1901-0045

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
A1A2CR5	1901-0028	8	DIODE: PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A1A2CR6	1901-0028		DIODE: PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A1A2CR7	1901-0028		DIODE: PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A1A2CR8	1901-0028		DIODE: PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A1A2CR9	1901-0045		DIODE: PWR RECT; 100V MAX VRM 750MA	28480	1901-0045
A1A2CR10	1901-0045		DIODE: PWR RECT; 100V MAX VRM 750MA	28480	1901-0045
A1A2CR11	1901-0045		DIODE: PWR RECT; 100V MAX VRM 750MA	28480	1901-0045
A1A2CR12	1901-0045		DIODE: PWR RECT; 100V MAX VRM 750MA	28480	1901-0045
A1A2CR13	1901-0415	8	DIODE: PWR RECT; 50V MAX VRM 1.5A	04713	SR1846-8
A1A2CR14	1901-0415		DIODE: PWR RECT; 50V MAX VRM 1.5A	04713	SR1846-8
A1A2CR15	1901-0415		DIODE: PWR RECT; 50V MAX VRM 1.5A	04713	SR1846-8
A1A2CR16	1901-0415		DIODE: PWR RECT; 50V MAX VRM 1.5A	04713	SR1846-8
A1A2CR17	1901-0415		DIODE: PWR RECT; 50V MAX VRM 1.5A	04713	SR1846-8
A1A2CR18	1901-0415		DIODE: PWR RECT; 50V MAX VRM 1.5A	04713	SR1846-8
A1A2CR19	1901-0415		DIODE: PWR RECT; 50V MAX VRM 1.5A	04713	SR1846-8
A1A2CR20	1901-0415		DIODE: PWR RECT; 50V MAX VRM 1.5A	04713	SR1846-8
A1A2CR21	1901-0028		DIODE: PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A1A2CR22	1901-0028		DIODE: PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A1A2CR23	1901-0028		DIODE: PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A1A2CR24	1901-0028		DIODE: PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A1A2F1	2110-0004		FUSE: .25A 250V	71400	AGC-1/4
A1A2R1	C687-6831	3	RESISTOR-FXD 68K 10% .5W CC TUBULAR	01121	EB6831
A1A2R2	C687-6831		RESISTOR-FXD 68K 10% .5W CC TUBULAR	01121	EB6831
A1A2R3	C684-8221	2	RESISTOR-FXD 8.2K 10% .25W CC TUBULAR	01121	CB8221
A1A2R4	C684-8221		RESISTOR-FXD 8.2K 10% .25W CC TUBULAR	01121	CB8221
A1A2R5	C687-6831		RESISTOR-FXD 68K 10% .5W CC TUBULAR	01121	EB6831
A1A2R6	C761-0022	1	RESISTOR-FXD 620 OHM 5% 1W MO TUBULAR	24546	FP32-1-T00-621-J
A1A2VR1	1902-3193	1	DIODE: ZENER; 13.3V VZ; .4W MAX PD	04713	SZ 10939-210
A1A3	00183-69501	1	BLOWER ASSY	28480	00183-69501
			NOTE THE MOTOR, CIRCUIT BOARD, HEAT SINK, FAN BLADE AND BRACKET ARE AVAILABLE ONLY AS A COMPLETE UNIT AS A1A3. INDIVIDUAL CIRCUIT BOARD PARTS ARE AVAILABLE AS LISTED BELOW.		
A1A3C1	0180-0155	6	CAPACITOR-FXD: 2.2UF+-20% 20VDC TA	56289	150D225X0020A2
A1A3CR1	1901-0040	39	DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A1A3CR2	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A1A3CR3	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A1A3CR4	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A1A3CR5	1901-0049	1	DIODE: PWR RECT; 50V MAX VRM 750MA	28480	1901-0049
A1A3CR6	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A1A3CR7	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A1A3Q1	1853-0020	5	TRANSISTOR PNP SI CHIP PD=300MW	28480	1853-0020
A1A3Q2	1853-0020		TRANSISTOR PNP SI CHIP PD=300MW	28480	1853-0020
A1A3Q3	1853-0020		TRANSISTOR PNP SI CHIP PD=300MW	28480	1853-0020
A1A3Q4	1853-0020		TRANSISTOR PNP SI CHIP PD=300MW	28480	1853-0020
A1A3Q5	1854-0071	1	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1A3Q6	1853-0020		TRANSISTOR PNP SI CHIP PD=300MW	28480	1853-0020
A1A3R1	0683-0335	1	RESISTOR-FXD 3.3 OHM 5% .25W CC TUBULAR	01121	CB3355
A1A3R2	C684-3311	3	RESISTOR-FXD 330 OHM 10% .25W CC	01121	CB3311
A1A3R3	C684-3311		RESISTOR-FXD 330 OHM 10% .25W CC	01121	CB3311
A1A3R4	C698-7255	2	RESISTOR-FXD 6.19K 2% .05W F TUBULAR	24546	C3-1/8-TO-6191-G
A1A3R5	C698-7255		RESISTOR-FXD 6.19K 2% .05W F TUBULAR	24546	C3-1/8-TO-6191-G
A1A3R6	0698-7239	1	RESISTOR-FXD 1.33K 2% .05W F TUBULAR	24546	C3-1/8-TO-1331-G
A1A3VR1	1902-3044	1	DIODE: ZENER; 5.11V VZ; .4W MAX PD	04713	SZ 10939-99
A2			NOT ASSIGNED		
A3	00183-66502	1	BOARD ASSY:EMITTER FOLLOWER	28480	00183-66502
A3C1	C18C-3665	38	CAPACITOR-FXD .01UF+80-20% 500WVDC	28480	0160-3665
A3C2	C18C-0155		CAPACITOR-FXD: 2.2UF+-20% 20VDC TA	56289	150D225X0020A2
A3C3	C18C-3665		CAPACITOR-FXD .01UF+80-20% 500WVDC	28480	0160-3665
A3C4	0180-0155		CAPACITOR-FXD: 2.2UF+-20% 20VDC TA	56289	150D225X0020A2
A3CR1	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A3CR2	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A3CR3	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A3CR4	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A3CR5	1901-0040		DIODE: SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A3Q1	1853-0036	6	TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A3Q2	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A3Q3	1853-0049	1	TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0049
A3R1	C684-2221	9	RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A3R2	C684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A3R3	C684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A3R4	C684-3921	1	RESISTOR-FXD 3.9K 10% .25W CC TUBULAR	01121	CB3921

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3R6	C684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A3R6	C684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A3R7	0684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A3R8	C684-3921		RESISTOR-FXD 3.9K 10% .25W CC TUBULAR	01121	CB3921
A3R9	0757-0804	1	RESISTOR-FXD 200 OHM 1% .5W F TUBULAR	30983	MF7C-1/2-T0-201-F
A3R10	C757-0449	3	RESISTOR-FXD 20K 1% .125W F TUBULAR	24546	C4-1/8-T0-2002-F
A3R11	0757-0736	1	RESISTOR-FXD 1.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-1501-F
A3R12	C757-0427		RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A3R13	C655-0002	9	RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB6805
A3R14	C655-0002		RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB6805
A3R15	C684-4721	10	RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A4	00183-66527	1	BOARD ASSY: CALIBRATOR (LESS A4U1)	28480	00183-66527
A4C1	0160-3452	8	CAPACITOR-FXD .02UF+-20% 100WVDC	28480	0160-3452
A4C2	C18C-0116	7	CAPACITOR-FXD: 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A4C3	C140-0150	1	CAPACITOR-FXD 39PF+-5% 300WVDC	72136	DM15E390J0300WV1CR
A4C4	C18C-0155		CAPACITOR-FXD: 2.2UF+-20% 20VDC TA	56289	150D225X9020A2
A4C5	018C-0155		CAPACITOR-FXD: 2.2UF+-20% 20VDC TA	56289	150D225X9020A2
A4C6	C18C-0116		CAPACITOR-FXD: 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A4C7	0160-3452		CAPACITOR-FXD .02UF+-20% 100WVDC	28480	0160-3452
A4C8	C16C-2257	1	CAPACITOR-FXD 10PF+-5% 500WVDC	28480	0160-2257
A4C9	016C-2130	1	CAPACITOR-FXD 6.5PF+-.1% 200WVDC	28480	0160-2130
A4C10	C18C-0116		CAPACITOR-FXD: 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A4C11	C16C-3454	1	CAPACITOR-FXD .47UF+-5% 200WVDC	28480	0160-3454
A4C12	C18C-0116		CAPACITOR-FXD: 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A4C13	018C-0116		CAPACITOR-FXD: 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A4C14	016C-3452		CAPACITOR-FXD .02UF+-20% 100WVDC	28480	0160-3452
A4C15	018C-0116		CAPACITOR-FXD: 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A4C16	018C-0116		CAPACITOR-FXD: 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
A4C17	0180-0155		CAPACITOR-FXD: 2.2UF+-20% 20VDC TA	56289	150D225X9020A2
A4C18	016C-3665		CAPACITOR-FXD .01UF+80-20% 500WVDC	28480	0160-3665
A4C19	0121-0407	1	CAPACITOR, VAR, TRMR, PSTN, 0.7 3PF	72982	536-016
A4C20	C16C-3665		CAPACITOR-FXD .01UF+80-20% 500WVDC	28480	0161-3665
A4C21	C18C-0230	7	CAPACITOR-FXD: 10F+-20% 50VDC TA-SOLID	56289	150D105X0050A2
A4CR4	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A4CR5	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A4CR6	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A4L1	9140-0146	1	COIL, FXD, MOLDED RF CHOKE, 100UH 10%	78526	1A1331M
A4Q1	1854-0019	17	TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A4Q2	1854-0019		TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A4Q3	1854-0019		TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A4Q4	1854-0019		TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A4Q5	1854-0019		TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A4Q6	1854-0019		TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A4Q7	1853-0086	3	TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0086
A4Q8	1854-0215	10	TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A4Q9	1853-0086		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0086
A4Q10	1853-0240	1	TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0240
A4R1	C757-0346	5	RESISTOR-FXD 10 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-10R0-F
A4R2	0757-0337	1	RESISTOR-FXD 422 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-432R-F
A4R3	C65E-4309	2	RESISTOR-FXD 511 OHM 1% .5W F TUBULAR	19701	MF7C1/2-T9-511R-F
A4R4	C65E-4309		RESISTOR-FXD 511 OHM 1% .5W F TUBULAR	19701	MF7C1/2-T9-511R-F
A4R5	C757-0722	1	RESISTOR-FXD 332 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-332R-F
A4R6	C757-0401	9	RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A4R7	C65E-3425	1	RESISTOR-FXD 1986 OHM 1% .125W F	03888	PME55-1/8-T0-1986-F
A4R8	C757-073C	1	RESISTOR-FXD 750 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-751-F
A4R9	C757-0725	2	RESISTOR-FXD 475 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-475R-F
A4R10	C757-0346		RESISTOR-FXD 10 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-10R0-F
A4R11	C65E-5525	2	RESISTOR-FXD 162 OHM 1% .25W F TUBULAR	19701	MF52C1/4-T9-162R-F
A4R12	C757-0247	2	RESISTOR-FXD 750 OHM 1% .25W F TUBULAR	30983	MF52C1/4-T9-751-F
A4R13	C65E-5804	2	RESISTOR-FXD 6.81K 1% .25W F TUBULAR	19701	MF52C1/4-T9-6811-F
A4R14	2100-0755	1	RESISTOR, VAR, TRMR, 1KOHM 5% WW	28480	2100-0755
A4R15	C65E-7526	2	RESISTOR-FXD 147 OHM 1% .125W F TUBULAR	30983	MF4C1/8-T9-147R-F
A4R16	2100-1423	2	RESISTOR, VAR, TRMR, 50 OHM 5% WW	28480	2100-1423
A4R17	C65E-5525		RESISTOR-FXD 162 OHM 1% .25W F TUBULAR	19701	MF52C1/4-T9-162R-F
A4R18	C757-0247		RESISTOR-FXD 750 OHM 1% .25W F TUBULAR	30983	MF52C1/4-T9-751-F
A4R19	C65E-5804		RESISTOR-FXD 6.81K 1% .25W F TUBULAR	19701	MF52C1/4-T9-6811-F
A4R20	2100-0755		RESISTOR, VAR, TRMR, 1K OHM 5% WW	28480	2100-0755
A4R21	2100-1423		RESISTOR, VAR, TRMR, 50 OHM 5% WW	28480	2100-1423
A4R22	C65E-7526		RESISTOR-FXD 147 OHM 1% .125W F TUBULAR	30983	MF4C1/8-T9-147R-F
A4R23	0757-0385	1	RESISTOR-FXD 22.1 OHM 1% .125W F	30983	MF4C1/8-T0-22R1-F
A4R24	C65E-3432	2	RESISTOR-FXD 26.1 OHM 1% .125W F	03888	PME55-1/8-T0-26R1-F
A4R25	0757-0411	1	RESISTOR-FXD 332 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-332R-F
A4R26	0757-0389	2	RESISTOR-FXD 33.2 OHM 1% .125W F	24546	C4-1/8-T0-33R2-F
A4R27	0757-0389		RESISTOR-FXD 33.2 OHM 1% .125W F	24546	C4-1/8-T0-33R2-F
A4R28	0757-0802	1	RESISTOR-FXD 162 OHM 1% .5W F TUBULAR	30983	MF7C-1/2-T0-162R-F
A4R29	C757-0279	2	RESISTOR-FXD 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1211-F

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
A4R30	0757-0426	1	RESIST [illegible]-FXD 1.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-1301-F
A4R31	0757-0415	3	RESIST [illegible]-FXD 475 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-475R-F
A4R32	2100-0858	2	RESISTOR, VAR, TMMR, 500 OHM 5% WW	28480	2100-0858
A4R33	0811-1166	1	RESISTOR-FXD 4.7K 3% 3W PWW TUBULAR	91637	NS283-11-4301-3
A4R34	2100-0858		RESISTOR, VAR, TMMR, 500 OHM 5% WW	28480	2100-0858
A4R35	0757-0421	2	RESISTOR-FXD 825 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-825R-F
A4R36	0757-0417	1	RESISTOR-FXD 562 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-562R-F
A4R37	0698-3439	1	RESISTOR-FXD 178 OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-178R-F
A4R38	0757-0358	2	RESISTOR-FXD 75 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-75R0-F
A4R39	0757-0284	3	RESISTOR-FXD 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A4R40	0698-3418	1	RESISTOR-FXD 50 OHM .1% .125W F TUBULAR	19701	MFAC1/8-T2-50R0-B
A4R41	0698-3432		RESISTOR-FXD 26.1 OHM 1% .125W F	03888	PME55-1/8-T0-26R1-F
A4R42	0698-7525	2	RESISTOR-FXD 61.11 OHM .25% .125W F	30983	MFAC1/8-T9-61R11-C
A4R43	0698-7524	1	RESISTOR-FXD 247.5 OHM .25% .125W F	30983	MFAC1/8-T9-247R5-C
A4R44	0698-7525		RESISTOR-FXD 61.11 OHM .25% .125W F	30983	MFAC1/8-T9-61R11-C
A4R45	0761-0070	1	RESISTOR-FXD 9.2K 5% 1W MO TUBULAR	24546	FP32-1-T00-9201-J
A4R46	0687-3311	1	RESISTOR-FXD 330 OHM 10% .5W CC TUBULAR	01121	EB3311
A4R47	2100-1777	2	RESISTOR, VAR, TMMR, 20KOHM 5% WW	28480	2100-1777
A4R48	0687-2211	1	RESISTOR-FXD 220 OHM 10% .5W CC TUBULAR	01121	EB2211
A4R49	2100-1775	1	RESISTOR, VAR, TMMR, 5KOHM 5% WW	28480	2100-1775
A4R50	0698-3159	2	RESISTOR-FXD 26.1K 1% .125W F TUBULAR	16299	C4-1/8-T0-2612-F
A4R51	2100-1777		RESISTOR, VAR, TMMR, 20KOHM 5% WW	28480	2100-1777
A4R52	0698-3159		RESISTOR-FXD 26.1K 1% .125W F TUBULAR	16299	C4-1/8-T0-2612-F
A4R53	0757-0260	5	RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A4R54	2100-2917	1	REVAR WW 50K OHM 20% 1/2W	28480	2100-2917
A4R55			NOT ASSIGNED		
A4R56			NOT ASSIGNED		
A4R57	0684-1031	4	RESISTOR-FXD 10K 10% .25W CC TUBULAR	01121	CB1031
A4R58			NOT ASSIGNED		
A4R59	0684-1041	2	RESISTOR-FXD 100K 10% .25W CC TUBULAR	01121	CB1041
A4R60	0684-1031		RESISTOR-FXD 10K 10% .25W CC TUBULAR	01121	CB1031
A4R61	2100-0580	1	RESISTOR, VAR, TMMR, 500KOHM 10% C	73138	72PR500K
A4R62	0687-1021		RESISTOR-FXD 1K 10% .5W CC TUBULAR	01121	EB1021
A4S1	3101-1270	1	SWITCH (FREQUENCY AND AMPLITUDE)	28480	3101-1270
A4S2	00183-21531	1	SWITCH-BEAMFINDER	28480	00183-21701
A4U1	5060-0491	1	CIRCUIT-HYBRID	28480	5060-0491
A4VR1	1902-3104	2	DIODE, ZENER: 5.62V VZ, .4W MAX PD	04713	SZ 10939-110
A4VR2	1902-3172	1	DIODE, ZENER: 11V VZ, .4W MAX PD	04713	SZ 10939-195
A4VR3	1902-3104		DIODE, ZENER: 5.62V VZ, .4W MAX PD	04713	SZ 10939-110
A4VR4			NOT ASSIGNED		
A5	00183-61102		HIGH VOLTAGE RECTIFIER	28480	00183-61102
A5CR1	1901-0341	2	DIODE:SI 7000 PIV 50MA	28480	1901-0341
A5CR2	1901-0341		DIODE:SI 7000 PIV 50MA	28480	1901-0341
A5T1			N.S.P. TRANSFORMER		
A5A1	00183-66504	1	BOARD ASSY:HIGH VOLTAGE RECTIFIER	28480	00183-66504
A5A1C1	0160-3007	6	CAPACITOR-FXD .0047UF+-20% 4000WVDC (POLARIZED RIGHT)	28480	0160-3007
A5A1C2	0160-3008	6	CAPACITOR-FXD .0047UF+-20% 4000WVDC (POLARIZED LEFT)	28480	0160-3008
A5A1C3	0160-3007		CAPACITOR-FXD .0047UF+-20% 4000WVDC (POLARIZED RIGHT)	28480	0160-3007
A5A1C4	0160-3008		CAPACITOR-FXD .0047UF+-20% 4000WVDC (POLARIZED LEFT)	28480	0160-3008
A5A1C5	0160-3007		CAPACITOR-FXD .0047UF+-20% 4000WVDC	28480	0160-3007
A5A1C6	0160-3008		CAPACITOR-FXD .0047UF+-20% 4000WVDC (POLARIZED LEFT)	28480	0160-3008
A5A1CR1			NOT ASSIGNED		
A5A1CR2			NOT ASSIGNED		
A5A1R1	0687-1001	1	RESISTOR-FXD 10 OHM 10% .5W CC TUBULAR	01121	EB1001
A5A1R2	0687-1531	1	RESISTOR-FXD 15K 10% .5W CC TUBULAR	01121	EB1531
A6	00183-61101	1	QUADRUPLER ASSY:HIGH VOLTAGE	28480	00183-61101
A6C1	0160-2402	1	CAPACITOR-FXD .001UF+50-20% 6000WVDC	28480	0160-2402
A6C2	0160-2401	3	CAPACITOR-FXD 390PF+50-20% 1500WVDC	28480	0160-2401
A6C3	0160-2401		CAPACITOR-FXD 390PF+50-20% 1500WVDC	28480	0160-2401
A6C4	0160-2401		CAPACITOR-FXD 390PF+50-20% 1500WVDC	28480	0160-2401
A6CR1	1880-0026	4	RECTIFIER, PM, PIV=10000V AT 1MA	03508	6RS18PH1608AB1
A6CR2	1880-0026		RECTIFIER, PM, PIV=10000V AT 1MA	03508	6RS18PH1608AB1
A6CR3	1880-0026		RECTIFIER, PM, PIV=10000V AT 1MA	03508	6RS18PH1608AB1
A6CR4	1880-0026		RECTIFIER, PM, PIV=10000V AT 1MA	03508	6RS18PH1608AB1
A6J1	1251-2407	1	CONNECTOR:FEMALE	28480	1251-2407
A6R1	0687-2241	1	RESISTOR-FXD 220K 10% .5W CC TUBULAR	01121	EB2241
A7	00183-66525	1	BOARD ASSY,HIGH VOLTAGE REGULATOR	28480	00183-66525
A7C1	0150-0057	1	CAPACITOR-FXD: 47UF+-10% 35VDC TA-SOLID	56289	150D476X9035S2
A7C2	0150-0052	11	CAPACITOR-FXD .05UF+-20% 400WVDC	28480	0150-0052
A7C3	0150-0052		CAPACITOR-FXD .05UF+-20% 400WVDC	28480	0150-0052

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7C4	C150-0052		CAPACITOR-FXD .05UF+-20% 400WVDC	28480	0150-0052
A7C5	C186C-2403	1	CAPACITOR-FXD .0015UF+-20% 500CWVDC	28480	0180-2403
A7C6	C18EC-3007		CAPACITOR-FXD .0047UF+-20% 400CWVDC (POLARIZED RIGHT)	28480	0180-3007
A7C7	C18EC-3008		CAPACITOR-FXD .0047UF+-20% 400CWVDC (POLARIZED LEFT)	28480	0180-3008
A7C8	C18EC-3007		CAPACITOR-FXD .0047UF+-20% 400CWVDC (POLARIZED RIGHT)	28480	0180-3007
A7C9	C18EC-3008		CAPACITOR-FXD .0047UF+-20% 400CWVDC (POLARIZED LEFT)	28480	0180-3008
A7C10	C150-0052		CAPACITOR-FXD .05UF+-20% 400WVDC	28480	0150-0052
A7C11	C150-0052		CAPACITOR-FXD .05UF+-20% 400WVDC	28480	0150-0052
A7C12	C18E-0100	11	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035R2
A7C13	C150-0052		CAPACITOR-FXD .05UF+-20% 400WVDC	28480	0150-0052
A7C14	0180-0100		CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035R2
A7C15	C18EC-3007		CAPACITOR-FXD .0047UF+-20% 400CWVDC (POLARIZED RIGHT)	28480	0180-3007
A7C16	C18EC-3008		CAPACITOR-FXD .0047UF+-20% 400CWVDC (POLARIZED LEFT)	28480	0180-3008
A7CR1	1901-0026		DIODE PWR RECT 200V MAX VRM 750MA	04713	SR1358-8
A7CR2	1901-0040		DIODE SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A7CR3	1901-0040		DIODE SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A7CR4	1901-0050	1	DIODE SWITCHING 120V MAX VRM 50MA	28480	1901-0050
A7CR5			NOT ASSIGNED		
A7CR6	1901-0460	2	DIODE HV RECT 3KV MAX VRM 250MA	04713	SR 2016-5
A7F1	2110-0026	1	FUSE .8A 250V SLO-BLO	71400	MDL 8/10
A7Q1	1853-0034	3	TRANSISTOR PNP SI CHIP PD=360MW	28480	1853-0034
A7Q2	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 1611
A7Q3	1855-0057	1	TRANSISTOR J-FET N-CHAN, D-MODE SI	28480	1855-0057
A7R1	C811-1071	1	RESISTOR-FXD 2.7 OHM 5% 2W PW TUBULAR	75042	HW2-2R7-J
A7R2	C687-1011	2	RESISTOR-FXD 100 OHM 10% .5W CC TUBULAR	01121	EB1011
A7R3	C684-2731	3	RESISTOR-FXD 27K 10% .25W CC TUBULAR	01121	CB2731
A7R4	C687-5611	1	RESISTOR-FXD 560 OHM 10% .5W CC TUBULAR	01121	EB5611
A7R5	C684-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A7R6	C684-2731		RESISTOR-FXD 27K 10% .25W CC TUBULAR	01121	CB2731
A7R7	C684-2721	1	RESISTOR-FXD 2.7K 10% .25W CC TUBULAR	01121	CB2721
A7R8	C684-2731		RESISTOR-FXD 27K 10% .25W CC TUBULAR	01121	CB2731
A7R9	C696-8018	2	RESISTOR-FXD 30M +1-15% 3W CP TUBULAR	03888	PVC175-3-TC-3004-F
A7R10	2100-2650	1	RESISTOR, VAR, TRMR, 200K OHM 10% C	28480	2100-2650
A7R11	C757-0350	1	RESISTOR-FXD 909K 1% .25W F TUBULAR	30983	MFF52C1/4-T0-9093-F
A7R12	C698-5674	1	RESISTOR-FXD 16.25M 5% 1W CF TUBULAR	77764	RNR41-16254-J
A7R13	2100-1618	1	RESISTOR,VAR,TRMR 1 MEGOHM 20% C	32997	3329H-1-105
A7R14	C687-2231	1	RESISTOR-FXD 22K 10% .5W CC TUBULAR	01121	EB2231
A7R15	C757-0344	5	RESISTOR-FXD 1M 1% .25W F TUBULAR	24546	C5-1/4-TO-1004-F
A7R16	C696-8018		RESISTOR-FXD 30M +1-15% 3W CP TUBULAR	03888	PVC175-3-TC-3004-F
A7R17	C757-0344		RESISTOR-FXD 1M 1% .25W F TUBULAR	24546	C5-1/4-TC-1004-F
A7R18	C687-2221	1	RESISTOR-FXD 2.2K 10% .5W CC TUBULAR	01121	EB2221
A7R19	C698-5677	1	RESISTOR-FXD 8.25M 5% 1W CF TUBULAR	77764	RNR41-8254-J
A7R20	C699-0002		RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB6861
A7R21	C696-0002		RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB6861
A7R22	C698-3553	1	RESISTOR-FXD 2.49M 1% .5W CF TUBULAR	91637	CCC-172-X-2494-F
A7TP1	1251-0266		CONNECTOR-CONT SKT .04 DIA;WHT TFL	98291	SKT-490
A7XF1	2110-0265		FUSEHOLDER; CLIP TYPE	28480	2110-0265
AE			NOT ASSIGNED		
AS	00183-61501	2	RESISTOR ASSYECHT TERMINATION (CONSISTS OF NSR PARTS,A9CR1 & A8R11)	28480	00183-61501
A10	00183-61501		RESISTOR ASSYECHT TERMINATION (CONSISTS OF NSR PARTS A10CR1 & A10R1)	28480	00183-61501
A11	00183-60523	1	HORIZONTAL AMPLIFIER MODULE (183A ONLY)	28480	00183-60523
A11MP1	00183-01238	1	BRACKET, HORIZ. AMPL (183A ONLY)	28480	00183-01238
A11MP2	0340-0152	6	INSULATOR: TSTR .375" THK (4 OF EACH IN HORIZ AMPL MODULE)	28480	0340-0152
A11MP3	5000-0543	6	HOLDER-TRANSISTOR (4 OF EACH IN HORIZ AMPL MODULE)	28480	5000-0543
A11MP4	5020-0513	6	CONTACT-ELECTRICAL (4 OF EACH IN HORIZ AMPL MODULE)	28480	5020-0513
A11MP5	0340-0039	6	TERMINAL BUSHING	28480	0340-0039
A11MP6	00183-24701	2	SUPPORT-RAC	28480	00183-24701
A11Q1	1853-0232	3	TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0232
A11Q2	1853-0232		TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0232
A11Q3	1854-0415	3	TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0415
A11Q4	1854-0415		TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0415
A11A1	00183-60511	2	BOARD ASSY-HORIZONTAL AMPLIFIER	28480	00183-60511
A11A1C1	0121-0454	1	CAPACITOR, VAR, TRMR, AIR, 1.7-11PF	74970	187-0106-105
A11A1C2	C18C-0230		CAPACITOR-FXD 1UF+-20% 50VDC TA-SOLID	56289	150D105X0050A2
A11A1C3	018C-0230		CAPACITOR-FXD 1UF+-20% 50VDC TA-SOLID	56289	150D105X0050A2
A11A1C4	01EC-3665		CAPACITOR-FXD .01UF+80-20% 500WVDC	28480	0160-3665

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11A1C5	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C6	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C7	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C8	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C9	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C10	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C11	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C12	0160-3452		CAPACITOR-FXD; .02UF+-20% 100WVDC	28480	0160-3452
A11A1C13	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C14	0132-0007	2	CAPACITOR, VAR, TRMR, PSTN, .7-3PF	72982	535-033-4R
A11A1C15	0132-0007		CAPACITOR, VAR, TRMR, PSTN, .7-3PF	72982	535-033-4R
A11A1C16	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C17	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C18	0170-0022	1	CAPACITOR-FXD; .1UF+-20% 600WVDC	28480	0170-0022
A11A1C19	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C20	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C21	0121-0059	1	CAPACITOR, VAR, TRMR, CER, 2-8PF	73899	DV11PR8A
A11A1C22	0160-2250	1	CAPACITOR-FXD; 5.1PF+-.25PF 500WVDC	28480	0160-2250
A11A1C23	0160-3452		CAPACITOR-FXD; .02UF+-20% 100WVDC	28480	0160-3452
A11A1C24			NOT ASSIGNED		
A11A1C25	0121-0105	1	CAPACITOR, VAR, TRMR, CER, 9-35PF	73899	DV11PR35D
A11A1C26	0180-0230		CAPACITOR-FXD; 10UF+-20% 50VDC TA-SOLID	56289	150D105X0050A2
A11A1C27	0180-0100		CAPACITOR-FXD; 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11A1C28	0180-0100		CAPACITOR-FXD; 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11A1C29	0160-3452		CAPACITOR-FXD; .02UF+-20% 100WVDC	28480	0160-3452
A11A1C30	0180-0100		CAPACITOR-FXD; 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11A1C31	0180-0100		CAPACITOR-FXD; 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
A11A1C32	0160-3452		CAPACITOR-FXD; .02UF+-20% 100WVDC	28480	0160-3452
A11A1C33	0180-0230		CAPACITOR-FXD; 10UF+-20% 50VDC TA-SOLID	56289	150D105X0050A2
A11A1C34	0180-0230		CAPACITOR-FXD; 10UF+-20% 50VDC TA-SOLID	56289	150D105X0050A2
A11A1C35	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C36	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C37	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C38	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C39	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C40	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C41	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C42	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C43	0180-0230		CAPACITOR-FXD; 10UF+-20% 50VDC TA-SOLID	56289	150D105X0050A2
A11A1C44	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C45	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C46	0160-3665		CAPACITOR-FXD; .01UF+80-20% 500WVDC	28480	0160-3665
A11A1C47	0160-3452		CAPACITOR-FXD; .02UF+-20% 100WVDC	28480	0160-3452
A11A1CR1	1901-0040		DIODE; SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A11A1CR2	1901-0040		DIODE; SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A11A1CR3	1901-0040		DIODE; SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A11A1CR4	1901-0040		DIODE; SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A11A1L1			NOT ASSIGNED		
A11A1L2	9140-0179	12	COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L3	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L4	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L5	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L6	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L7	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L8	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L9	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L10	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L11	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1L12	9140-0179		COIL, FXD, MOLDED RF CHOKE, 22UH 10%	24226	15/222
A11A1MP1	1205-0204	4	HEAT DISSIPATOR SEMICONDUCTOR	28480	1205-0204
A11A1MP2	1205-0204		HEAT DISSIPATOR SEMICONDUCTOR	28480	1205-0204
A11A1MP3	1205-0204		HEAT DISSIPATOR SEMICONDUCTOR	28480	1205-0204
A11A1MP4	1205-0204		HEAT DISSIPATOR SEMICONDUCTOR	28480	1205-0204
A11A1Q1	1853-0034		TRANSISTOR:PNP SI CHIP, PD=360MW	28480	1853-0034
A11A1Q2	1853-0034		TRANSISTOR PNP SI CHIP, PD=360MW	28480	1853-0034
A11A1Q3	1854-0019		TRANSISTOR:NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A11A1Q4	1854-0019		TRANSISTOR:NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A11A1Q5	1854-0019		TRANSISTOR:NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A11A1Q6	1854-0019		TRANSISTOR:NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A11A1Q7	1854-0019		TRANSISTOR:NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A11A1Q8	1854-0019		TRANSISTOR:NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A11A1Q9	1854-0019		TRANSISTOR:NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A11A1Q10	1854-0019		TRANSISTOR:NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A11A1Q11	1853-0203	5	TRANSISTOR:PNP SI CHIP, PD=360MW	28480	1853-0203
A11A1Q12	1853-0203		TRANSISTOR:PNP SI CHIP, PD=360MW	28480	1853-0203

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
A11A1Q13			THRU		
A11A1Q16			NOT ASSIGNED		
A11A1Q17	1855-0081	1	TRANSISTOR J-FET N-CHAN, D-MODE SI	01295	2N5245
A11A1Q18	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A11A1R1	C698-7518	2	RESISTOR-FXD 244.3 OHM .25% .125W F	30983	MF4C1/8-T2-2443-C
A11A1R2	C698-7517	1	RESISTOR-FXD 990 OHM .25% .125W F	30983	MF4C1/8-T2-9900-C
A11A1R3	0698-7516		RESISTOR-FXD 244.3 OHM .25% .125W F	30983	MF4C1/8-T2-2443-C
A11A1R4	C698-7518	2	RESISTOR-FXD 200 OHM .25% .125W F	30983	MF4C1/8-T2-2000-C
A11A1R5	C757-0388	4	RESISTOR-FXD 30.1 OHM 1% .125W F	24546	C4-1/8-T0-30R1-F
A11A1R6	C698-3177	1	RESISTOR-FXD 20K 2% 1W MO TUBULAR	75042	RG42-1-B-2002-G
A11A1R7	C757-0388		RESISTOR-FXD 30.1 OHM 1% .125W F	24546	C4-1/8-T0-30R1-F
A11A1R8	C757-0434		RESISTOR-FXD 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A11A1R9	C757-0284		RESISTOR-FXD 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A11A1R10	C757-0284		RESISTOR-FXD 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A11A1R11	C698-3445	1	RESISTOR-FXD 348 OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-348R-F
A11A1R12	C757-0434		RESISTOR-FXD 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A11A1R13	C757-0421		RESISTOR-FXD 825 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-825R-F
A11A1R14	C757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A11A1R15	C757-0482	3	RESISTOR-FXD 511K 1% .125W F TUBULAR	28480	0757-0482
A11A1R16	C757-0458	4	RESISTOR-FXD 51.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-5112-F
A11A1R17	2100-2516	1	RESISTOR, VAR, TRMR, 100K OHM 10% C	28480	2100-2516
A11A1R18	C757-0458		RESISTOR-FXD 51.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-5112-F
A11A1R19	C754-0042	1	RESISTOR-FXD 1.3K 5% .25W F TUBULAR	24546	C5-1/4-T0-1301-J
A11A1R20	C757-0395		RESISTOR-FXD 75 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-75R0-F
A11A1R21	C757-0747	2	RESISTOR-FXD 5.11K 1% .25W F TUBULAR	24546	C5-1/4-T0-5111-F
A11A1R22	C757-0769		RESISTOR-FXD 51.1K 1% .25W F TUBULAR	24546	C5-1/4-T0-5112-F
A11A1R23	C757-0468	1	RESISTOR-FXD 243 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-243R-F
A11A1R24	2100-3028	1	RESISTOR, VARI CONTE 200 OHM 20% CC	28480	2100-3028
A11A1R25	C757-0769		RESISTOR-FXD 51.1K 1% .25W F TUBULAR	24546	C5-1/4-T0-5112-F
A11A1R26	0757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A11A1R27	C757-0747		RESISTOR-FXD 5.11K 1% .25W F TUBULAR	24546	C5-1/4-T0-5111-F
A11A1R28	C757-0427		RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A11A1R29	C757-0388		RESISTOR-FXD 30.1 OHM 1% .125W F	24546	C4-1/8-T0-30R1-F
A11A1R30	0761-0073	2	RESISTOR-FXD 13K 5% 1W MO TUBULAR	24546	FP32-1-T00-1302-J
A11A1R31	C764-0044	1	RESISTOR-FXD 8.2K 5% 2W MO TUBULAR	24546	FP42-2-T00-8201-J
A11A1R32	C761-0073		RESISTOR-FXD 13K 5% 1W MO TUBULAR	24546	FP32-1-T00-1302-J
A11A1R33	C757-0388		RESISTOR-FXD 30.1 OHM 1% .125W F	24546	C4-1/8-T0-30R1-F
A11A1R34	C757-0427		RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A11A1R35	C757-0832	2	RESISTOR-FXD 4.75K 1% .5W F TUBULAR	30983	MF7C1/2-T0-4751-F
A11A1R36	C757-0832		RESISTOR-FXD 4.75K 1% .5W F TUBULAR	30983	MF7C1/2-T0-4751-F
A11A1R37	C757-0346		RESISTOR-FXD 10 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-10R0-F
A11A1R38	C757-0158	1	RESISTOR-FXD 16.2K 1% .25W F TUBULAR	24546	C5-1/4-T0-1622-F
A11A1R39	C757-0846	2	RESISTOR-FXD 22.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2212-F
A11A1R40			NOT ASSIGNED		
A11A1R41	C757-0846		RESISTOR-FXD 22.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2212-F
A11A1R42	C757-0420	4	RESISTOR-FXD 750 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-751-F
A11A1R43	C757-0420		RESISTOR-FXD 750 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-751-F
A11A1R44	C698-3447	1	RESISTOR-FXD 422 OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-422R-F
A11A1R45	C757-0354	4	RESISTOR-FXD 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A11A1R46	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A11A1R47	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A11A1R48	C757-0354		RESISTOR-FXD 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A11A1R49	C757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A11A1R50	C757-0420		RESISTOR-FXD 750 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-751-F
A11A1R51	C757-0354		RESISTOR-FXD 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A11A1R52	C757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A11A1R53	C757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A11A1R54	C757-0420		RESISTOR-FXD 750 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-751-F
A11A1R55	C757-0354		RESISTOR-FXD 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A11A1R56	C757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A11A1R57	C757-0769		RESISTOR-FXD 51.1K 1% .25W F TUBULAR	24546	C5-1/4-T0-5112-F
A11A1R58	C757-0769		RESISTOR-FXD 51.1K 1% .25W F TUBULAR	24546	C5-1/4-T0-5112-F
A11A1R59	C757-0436	2	RESISTOR-FXD 4.32K 1% .125W F TUBULAR	24546	C4-1/8-T0-4321-F
A11A1R60	C757-0436		RESISTOR-FXD 4.32K 1% .125W F TUBULAR	24546	C4-1/8-T0-4321-F
A11A1R61	C757-0726	2	RESISTOR-FXD 511 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-511R-F
A11A1R62	C757-0726		RESISTOR-FXD 511 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-511R-F
A11A1R63	C757-0829	6	RESISTOR-FXD 3.65K 1% .5W F TUBULAR	30983	MF7C1/2-T0-3651-F
A11A1R64	C757-0449		RESISTOR-FXD 20K 1% .125W F TUBULAR	24546	C4-1/8-T0-2002-F
A11A1R65	C757-0829		RESISTOR-FXD 3.65K 1% .5W F TUBULAR	30983	MF7C1/2-T0-3651-F
A11A1R66	C757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A11A1R67	C757-0829		RESISTOR-FXD 3.65K 1% .5W F TUBULAR	30983	MF7C1/2-T0-3651-F
A11A1R68	0757-0829		RESISTOR-FXD 3.65K 1% .5W F TUBULAR	30983	MF7C1/2-T0-3651-F
A11A1R69	0757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A11A1R70	C698-7518		RESISTOR-FXD 200 OHM .25% .125W F	30983	MF4C1/8-T2-2000-C

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
A11A1R71	C757-0853	1	RESISTOR-FXD 51.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-5112-F
A11A1R72	C757-0465		RESISTOR-FXD 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A11A1R73	C757-0416	5	RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-5110-F
A11A1R74	C757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-5110-F
A11A1R75	C757-0283		RESISTOR-FXD 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A11A1R76	C757-0465	1	RESISTOR-FXD 82.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-8252-F
A11A1R77	C757-0466	1	RESISTOR-FXD 110K 1% .125W F TUBULAR	24546	C4-1/8-T0-1103-F
A11A1R78	C698-5438	1	RESISTOR-FXD 100 OHM .25% .125W F	19701	MF4C1/8-T2-100R-C
A11A1R79	C698-7515	1	RESISTOR-FXD 66.7 OHM .25% .125W F	30983	MF4C1/8-T2-66R7-C
A11A1R80	C757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A11A1R81	C757-0156	1	RESISTOR-FXD 1.5M 1% .5W F TUBULAR	30983	MF7C1/2-T0-1504-F
A11A1R82	C727-0287	1	RESISTOR-FXD 2M 1% .5W CF TUBULAR	91637	CC51/2-15
A11A1R83	C757-0344		RESISTOR-FXD 1M 1% .25W F TUBULAR	24546	C5-1/4-T0-1004-F
A11A1R84	C757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A11A1R85	C757-0465		RESISTOR-FXD 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A11A1R86	C757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A11A1R87	C757-0467	3	RESISTOR-FXD 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-201-F
A11A1R88	C757-0847	1	RESISTOR-FXD 27.4K 1% .5W F TUBULAR	30983	MF/C1/2-T0-2742-F
A11A1R89	C698-3512	1	RESISTOR-FXD 1.10K 1% .125W F TUBULAR	16299	C4-1/8-T0-1101-F
A11A1R90	2100-2514	1	RESISTOR VAR, TRMR, 20K OHM 10% C	19701	ET50X203
A11A1R91	C698-3151	1	RESISTOR-FXD 2.87K 1% .125W F TUBULAR	16299	C4-1/8-T0-2871-F
A11A1R92	C757-0346		RESISTOR-FXD 10 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-10R0-F
A11A1R93	C757-0346		RESISTOR-FXD 10 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-10R0-F
A11A1R94	C757-0473	2	RESISTOR-FXD 221K 1% .125W F TUBULAR	24546	C4-1/8-T0-2213-F
A11A1R95	C757-0473		RESISTOR-FXD 221K 1% .125W F TUBULAR	24546	C4-1/8-T0-2213-F
A11A1R96	C757-0449		RESISTOR-FXD 20K 1% .125W F TUBULAR	24546	C4-1/8-T0-2002-F
A11A1S1	3101-0265	1	SWITCH-SLIDE SWITCHES SECTION A(HORIZONTAL X1) B(HORIZONTAL X10) C(HORIZONTAL EXT-INT) D(HORIZONTAL AC-DC)	28480	3101-1269
A11A1S2	3101-0973	1	SWITCH: SLD DPDT ASE .5A 125VAC/DC (ACHM-CAL)	77727	OFI26-0018
A11A1S3	3101-0982	1	SWITCH: SLD SPDT ASE .5A 125VAC/DC (BW-PHASE)	77727	OFI24-0007
A11A1U1	1826-0552		IC(LINE)TRANSISTOR ARRAY	02735	CA3045
A11A1VR1	1902-3203		DIODE: ZENER 14.7V VZ5 .4W MAX PD	04713	SZ 10939-230
A11A1VR2	1902-3203		DIODE: ZENER 14.7V VZ5 .4W MAX PD	04713	SZ 10939-230
A11A1VR3	1902-0041	4	DIODE: ZENER 5.11V VZ5 .4W MAX PD	04713	SZ 10939-98
A11A1VR4	1902-0041		DIODE: ZENER 5.11V VZ5 .4W MAX PD	04713	SZ 10939-98
A12	00183-69522	1	HORIZONTAL AMPLIFIER MODULE (183B ONLY)	28480	00183-69522
A12MP1	00183-01239	1	BRACKET: HORIZONTAL AMPL (183B ONLY)	28480	00183-01239
A12MP2	0340-0152	6	INSULATOR, TSTR (4 OF EACH	28480	0340-0152
A12MP3	5000-0543	6	HOLDER:TRANSISTOR (IN HORIZ	28480	5000-0543
A12MP4	5020-0513	6	CONTACT:ELECTRICAL (AMPL MODULE	28480	5020-0513
A12MP5	0340-0039	6	TERMINAL BUSHING	28480	0340-0039
A12MP6	00183-24701	2	SUPPORT:BNC	28480	00183-24701
A12Q1	1853-0232	3	TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0232
A12Q2	1853-0232		TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0232
A12Q3	1854-0419	3	TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0419
A12Q4	1854-0419		TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0419
A12A1	00183-66511	1	BOARD ASSY:HORIZONTAL AMPLIFIER	28480	00183-66511
A12A1	00183-69518		SAME AS A12A1, USE PREFIX A12A1-		
A13	00183-69528	1	GATE BOARD MODULE (183A ONLY)	28480	00183-69528
A13MP1	00183-01209	1	BRACKET:GATE AMPLIFIER (183A ONLY	28480	00183-01209
A13MP2	0340-0152		INSULATOR, TSTR (2 OF EACH	28480	0340-0152
A13MP3	5000-0543		HOLDER:TRANSISTOR (IN GATE	28480	5000-0543
A13MP4	5020-0513		CONTACT:ELECTRICAL (BD MODULE	28480	5020-0513
A13MP5	0340-0039		TERMINAL BUSHING	28480	0340-0039
A13Q1	1853-0232		TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0232
A13Q2	1854-0419		TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0419
A13A1	00183-66526	2	BOARD ASSY, GATE	28480	00183-66526
A13A1C1	C180-2236	1	CAPACITOR-FXD, 1PF+-.25PF 500WVDC	28480	0180-2236
A13A1C2	C180-3665		CAPACITOR-FXD, .01UF+80-20% 500WVDC	28480	0160-3665
A13A1C3	C180-3665		CAPACITOR-FXD, .01UF+80-20% 500WVDC	28480	0160-3665
A13A1C4	C180-3665		CAPACITOR-FXD, .01UF+80-20% 500WVDC	28480	0160-3665
A13A1C5	C180-3665		CAPACITOR-FXD, .01UF+80-20% 500WVDC	28480	0160-3665
A13A1C6	C180-2239	1	CAPACITOR-FXD, 1.8PF+-.25PF 500WVDC	28480	0160-2239
A13A1C7	C121-0168	2	CAPACITOR, VAR, TRMR, PSTN, 2-1.5PF	28480	0121-0168
A13A1C8	C121-0168		CAPACITOR, VAR, TRMR, PSTN, 2-1.5PF	28480	0121-0168
A13A1C9	0160-3665		CAPACITOR FXD, 01UF+80 20% 500WVDC	28480	0160-3665
A13A1C10	C180-3665		CAPACITOR-FXD, .01UF+80-20% 500WVDC	28480	0160-3665
A13A1C11	C185C-0052		CAPACITOR-FXD, .05UF+-20% 400WVDC	28480	0150-0052
A13A1C12	C180-2204	3	CAPACITOR-FXD, 100PF+-5% 300WVDC	28480	0160-2204
A13A1C13	C180-2204		CAPACITOR-FXD, 100PF+-5% 300WVDC	28480	0160-2204

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A13A1C14	C160-0157	2	CAPACITOR-FXD .0047UF +-10% 200WVDC	56289	292P47292
A13A1C15	0150-0052		CAPACITOR-FXD .05UF +-20% 400WVDC	28480	0150-0052
A13A1C16	C160-0157		CAPACITOR-FXD .0047UF +-10% 200WVDC	56289	292P47292
A13A1C17	C18C-0100		CAPACITOR-FXD 4.7UF +-10% 35VDC TA	56289	150D475X9035R2
A13A1C18	C16C-3450	1	CAPACITOR-FXD .0005UF +-10% 250WVDC	28480	0160-3450
A13A1C19			NOT ASSIGNED		
A13A1C20	C16C-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC	28480	0160-3665
A13A1C21	C18C-0100		CAPACITOR-FXD 4.7UF +-10% 35VDC TA	56289	150D475X9035R2
A13A1C22	C16C-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC	28480	0160-3665
A13A1C23	C18C-0100		CAPACITOR-FXD 4.7UF +-10% 35VDC TA	56289	150D475X9035R2
A13A1C24	C160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC	28480	0160-3665
A13A1C25	C18C-0100		CAPACITOR-FXD 4.7UF +-10% 35VDC TA	56289	150D475X9035R2
A13A1C26	C16C-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC	28480	0160-3665
A13A1C27	C18C-0100		CAPACITOR-FXD 4.7UF +-10% 35VDC TA	56289	150D475X9035R2
A13A1C28	C15C-0052		CAPACITOR-FXD .05UF +-20% 400WVDC	28480	0150-0052
A13A1C29	C15C-0052		CAPACITOR-FXD .05UF +-20% 400WVDC	28480	0150-0052
A13A1C30	0160-2204		CAPACITOR-FXD 100PF +-5% 300WVDC	28480	0160-2204
A13A1C31	C18C-0251	1	CAPACITOR-FXD 10F +-10% 35VDC TA-SOLID	56289	150D106X9035A2
A13A1C32			NOT ASSIGNED		
A13A1C33	C15C-0052		CAPACITOR-FXD .05UF +-20% 400WVDC	28480	0150-0052
A13A1CR1	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR2	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR3	1901-0347	1	DIODE: SCHOTTKY 8V MAX VRM	28480	1901-0347
A13A1CR4	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR5	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR6	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR7	1901-0026		DIODE: PWR RECT 200V MAX VRM 750MA	04713	SR1354-8
A13A1CR8	1901-0490		DIODE: HV RECT 5KV MAX VRM 250MA	04713	SR1510-5
A13A1CR9			NOT ASSIGNED		
A13A1CR10	1901-0026		DIODE: PWR RECT 200V MAX VRM 750MA	04713	SR1354-8
A13A1CR11	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR12	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR13	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR14	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR15	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR16	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR17	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR18	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR19	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR20	1901 0040		DIODE, SWITCHING, 30V MAX VRM 50MA	28480	1901 0040
A13A1CR21	1901 0040		DIODE, SWITCHING, 30V MAX VRM 50MA	28480	1901 0040
A13A1CR22	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR23	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR24	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1CR25	1901-0040		DIODE: SWITCHING 30V MAX VRM 50MA	28480	1901-0040
A13A1L1	9170 0029		CORE FERRITE BEAD	28480	9170 0029
A13A1Q1	1854-0345	5	TRANSISTOR: NPN 2N5179 SI PD=200MW	04713	2N5179
A13A1Q2	1854-0015		TRANSISTOR: NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A13A1Q3	1853-0203		TRANSISTOR: PNP SI CHIP, PD=360MW	28480	1853-0203
A13A1Q4	1853-0203		TRANSISTOR: PNP SI CHIP, PD=360MW	28480	1853-0203
A13A1Q5	1854-0015		TRANSISTOR: NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A13A1Q6	1854-0015		TRANSISTOR: NPN SI, PD=360MW FT=500MHZ	28480	1854-0019
A13A1Q7	1853-0203		TRANSISTOR: PNP SI CHIP, PD=360MW	28480	1853-0203
A13A1Q8			NOT ASSIGNED		
A13A1Q9			NOT ASSIGNED		
A13A1Q10	1853-0036		TRANSISTOR: PNP SI CHIP, PD=310MW	28480	1853-0036
A13A1Q11	1854-0215		TRANSISTOR: NPN SI, PD=310MW FT=300MHZ	04713	SPS 3611
A13A1Q12	1854-0215		TRANSISTOR: NPN SI, PD=310MW FT=300MHZ	04713	SPS 3611
A13A1Q13	1853-0036		TRANSISTOR: PNP SI CHIP, PD=310MW	28480	1853-0036
A13A1Q14	1854-0215		TRANSISTOR: NPN SI, PD=310MW FT=300MHZ	04713	SPS 3611
A13A1Q15	1853-0036		TRANSISTOR: PNP SI CHIP, PD=310MW	28480	1853-0036
A13A1Q16	1854-0215		TRANSISTOR: NPN SI, PD=310MW FT=300MHZ	04713	SPS 3611
A13A1Q17	1854-0215		TRANSISTOR: NPN SI, PD=310MW FT=300MHZ	04713	SPS 3611
A13A1Q18	1854-0215		TRANSISTOR: NPN SI, PD=310MW FT=300MHZ	04713	SPS 3611
A13A1Q19	1853-0036		TRANSISTOR: PNP SI CHIP, PD=310MW	28480	1853-0036
A13A1Q20	1854-0215		TRANSISTOR: NPN SI, PD=310MW FT=300MHZ	04713	SPS 3611
A13A1Q21	1853-0086		TRANSISTOR: PNP SI CHIP, PD=310MW	28480	1853-0086
A13A1R1	C157-C4CC	1	RESISTOR-FXD 90.9 OHM 1% .125W F	24546	C4-1/8-TO-90R9-F
A13A1R2	0757-C4C7		RESISTOR-FXD 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-TO-201-F
A13A1R3	0757-04C7		RESISTOR-FXD 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-TO-201-F
A13A1R4	C084-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CH4721
A13A1R5	C084-3921		RESISTOR-FXD 3.9K 10% .25W CC TUBULAR	01121	CH3921
A13A1R6	C084-1011	5	RESISTOR-FXD 100 OHM 10% .25W CC	01121	CH1011
A13A1R7	0757-0458		RESISTOR-FXD 51.1K 1% .125W F TUBULAR	24546	C4-1/8-TO-5112-F
A13A1R8	0757-0273	2	RESISTOR-FXD 3.01K 1% .125W F TUBULAR	24546	C4-1/8-TO-3011-F
A13A1R9	2100-2497	1	RESISTOR, VAR, TRMR, 2K OHM 10% C	19701	ET504202

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
A13A1R10	0757-0419	1	RESISTOR-FXD 681 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-681R-F
A13A1R11	C684-1011		RESISTOR-FXD 100 OHM 10% .25W CC	01121	CB1011
A13A1R12	C684-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A13A1R13	C684-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A13A1R14	C684-1011		RESISTOR-FXD 100 OHM 10% .25W CC	01121	CB1011
A13A1R15	C757-0409	2	RESISTOR-FXD 274 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-274R-F
A13A1R16	C757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A13A1R17	0757-0437		RESISTOR-FXD 4.75K 1% .125W F TUBULAR	24546	C4-1/8-T0-4751-F
A13A1R18	C684-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A13A1R19	C757-0430	3	RESISTOR-FXD 2.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-2211-F
A13A1R20	C757-0274		RESISTOR-FXD 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A13A1R21	2100-1986	1	RESISTOR, VAR, TRMR, 1K OHM 10% C	28480	2100-1986
A13A1R22	C757-0715		RESISTOR-FXD 475 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-475R-F
A13A1R23	C684-1011		RESISTOR-FXD 100 OHM 10% .25W CC	01121	CB1011
A13A1R24	C684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A13A1R25	C684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A13A1R26	C684-1011		RESISTOR-FXD 100 OHM 10% .25W CC	01121	CB1011
A13A1R27	C757-0829		RESISTOR-FXD 3.65K 1% .5W F TUBULAR	30983	MF7C1/2-T0-3651-F
A13A1R28	C757-0829		RESISTOR-FXD 3.65K 1% .5W F TUBULAR	30983	MF7C1/2-T0-3651-F
A13A1R29	C757-0430		RESISTOR-FXD 2.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-2211-F
A13A1R30	C757-0725		RESISTOR-FXD 475 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-475R-F
A13A1R31	C757-0190	1	RESISTOR-FXD 20K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2002-F
A13A1R32	C684-1011		RESISTOR-FXD 100 OHM 10% .5W CC TUBULAR	01121	EB1011
A13A1R33	0764-0046	1	RESISTOR-FXD 33K 5% 2W MO TUBULAR	24546	FP42-2-T00-3302-J
A13A1R34	C644-4711	2	RESISTOR-FXD 470 OHM 10% .25W CC	01121	CB4711
A13A1R35	C757-0415		RESISTOR-FXD 475 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-475R-F
A13A1R36	C757-0430		RESISTOR-FXD 2.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-2211-F
A13A1R37	C757-0441	1	RESISTOR-FXD 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F
A13A1R38	0757-0200	1	RESISTOR-FXD 5.62K 1% .125W F TUBULAR	24546	C4-1/8-T0-5621-F
A13A1R39	C757-0427		RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A13A1R40	0757-0409		RESISTOR-FXD 274 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-274R-F
A13A1R41	C684-1021	1	RESISTOR-FXD 1K 10% .25W CC TUBULAR	01121	CB1021
A13A1R42	C684-1031		RESISTOR-FXD 10K 10% .25W CC TUBULAR	01121	CB1031
A13A1R43	C757-0458		RESISTOR-FXD 51.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-5112-F
A13A1R44	C684-4711		RESISTOR-FXD 470 OHM 10% .25W CC	01121	CB4711
A13A1R45	C684-1221	1	RESISTOR-FXD 1.2K 10% .25W CC TUBULAR	01121	CB1221
A13A1R46			NOT ASSIGNED		
A13A1R47	C684-4731	1	RESISTOR-FXD 47K 10% .25W CC TUBULAR	01121	CB4731
A13A1R48			NOT ASSIGNED		
A13A1R49	C684-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A13A1R50	C684-1031		RESISTOR-FXD 10K 10% .25W CC TUBULAR	01121	CB1031
A13A1R51	C684-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A13A1R52	C684-1041		RESISTOR-FXD 100K 10% .25W CC TUBULAR	01121	CB1041
A13A1R53	C757-0273		RESISTOR-FXD 3.01K 1% .125W F TUBULAR	24546	C4-1/8-T0-3011-F
A13A1R54	0757-0442	3	RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A13A1R55	2100-2216	1	RESISTOR, VAR, TRMR, 5K OHM 10% C	28480	2100-2216
A13A1R56	C684-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A13A1R57	C757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A13A1R58	C684-4721		RESISTOR-FXD 4.7K 10% .25W CC TUBULAR	01121	CB4721
A13A1R59	C684-2231	2	RESISTOR-FXD 22K 10% .25W CC TUBULAR	01121	CB2231
A13A1R60	C757-0443		RESISTOR-FXD 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A13A1R61	C757-0435		RESISTOR-FXD 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A13A1R62	C684-2231		RESISTOR-FXD 22K 10% .25W CC TUBULAR	01121	CB2231
A13A1R63	C695-0002		RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB68G1
A13A1R64	C695-0002		RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB68G1
A13A1R65	C695-0002		RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB68G1
A13A1R66	C695-0002		RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB68G1
A13A1R67	C695-0002		RESISTOR-FXD 6.8 OHM 10% .5W CC TUBULAR	01121	EB68G1
A13A1R68	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A13A1R69	C757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A13A1R70	C684-3311		RESISTOR-FXD 330 OHM 10% .25W CC	01121	CB3311
A13A1R71	C684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A13A1R72	C757-0477	2	RESISTOR-FXD 332K 1% .125W F TUBULAR	30983	MF4C1/8-T0-3323-F
A13A1R73	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A13A1VR1	1902-0519	1	DIODE: ZENER: 5.1V VZ: .4W MAX PD	28480	1902-0519
A13A1VR2	1902-0041		DIODE: ZENER: 5.11V VZ: .4W MAX PD	04713	SZ 10939-98
A13A1VR3	1902-0041		DIODE: ZENER: 5.11V VZ: .4W MAX PD	04713	SZ 10939-98
A13A1VR4	1902-0202	1	DIODE: ZENER: 13V VZ: 1W MAX PD	04713	SZ11213-191
A13A1VR5	1902-3024	1	DIODE: ZENER: 2.87V VZ: .4W MAX PD	04713	SZ 10939-26
A14	00183 69629	1	GATE BOARD MODULE (183B ONLY)	28480	00183-69521
A14MP1	C0183-01219	1	BRACKET:CAT "A" BOARD	28480	00183-01219
A14MP2	0340-0152		INSULATOR, TSTR	28480	0340-0152
A14MP3	5000-0543		HOLDER:TRANSISTOR (2 OF EACH IN GATE BD. MODULE)	28480	5000-0543
A14MP4	5020-0513		CONTACT:ELECTRICAL (2 OF EACH IN GATE BD. MODULE)	28480	5020-0513
A14MP5	0340-0039		TERMINAL BUSHING (2 OF EACH IN GATE BD. MODULE)	28480	0340-0039

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
A1A01	1853-0232		TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0232
A1A02	1854-0419		TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0419
A1A3	00183-66526		BOARD ASSY, GATE	28480	00183-66526
A1A4			SAME AS A13A1, USE PREFIX A14A1.		

Table 6-3. List of Manufacturers' Codes

MFR NO.	MANUFACTURER'S NAME	ADDRESS	ZIP CODE
	NO A/F DESCRIPTION FOR THIS MFG NUMBER		
00207	C F W CO INC	DANIELSON CT	06239
00853	SPRAGUE ELEC CO S CAROLINA DIV	PERKINS SC	29671
01121	ALLEN BRADLEY CO	MILWAUKEE WI	53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75231
02114	FERROXCUBE CORP	SAUGERTIES NY	12477
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE NJ	08876
03508	GE CO SEMICONDUCTOR PROD DEPT	SYRACUSE NY	13201
03888	PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
09353	C AND K COMPONENTS INC	WATERTOWN MA	02172
12954	DICKSON ELECTRONICS CORP	SCOTTSDALE AZ	85252
14655	CORNING GL WK ELEC CMPNT DIV	RALEIGH NC	27604
19701	MEPCO/ELECTRA CORP (NE MFG)	MINERAL WELLS TX	76067
24226	SYNTRON ELECTRONICS CORP	OWANDA NY	14779
24446	CORNING GLASS WORKS (C STYLE MFG)	BRADFORD PA	16701
24931	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS IN	46227
27264	MOLEX PRODUCTS CO	DOWNERS GROVE IL	60515
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
33173	MEPCO/ELECTRA CORP (VAR MFG)	SAN DIEGO CA	92121
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	92507
50434	NO A/F DESCRIPTION FOR THIS MFG NUMBER		
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
70903	BELDEN CORP	CHICAGO IL	60644
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS MO	63107
71744	CHICAGO MINIATURE LAMP WORKS	CHICAGO IL	60640
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE IL	60007
72136	ELECTRO MOTIVE MFG CO INC	WILLIMANTIC CT	06226
72982	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE PA	16512
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
73899	J F D ELECTRONICS CORP	BROOKLYN NY	11219
74970	JOHNSON E F CO	WASECA MN	56093
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTELFUSE INC	DES PLAINES IL	60016
77764	RESISTANCE PRODUCTS CO	HARRISBURG PA	17105
78526	STAINLESS WIRE DIV SAN FERNANDO ELEC	NEWBURGH NY	12550
79727	C-W INDUSTRIES	WAYNESBORO PA	17074
82389	NO A/F DESCRIPTION FOR THIS MFG NUMBER		
85471	WOVEN W CO	SAN FRANCISCO CA	94103
91637	AMPHENOL SALES DIV OF BUNKER-RAMO	HAZELWOOD MO	63042
91506	SUGAR INC	ATTLEBORO MA	02703
91827	DALE ELECTRONICS INC	COLUMBUS NE	68601
95987	KEYSTONE CO INC	CHICAGO IL	60641
97464	PRECISION RETAINING RING CO	IRVINGTON NJ	07111
98291	SEALECTRO CORP	MAMARONECK NY	10544

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 the same serial prefix shown on the manual title page. If the serial prefix of your instrument is not the same as the one on the title page, find your serial prefix in Table 7-1 and make the changes to the manual listed for that serial prefix. When making changes listed in Table 7-1, make the change with the HIGHEST number first. For example, if backdating changes 1, 2, and 3 are required for your serial prefix, make Change 3 first, then Change 2, and finally change 1. This will eliminate changing the same item more than once. If the serial prefix of your instrument is not listed on the title page or in Table 7-1, refer to the enclosed change sheets for updating information.

Table 7-1. Manual Changes

Serial Prefix	Make Changes
941— (183A)	14 thru 11 and 9 thru 1
941— (183B)	14 thru 10 and 8 thru 1
958— (183A)	14 thru 11 and 9 thru 2
963— (183B)	14 thru 10 and 8 thru 2
967— (183A)	14 thru 11 and 9 thru 3
965— (183B)	14 thru 10 and 8 thru 3
987— 183A)	14 thru 11 and 9 thru 4
987— (183B)	14 thru 10 and 8 thru 4
988— (183A)	14 thru 11 and 9 thru 5
988— (183B)	14 thru 10 and 8 thru 5
989— (183A)	14 thru 11 and 9 thru 6
989— (183B)	14 thru 10 and 8 thru 6
990—, 1107A (183A)	14 thru 11 and 9 thru 7
990— (183B)	14 thru 10 and 8, 7
1109A (183A)	14 thru 11 and 9, 8
1108A (183B)	14 thru 10 and 8
1113A, 1120A (183A)	14 thru 11 and 9
1112A, 1120A (183B)	14 thru 10
1127A	14 thru 11
1134A, 1204A (183A)	14 thru 12
1134A, 1141A (183B)	14 thru 12
1211A, 1235A (183A)	14, 13
1204A (183B)	14, 13
1251A (183A)	14
1246A, 1326A (183B)	14

CHANGE 1

Page 6-14, Table 6-2,
A11A1: Change to HP Part No. 00183-66506; BOARD ASSY: HORIZONTAL AMPLIFIER; Mfr. Code 28480; Mfr. Part No. 00183-66506.
Page 6-15, Table 6-2,
Add: A11A1L1; HP Part No. 9100-2258; COIL/CHOKE FXD 1.20 uH 10%; Mfr. Code 28480; Mfr. Part No. 9100-2258.
Page 6-17, Table 6-2,
A11A1R72: Change to HP Part No. 0757-0478; R: FXD MET FLM 365k ohms 1% 1/8W; Mfr. Code 28480; Mfr. Part No. 0757-0478.
Delete: A11A1R96.

Page 8-19, Figure 8-8,
Replace with Figure 7-1.
Page 8-19, Figure 8-9,
Add: L1; 1.2 uH between R44 and junction of R39 and Q7 emitter.
Change: A11A1R72 value to 365k ohms.
Delete: A11A1R96.

CHANGE 2

Page 6-5, and 6-12, Table 6-2,
A4: Change to HP Part No. 00183-66505; BOARD ASSY: CALIBRATOR; Mfr. Code 28480; Mfr. Part No. 00183-66505.
Page 6-13, Table 6-2,
Delete: A4R55 and A4R56.
Delete: A4VR4.

Page 6-17, Table 6-2,
A13A1: Change to HP Part No. 00183-66503; BOARD ASSY: GATE; Mfr. Code 28480; Mfr. Part No. 00183-66503.
Page 6-18, Table 6-2
Delete: A13A1C30.
A13A1CR8: Change to HP Part No. 1901-0487; DIODE: SILICON 1500 PIV; Mfr. Code 28480; Mfr. Part No. 1901-0487.
Add: A13A1CR9; HP Part No. 1901-0487; DIODE: SILICON 1500 PIV; Mfr. Code 28480; Mfr. Part No. 1901-0487.
Page 6-19, Table 6-2,
Add: A13A1R60; HP Part No. 0684-4731; R: FXD 47k ohms 10% 1/4W; Mfr. Code 28480; Mfr. Part No. 0684-4731.
Delete: A13A1R68.

Page 6-7, Table 6-2,
Add: R9; HP Part No. 0757-0464; R: FXD MET FLM 90.9k ohms 1/8W; Mfr. Code 28480; Mfr. Part No. 0757-0464.
Add: VR1; HP Part No. 1902-3357; DIODE: BREAKDOWN 56.2V 5%.

Page 8-17, Figure 8-5,
Replace with Figure 7-2,
Page 8-17, Schematic 1,
Delete: R55, R56, and VR4 and add the circuit in Figure 7-4.
Page 8-21, Figure 8-12,
Replace with Figure 7-3.
Page 8-21, Schematic 4,
Add: A13A1CR9 between A13A1CR8 and junction of A13A1R33 and unblanking gate output. Connect the anode of A13A1CR9 to the cathode of A13A1CR8.
Add: A13A1R60 value 47k ohms from TP2 to ground.
Delete: A13A1C30 and A13A1R68; connect collector of Q10 to ground.
Page 8-27, Figure 8-23,
Add the circuit in Figure 7-5.

CHANGE 3

Page 6-5, Table 6-2,
Delete: C2.

Page 6-9, Table 6-2,
A1A1R1: Change to HP Part No. 0761-0022; R: FXD MET OX 620 ohms 5% 1W; Mfr. Code 28480; Mfr. Part No. 0761-0022.

Page 6-6, Table 6-2,
MP162: Change to HP Part No. 00183-01213; BRACKET: CLAMP; Mfr. Code 28480; Mfr. Part No. 00183-01213.

Page 6-7, Table 6-2,
MP171: Change to HP Part No. 5000-0590; COVER: TOP, RIGHT (183A only); Mfr. Code 28480; Mfr. Part No. 5000-0590.
MP172: Change to HP Part No. 5000-0591; COVER: TOP, LEFT (183A only); Mfr. Code 28480; Mfr. Part No. 5000-0591.
MP173: Change to HP Part No. 00183-04105; COVER: BOTTOM, RIGHT (183A only); Mfr. Code 28480; Mfr. Part No. 00183-04105.
MP174: Change to HP Part No. 00183-04106; COVER: BOTTOM, LEFT (183A only); Mfr. Code 28480; Mfr. Part No. 00183-04106.

Page 6-8, Table 6-2,
W23: Change to HP Part No. 00183-61602; CABLE: VERTICAL INPUT, BLUE; Mfr. Code 28480; Mfr. Part No. 00183-61602.
Page 8-23, Schematic 5,
Delete: C2.
Page 8-25/8-26, Schematic 7,
A1A1R1: Change value to 620 ohms.

CHANGE 4

Page 6-9, Table 6-2,
A1W1: Change to HP Part No. 00183-61601; CABLE ASSY: POWER SUPPLY; Mfr. Code 28480; Mfr. Part No. 00183-61601.
Page 6-10, Table 6-2,
A1A2: Change to HP Part No. 00183-66508; BOARD ASSY: LOW VOLTAGE RECTIFIER; Mfr. Code 28480; Mfr. Part No. 00183-66508.
Delete: A1A2F1.
Page 6-13, Table 6-2,
A4R46: Change to HP Part No. 0757-0280; R: FXD MET FLM 1k ohms 1% 1/8W; Mfr. Code 14674; Mfr. Part No. C4.
A4R48: Change to HP Part No. 0757-0280; R: FXD MET FLM 1k ohms 1% 1/8W; Mfr. Code 14674; Mfr. Part No. C4.
Page 8-23, Figure 8-17,
A4R46: Change value to 1000 ohms.
A4R48: Change value to 1000 ohms.
Page 8-25/8-26, Figure 8-21,
Replace with Figure 7-7.
Page 8-25/8-26, Figure 8-22,
Delete: A1A2F1. Make straight-through connection.
Change: A1W1J2 pin 1 (6) wire for fan circuit to pin 4, pin 2 (8) wire to pin 1, and pin 3 (903) wire to pin 2.

CHANGE 5

Page 6-9, Table 6-2,
A1MP104: Change to HP Part No. 00183-61202; BRACKET ASSY: CAPACITOR; Mfr. Code 28480; Mfr. Part No. 00183-61202.
A1MP105: Change to HP Part No. 00183-01214; BRACKET: POWER MODULE; Mfr. Code 28480; Mfr. Part No. 00183-01214.

CHANGE 6

Page 6-17, Table 6-2,
A13A1: Change to HP Part No. 00183-66510; BOARD ASSY: GATE; Mfr. Code 28480; Mfr. Part No. 00183-66510.
Page 6-18, Table 6-2,
A13A1C16: Change to HP Part No. 0160-2145; C: FXD CER 5000 pF +80 —20% 100 VDCW; Mfr. Code 91418; Mfr. Part No. TA.
Page 6-19, Table 6-2,
A13A1R30: Change to HP Part No. 0757-0415; R: FXD MET FLM 475 ohms 1% 1/8W; Mfr. Code 28480; Mfr. Part No. 0757-0415.
Delete: A13A1R69.
Page 8-21, Figure 8-12,
Replace with Figure 7-8.
Page 8-21, Figure 8-13,
A13A1C16: Change value to 5000 pF.
Delete: A13A1R69. Connect base of A13A1Q1 directly to ground.

CHANGE 7

Page 2-1, Paragraph 2-10,
Change to read: 230V OPERATION. If the instrument is to be operated on 230 Vac, set the rear-panel VOLTS AC switch to 230. It is not necessary to change the 115V fuse. Positioning the VOLTS AC switch selects the proper fuse for the desired voltage.
Page 6-8, Table 6-2,
Add: A1F2; FUSE: CARTRIDGE 1.5A 230V SLOW BLOW; Mfr. Code 71400; Mfr. Part No. MDL 1.5.
A1J3: Change to HP Part No. 1251-0148; CONNECTOR: POWER, 3-PIN MALE; Mfr. Code 87930; Mfr. Part No. 1065-1.
A1MP100: Change to HP Part No. 00183-00210; PANEL: REAR POWER (INCLUDES A1S1); Mfr. Code 28480; Mfr. Part No. 00183-00210.
A1MP101: Increase total quantity to 2.
Add: A1MP102; HP Part No. 5020-0549; SPACER: POWER PLUG; Mfr. Code 28480; Mfr. Part No. 5020-0549.
Page 6-5, Table 6-2,
Delete: C3.
Page 6-7, Table 6-2,
W20 (183A only): Change to HP Part No. 8120-0078; CABLE ASSY: POWER CORD; Mfr. Code 28480; Mfr. Part No. 8120-0078.
Delete: W20 (183B only); HP Part No. 8120-1545.
Page 8-21, Schematic 4.
Delete: C3; capacitor connected between wire (908) on switch S2 and ground.
Page 8-25/8-26, Schematic 7,
Add: A1F2; fuse is in series with jumper wire (9) on switch A1S1.

CHANGE 8

Paragraph 5-38, Steps q and r,
Delete: A11A1C1 as an adjustment.
Page 6-14, Table 6-2,
A11A1C1: Change to HP Part No. 0160-2244; C: FXD CER 3.0 +/—0.25 pF 500 VDCW; Mfr. Code 28480; Mfr. Part No. 0160-2244.
Page 6-5 and 6-17, Table 6-2,
A13: Change to HP Part No. 00183-69506; GATE BOARD MODULE (183A only); Mfr. Code 28480; Mfr. Part No. 00183-69506.
Page 6-17, Table 6-2,
A13A1: Change to HP Part No. 00183-66514; BOARD ASSY: GATE; Mfr. Code 28480; Mfr. Part No. 00183-66514.
Page 6-18, Table 6-2,
Delete: A13A1C31.
Add: A13A1CR20; HP Part No. 1901-0040; DIODE: SILICON 30 MA 30 WV; Mfr. Code 07263; Mfr. Part No. FDG 1088.
Add: A13A1CR21; HP Part No. 1901-0040; DIODE: SILICON 30 MA 30 WV; Mfr. Code 07263; Mfr. Part No. FDG1088.
Page 6-19, Table 6-2,
A13A1R61: Change to HP Part No. 0684-2731; R: FXD COMP 27k ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 2731.
Page 6-19, Table 6-2,
Delete: A13A1VR5.
Page 6-5 and 6-19, Table 6-2,
A14: Change to HP Part No. 00183-69507; GATE BOARD MODULE (183B only); Mfr. Code 28480; Mfr. Part No. 00183-69507.
Page 6-20, Table 6-2,
A14A1: Change to HP Part No. 00183-66510; BOARD ASSY: GATE (same as A13A1); Mfr. Code 28480; Mfr. Part No. 00183-66510.
Page 6-7, Table 6-2,
W21: Change to HP Part No. 00183-61603; CABLE ASSY: MAIN (183A only); Mfr. Code 28480) Mfr. Part No. 00183-61603.
Page 6-8, Table 6-2,
Add: W21R3; HP Part No. 0684-4711; R: FXD COMP 470 ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB4711.
W22: Change to HP Part No. 00183-61604; CABLE ASSY: MAIN (183B only); Mfr. Code 28480; Mfr. Part No. 00183-61604.
Page 8-19, Schematic 2,
A11A1C1: Change to fixed capacitor and value to 3 pF.
Page 8-21, Schematic 4,
Make circuit changes indicated in Figure 7-9.
Page 8-21, Schematic 4,
A13A1R61: Change value to 27k ohms.

CHANGE 9

Page 6-6, Table 6-2,
MP160: Change to HP Part No. 00183-01202; BRACKET: CALIBRATOR (183A only); Mfr. Code 28480; Mfr. Part No. 00183-01202.
Delete: MP163; HP Part No. 00183-01237.
Page 6-7, Table 6-2,
MP171: Change to HP Part No. 5000-8424; COVER: TOP RIGHT (183A only); Mfr. Code 28480; Mfr. Part No. 5000-8424.
MP172: Change to HP Part No. 5000-8425; COVER: TOP LEFT (183A only); Mfr. Code 28480; Mfr. Part No. 5000-8425.
MP173: Change to HP Part No. 00183-04107; COVER: BOTTOM RIGHT (183A only); Mfr. Code 28480; Mfr. Part No. 00183-04107.
MP174: Change to HP Part No. 00183-04108; COVER: BOTTOM LEFT (183A only); Mfr. Code 28480; Mfr. Part No. 00183-04108.

CHANGE 10

Page 6-6, Table 6-2,
Add: MP161; HP Part No. 00183-01226; BRACKET: CALIBRATOR (183B only); Mfr. Code 28480; Mfr. Part No. 00183-01226.
MP163: HP Part No. 00183-01211. Delete (183B only) after description.
Page 6-7, Table 6-2,
MP175: Change to HP Part No. 5000-0444; COVER: SIDE (183B only); Mfr. Code 28480; Mfr. Part No. 5000-0444.

MP176: Change to HP Part No. 5000-0445; COVER: BOTTOM (183B only); Mfr. Code 28480; Mfr. Part No. 5000-0445.
MP177: Change to HP Part No. 5000-0446; COVER: TOP (183B only); Mfr. Code 28480; Mfr. Part No. 5000-0446.
MP184: Change to HP Part No. 5060-0552; KIT; 5H RACK MOUNT (183B only); Mfr. Code 28480; Mfr. Part No. 5060-0552.

CHANGE 11

Page 6-5 and 6-14, Table 6-2,
A11: Change to HP Part No. 00183-69504; HORIZONTAL AMPL MODULE (183A only); Mfr. Code 28480; Mfr. Part No. 00183-69504.
Page 6-14, Table 6-2,
A11MP1: Change to HP Part No. 00183-01224; BRACKET: HORIZONTAL AMPL (183A only); Mfr. Code 28480; Mfr. Part No. 00183-01224.
Page 6-5 and 6-17, Table 6-2,
A12: Change to HP Part No. 00183-69505; HORIZONTAL AMPL MODULE (183B only); Mfr. Code 28480; Mfr. Part No. 00183-69505.
Page 6-17, Table 6-2,
A12MP1: Change to HP Part No. 00183-01225; BRACKET: HORIZONTAL AMPL (183B only); Mfr. Code 28480; Mfr. Part No. 00183-01225.
Page 6-6, Table 6-2,
MP136: Change to HP Part No. 00183-60105; CHASSIS ASSY: DISPLAY (183A only); Mfr. Code 28480; Mfr. Part No. 00183-60105.
MP137: Change to HP Part No. 00183-60101; CHASSIS ASSY: DISPLAY (183B only); Mfr. Code 28480; Mfr. Part No. 00183-60101.

CHANGE 12

Page 6-17, Table 6-2,
A13A1: Change to HP Part No. 00183-66518; BOARD ASSY: GATE; Mfr. Code 28480; Mfr. Part No. 00183-66518.
Page 6-18, Table 6-2,
Delete: A13A1CR25.
Page 6-19, Table 6-2,
A13A1R44: Change to HP Part No. 0684-1021; R: FXD COMP 1000 ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 1021.
A13A1R45: Change to HP Part No. 0584-1021; R: FXD COMP 1000 ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 1021
Add: A13A1R46; HP Part No. 0684-4721; R: FXD COMP 4700 ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 4721.
Add: A13A1R48; HP Part No. 0684-4711; R: FXD COMP 470 ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 4711.
Delete: A13A1R70.
Delete: A13A1R71.

Page 6-7, Table 6-2,
Delete: MP187.
Page 8-21, Schematic 4,
Replace: A13A1CR25 with A13A1R48. Value of resistor is 470 ohms.
A13A1R44: Change value to 1000 ohms.
A13A1R45: Change value to 1000 ohms.
Add: A13A1R46; insert in series between —12.6VF(B) supply and collector of A13A1Q15.
Delete: A13A1R70; make straight-through connection.
Delete: A13A1R71.

CHANGE 13

Page 6-5 and 6-12, Table 6-2,
A4: Change to HP Part No. 00183-66512; BOARD ASSY: CALIBRATOR, Mfr. Code 28480; Mfr. Part No. 00183-66512.
Page 6-6, Table 6-2,
MP158: Change to HP Part No. 00183-23702; SHAFT: ASTIGMATISM; Mfr. Code 28480; Mfr. Part No. 00183-23702.
Page 8-25, Schematic 7 and Page 8-27, Figure 8-23, Change primary power circuit wiring color codes to those shown in Figure 7-10.

CHANGE 14

Section V,
Delete adjustment procedures in paragraphs 5-29. FOCUS ADJUSTMENT and 5-30. FLOODGUN ADJUSTMENT.
Page 6-5, Table 6-2,
Delete: CR1.
Page 6-7, Table 6-2,
Delete: R8.
Page 6-5, Table 6-2,
Add: C3; HP Part No. 0150-0023; C: FXD CER 2000 pF 20% 1000 VDCW; Mfr. Code 56289; Mfr. Part No. 20C295A2-CDH.
Page 6-7, Table 6-2,
R2: Change to HP Part No. 2100-2920; R: VAR COMP 100k ohms 20% 10 CLOG 1/4W; Mfr. Code 28480; Mfr. Part No. 2100-2920.
W21: Change to HP Part No. 00183-61634; CABLE ASSY: MAIN (183A only); Mfr. Code 28480; Mfr. Part No. 00183-61634.
W22: Change to HP Part No. 00183-61635; CABLE ASSY: MAIN (183B only); Mfr. Code 28040; Mfr. Part No. 00183-61635.

Page 6-5 and 6-12, Table 6-2,
A4: Change to HP Part No. 00183-66523; BOARD ASSY: CALIBRATOR (LESS A4U1); Mfr. Code 28480; Mfr. Part No. 00183-66523.
Page 6-12, Table 6-2,
Delete: A4C21.
Delete: A4CR4, A4CR5, and A4CR6.
Delete: A4Q7, A4Q8, A4Q9, and A4Q10.

Page 6-13, Table 6-2,
Add: A4R55; HP Part No. 0757-0280; R: FXD MET FLM 1k ohms 1% 1/8W; Mfr. Code 14674; Mfr. Part No. C4.
Add: A4R56; HP Part No. 0757-0464 R: FXD MET FLM 90.9k ohms 1% 1/8W; Mfr. Code 28480; Mfr. Part No. 0757-0464.
Delete: A4R57.
Delete: A4R59.
Delete: A4R60.
Delete: A4R61.
Delete: A4R62.
Add: A4VR4; HP Part No. 1902-3357; DIODE: BREAKDOWN, 56.2V 5%; Mfr. Code 28480; Mfr. Part No. 1902-3357.

Page 6-5 and 6-13, Table 6-2,
A7: Change to HP Part No. 00183-66501; BOARD ASSY: HIGH VOLTAGE REGULATOR; Mfr. Code 28480; Mfr. Part No. 00183-66501.

Page 6-14, Table 6-2,
Delete: A7R22.
Page 6-5 and 6-17, Table 6-2,
A13: Change to HP Part No. 00183-69520; GATE BOARD MODULE (183A only); Mfr. Code 28480; Mfr. Part No. 00183-69520.
Page 6-17, Table 6-2,
A13A1: Change to HP Part No. 00183-66521; BOARD ASSY: GATE; Mfr. Code 28480; Mfr. Part No. 00183-66521.
Page 6-18, Table 6-2,
A13A1C16: Change to HP Part No. 0160-0158; C: FXD MYLAR 5600 pF 10%, Mfr. Code 56289; Mfr. Part No. 192P56292-P'TS.

A13A1C18: Change to HP Part No. 0160-3665; C: FXD CER 0.01 uF +85 —20% 500 VDCW; Mfr. Code 72982; Mfr. Part No. 811-014-Y5U0-103Z.
Page 6-18, Table 6-2,
Add: A13A1C19; HP Part No. 0160-3665; C: FXD CER 0.01 uF +85 —20% 500 VDCW; Mfr. Code 72982; Mfr. Part No. 811-014-Y5U0-103Z.
Delete: A13A1C33, A13A1CR20, and A13A1CR21.
Delete: A13A1Q20 and A13A1Q21.

A13A1R5: Change to HP Part No. 0684-1031; R: FXD COMP 10k ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 1031.

Page 6-19, Table 6-2,

A13A1R53: Change to HP Part No. 0684-1021; R: FXD COMP 1000 ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 1021.

A13A1R54: Change to HP Part No. 0684-4731; R: FXD COMP 47k ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 4731.

A13A1R55: Change to HP Part No. 0684-1031; R: FXD COMP 10k ohms 10% 1/4W Mfr. Code 01121; Mfr. Part No. CB 1031.

Page 6-19, Table 6-2,
A13A1R57: Change to HP Part No. 0684-4711; R: FXD COMP 470 ohms 10% 1/4W Mfr. Code 01121; Mfr. Part No. CB 4711.
A13A1R59: Change to HP Part No. 0684-1041; R: FXD COMP 100k ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 1041.
Delete: A13A1R60.
A13A1R61: Change to HP Part No. 0684-1531; R: FXD COMP 15k ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 1531.
A13A1R62: Change to HP Part No. 0684-1031; R: FXD COMP 10k ohms 10% 1/4W; Mfr. Code 01121; Mfr. Part No. CB 1031.
Delete: A13A1R72 and A13A1R73.

Page 6-5 and 6-19, Table 6-2,
A14: Change to HP Part No. 00183-69521; GATE BOARD MODULE (183B only); Mfr. Code 28480; Mfr. Part No. 00183-69521.
Page 6-20, Table 6-2,
A14A1: Change to HP Part No. 00183-66521; BOARD ASSY: GATE (same as A13A1); Mfr. Code 28480; Mfr. Part No. 00183-36521.
Page 8-17, Figure 8-5,
Replace with Figure 7-11.
Page 8-17, Schematic 1,
Replace with Figure 7-12.
Page 8-21, Figure 8-12,
Replace with Figure 7-13.
Page 8-21, Schematic 4,
Replace with Figure 7-14.
Page 8-23, Schematic 5,
Delete A7R22 and square-pin connector that goes to A4 pin Z on Schematic 1. Connect former junction of A7R12/A7R22 to ground.
CRT pin W: Change to pin T. Show to A4R55 on Schematic 1.

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. The following options for the Model 183A/B are available.

a. OPTION 002: Standard CRT (V1) is replaced by internal graticule P2 phosphor CRT; HP Part No. 5083-2070.

b. OPTION 003: Standard instrument with a line filter added. Line filter (FL100) HP Part No. 9100-2483, two cap (C100, C101) HP Part No. 0160-0151. Hook up as shown in Figure 7-6.

c. OPTION 004: Standard CRT (V1) is replaced by internal graticule P4 phosphor CRT; HP Part No. 5083-2074.

d. OPTION 005 (183B only): Standard CRT (V1) is replaced by special CRT; HP Part No. 5083-4352. A special CRT shield, HP Part No. 00183-00604, and CRT mask, HP Part No. 00183-04111, are also provided. Replacements for the CRT, shield, and mask must be ordered directly from HP Colorado Springs Division using the above part numbers and specifying for use in Model 183B/Option 005. When appropriate changes are made in Table 6-2, the operating and service manual will apply to this special instrument.

RETROFIT KIT: A retrofit kit for field installation of Option 005 on the 183A/B/D is available. Contact the HP field sales office in your area for details.

e. OPTION 007: Standard CRT (V1) is replaced by internal graticule P7 phosphor CRT; HP Part No. 5083-2071. An amber CRT filter, HP Part No. 5020-0530, is also provided.

f. OPTION 011: Standard CRT (V1) is replaced by internal graticule P11 phosphor CRT; HP Part No. 5083-2072 (see paragraph 7-11).

NOTE

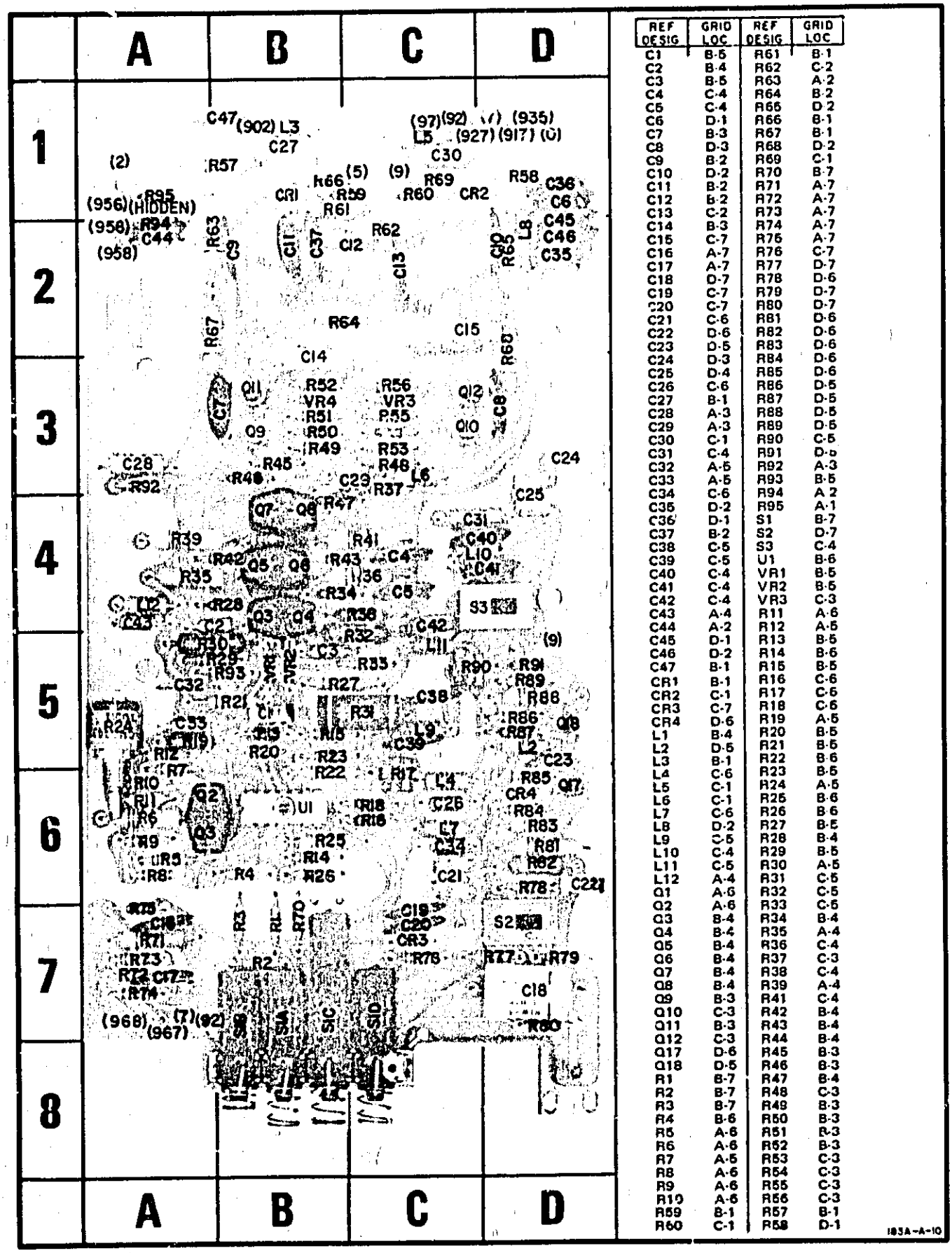
The intensification feature of FIND BEAM has been disabled by disconnecting the (958) wire from pin 14 of A8A1. See schematic 4.

g. OPTION X95: Mainframe with blue-gray covers. Order replacement parts as listed in Table 7-2.

Table 7-2. Parts List for Option X95

Ref. Desig.	HP Part No.	Description
MP 171	5000-8424	Cover, top right
MP 172	5000-8425	Cover, top left
MP 173	00183-04107	Cover, bottom right
MP 174	00183-04108	Cover, bottom left
MP 175	5000-0444	Cover, side, rack
MP 176	5000-0445	Cover, bottom, rack
MP 177	4000-0446	Cover, top, rack
MP 184	5000-0551	Kit, rack mount

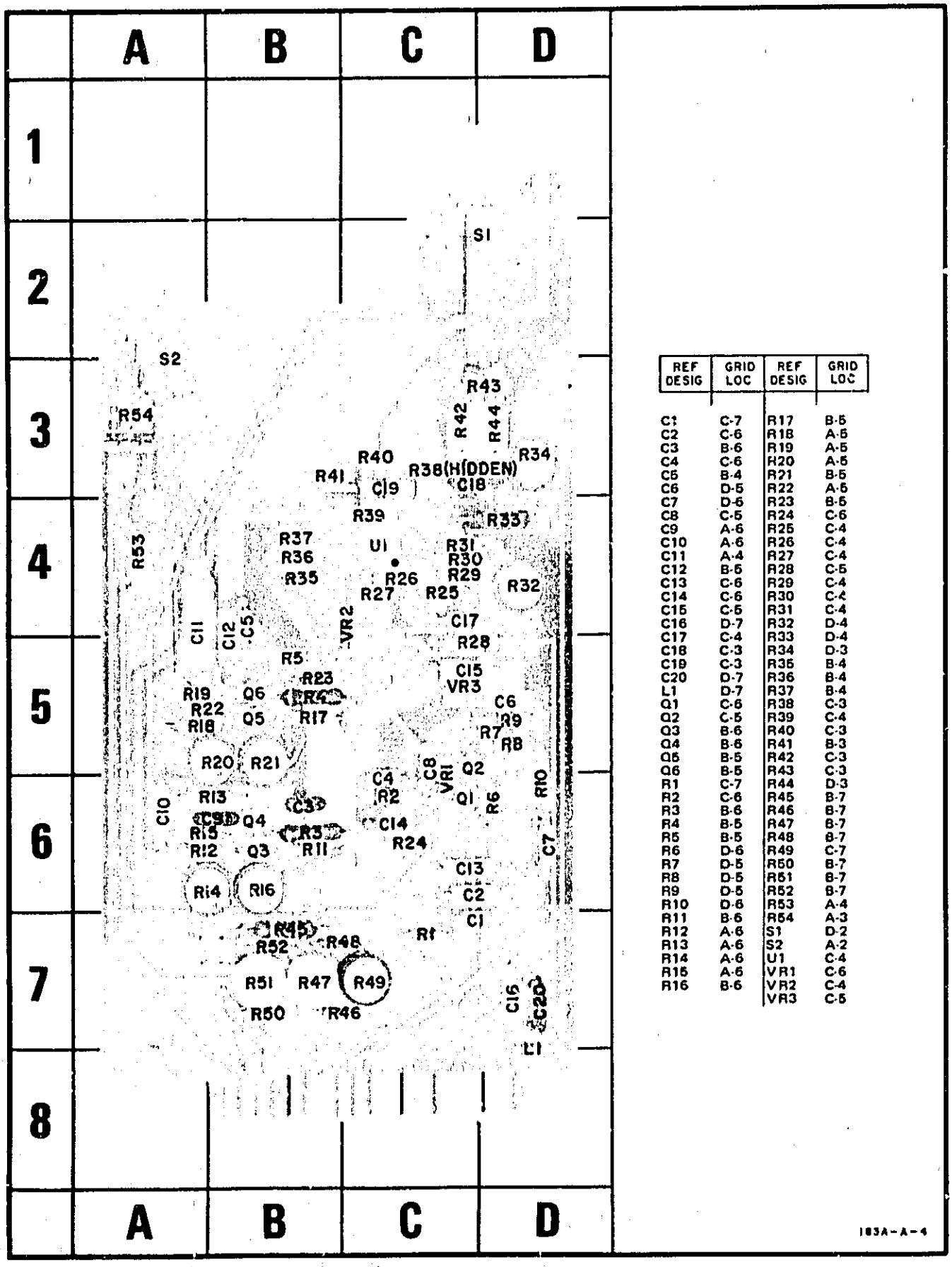
7-11. On instruments with CRT's that have sensitive phosphors the intensifying portion of the FIND BEAM switch may have been disconnected by removing the (958) wire from W21J4 pin 14 (see schematic 4). To hook up the intensifying portion of the FIND BEAM switch locate the end of the (958) wire (in the cable), take off the shrink tubing, and solder the wire to W21J4 pin 14.



REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-5	R61	B-1
C2	B-4	R62	C-2
C3	B-5	R63	A-2
C4	C-4	R64	B-2
C5	C-4	R66	D-2
C6	D-1	R66	B-1
C7	B-3	R67	B-1
C8	D-3	R68	D-2
C9	B-2	R69	C-1
C10	D-2	R70	B-7
C11	B-2	R71	A-7
C12	B-2	R72	A-7
C13	C-2	R73	A-7
C14	B-3	R74	A-7
C15	C-7	R75	A-7
C16	A-7	R76	C-7
C17	A-7	R77	D-7
C18	D-7	R78	D-6
C19	C-7	R79	D-7
C20	C-7	R80	D-7
C21	C-6	R81	D-6
C22	D-6	R82	D-6
C23	D-5	R83	D-6
C24	D-3	R84	D-6
C25	D-4	R85	D-6
C26	C-6	R86	D-5
C27	B-1	R87	D-5
C28	A-3	R88	D-5
C29	A-3	R89	D-5
C30	C-1	R90	C-5
C31	C-4	R91	D-5
C32	A-5	R92	A-3
C33	A-5	R93	B-5
C34	C-6	R94	A 2
C35	D-2	R95	A-1
C36	D-1	S1	B-7
C37	B-2	S2	D-7
C38	C-5	S3	C-4
C39	C-5	U1	B-6
C40	C-4	VR1	B-5
C41	C-4	VR2	B-5
C42	C-4	VR3	C-3
C43	A-4	R11	A-6
C44	A-2	R12	A-5
C45	D-1	R13	B-5
C46	D-2	R14	B-6
C47	B-1	R15	B-5
CR1	B-1	R16	C-6
CR2	C-1	R17	C-6
CR3	C-7	R18	C-6
CR4	D-6	R19	A-5
L1	B-4	R20	B-5
L2	D-5	R21	B-5
L3	B-1	R22	B-6
L4	C-6	R23	B-5
L5	C-1	R24	A-5
L6	C-1	R25	B-6
L7	C-6	R26	B-6
L8	D-2	R27	B-5
L9	C-5	R28	B-4
L10	C-4	R29	B-5
L11	C-5	R30	A-5
L12	A-4	R31	C-5
Q1	A-6	R32	C-5
Q2	A-6	R33	C-5
Q3	B-4	R34	B-4
Q4	B-4	R35	A-4
Q5	B-4	R36	C-4
Q6	B-4	R37	C-3
Q7	B-4	R38	C-4
Q8	B-4	R39	A-4
Q9	B-3	R41	C-4
Q10	C-3	R42	B-4
Q11	B-3	R43	B-4
Q12	C-3	R44	B-4
Q17	D-6	R45	B-3
Q18	D-5	R46	B-3
R1	B-7	R47	B-4
R2	B-7	R48	C-3
R3	B-7	R49	B-3
R4	B-6	R50	B-3
R5	A-6	R51	B-3
R6	A-6	R52	B-3
R7	A-5	R53	C-3
R8	A-6	R54	C-3
R9	A-6	R55	C-3
R10	A-6	R56	C-3
R59	B-1	R57	B-1
R60	C-1	R58	D-1

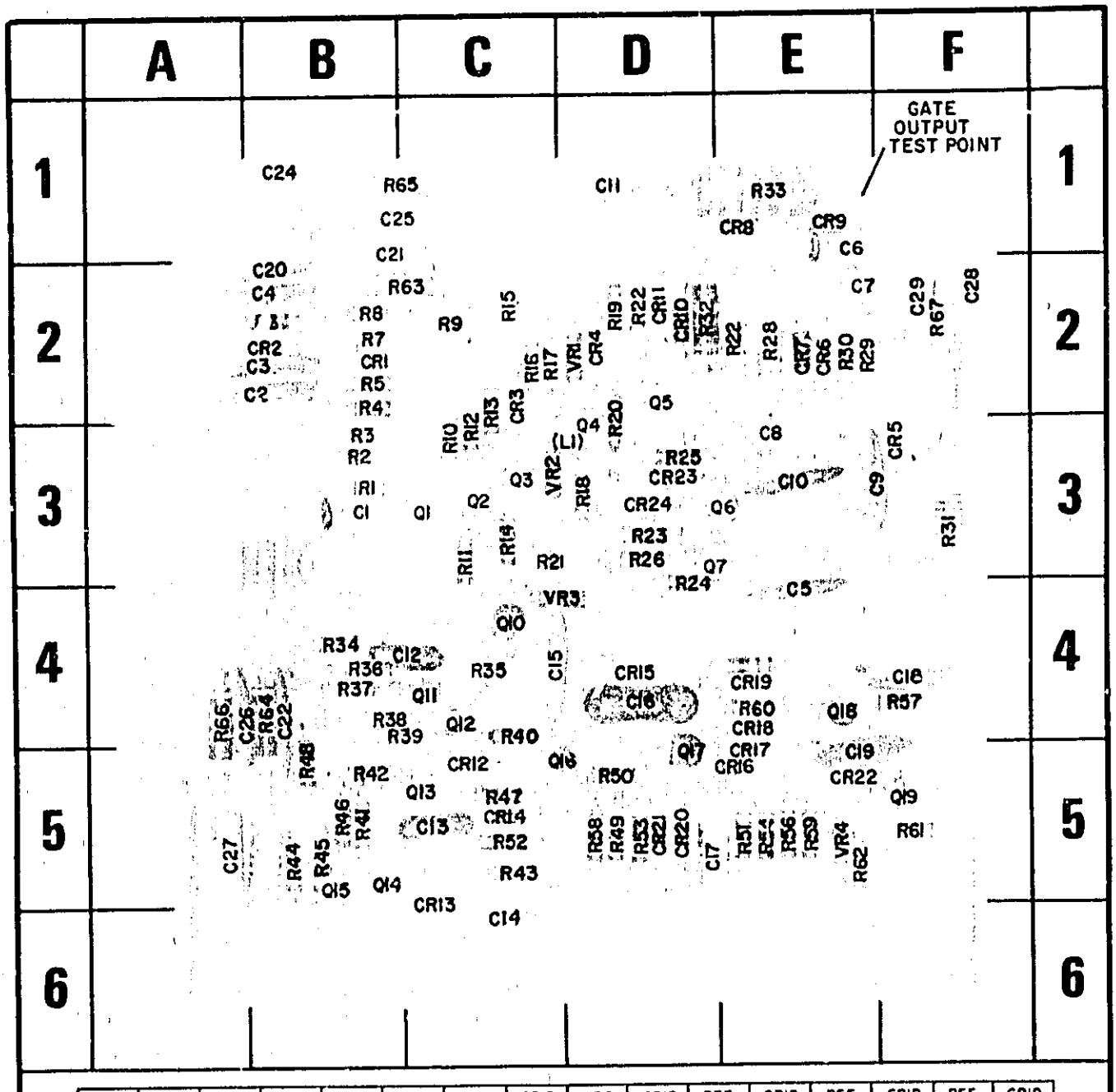
183A-A-10

Figure 7-1. Component Locations, Horizontal Amplifier Board A11A1



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

Figure 7-2. Component Locations, Calibrator Board A4



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	C19	E-4	CR8	E-1	Q1	C-3	Q19	F-5	R18	D-3	R36	B-4	R54	E-5
C2	B-2	C20	B-2	CR9	E-1	Q2	C-3	R1	B-3	R19	D-2	R37	B-4	R55	E-4
C3	B-2	C21	C-2	CR10	D-2	Q3	C-3	R2	B-3	R20	D-3	R38	C-4	R56	E-5
C4	B-2	C22	B-4	CR11	D-2	Q4	D-3	R3	B-3	R21	D-3	R39	C-4	R57	F-4
C5	E-4	C23	B-5	CR12	C-5	Q5	D-3	R4	B-3	R22	D-2	R40	C-4	R58	D-5
C6	E-2	C24	B-1	CR13	C-5	Q6	E-3	R5	C-2	R23	D-3	R41	B-5	R59	E-5
C7	E-2	C25	C-1	CR14	C-5	Q7	E-3	R6	B-2	R24	D-4	R42	B-5	R60	E-4
C8	E-3	C26	B-4	CR15	D-4	Q8	E-3	R7	C-2	R25	D-3	R43	C-5	R61	F-5
C9	E-3	C27	B-5	CR16	E-5	Q9	E-3	R8	C-2	R26	D-3	R44	B-5	R62	E-5
C10	E-3	C28	F-2	CR17	F-4	Q10	C-4	R9	C-2	R27	E-2	R45	B-5	R63	C-2
C11	D-1	C29	F-2	CR18	E-4	Q11	C-4	R10	C-3	R28	E-2	R46	B-5	R64	B-2
C12	C-4	CR1	C-2	CR19	E-4	Q12	C-4	R11	C-3	R29	E-2	R47	C-5	R65	C-1
C13	C-5	CR2	B-2	CR20	D-5	Q13	C-5	R12	C-3	R30	E-2	R48	B-4	R66	B-4
C14	C-5	CR3	C-3	CR21	D-5	Q14	C-5	R13	C-3	R31	F-3	R49	D-5	R67	F-2
C15	D-4	CR4	D-2	CR22	E-5	Q15	B-5	R14	C-3	R32	D-2	R50	C-5	VR1	D-2
C16	D-4	CR5	F-3	CR23	D-3	Q16	D-5	R15	C-2	R33	E-1	R51	E-5	VR2	D-3
C17	D-5	CR6	E-2	CR24	D-3	Q17	D-4	R16	C-2	R34	B-4	R52	C-5	VR3	D-4
C18	F-4	CR7	E-2	L1	D-3	Q18	E-4	R17	D-2	R35	C-4	R53	D-5	VR4	E-5

183A-A-9

Figure 7-3. Component Locations, Gate Amplifier Board A13A1

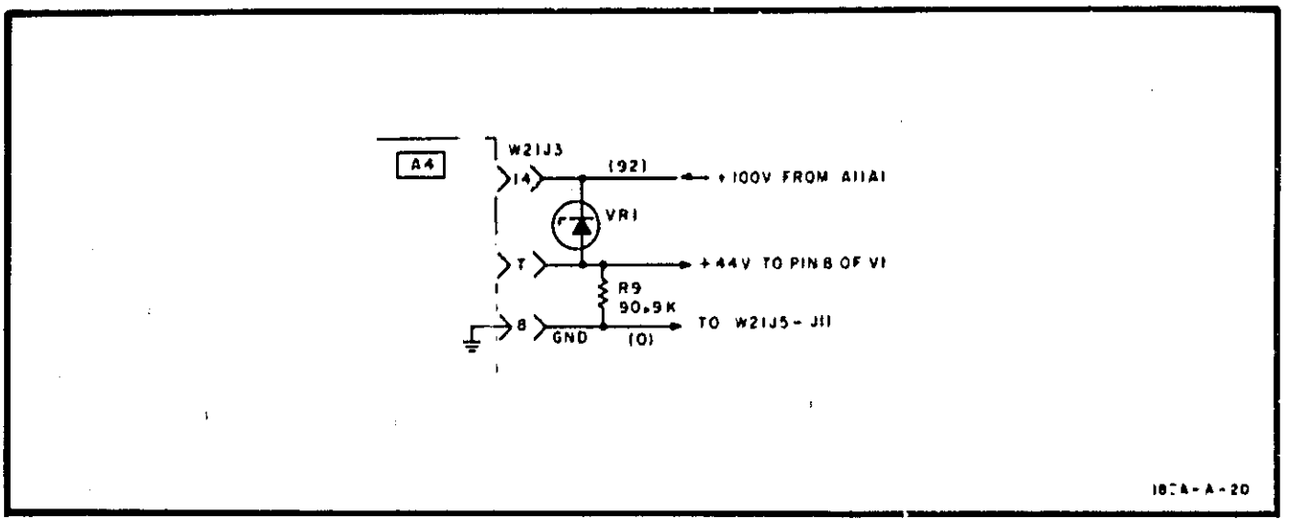


Figure 7-4. Voltage Regulator Circuit

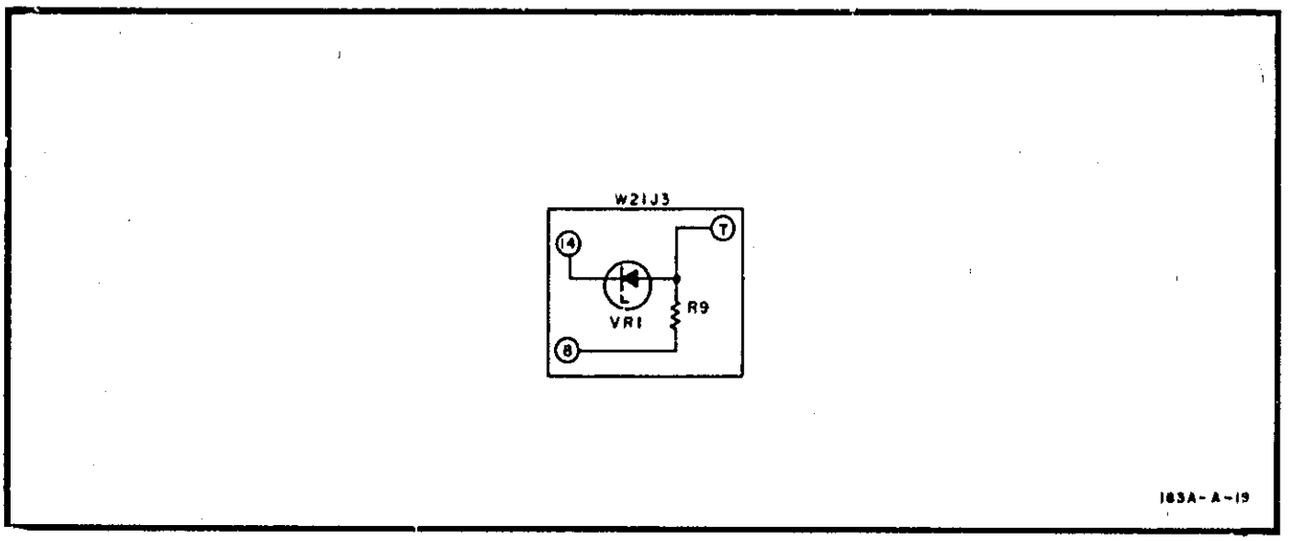


Figure 7-5. Voltage Regulator Circuit

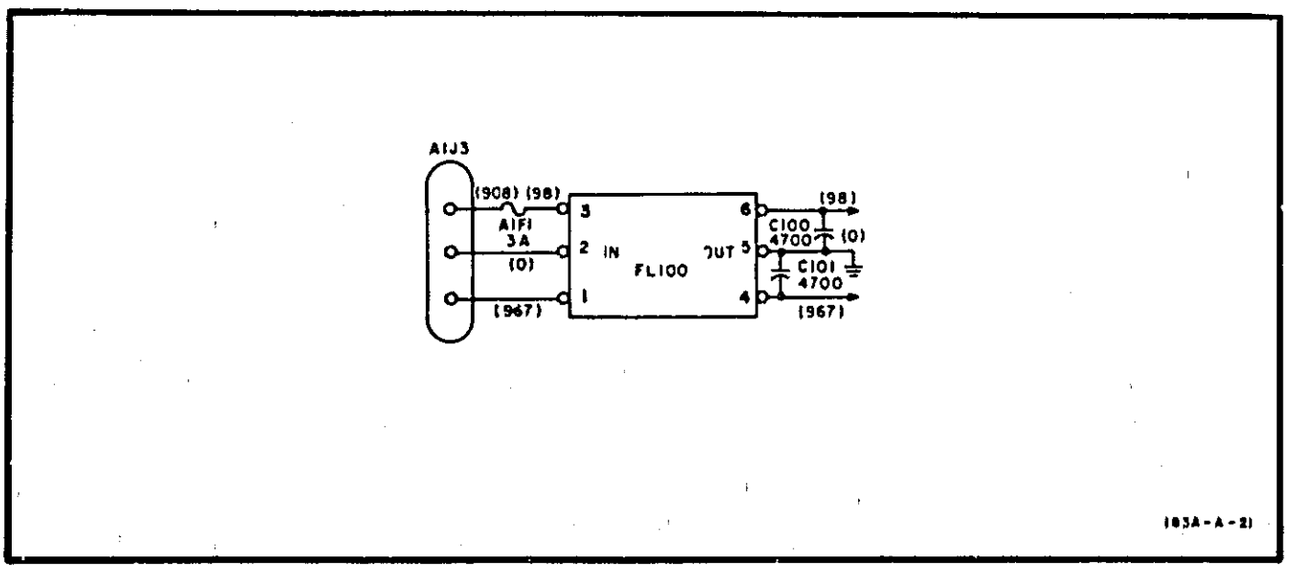
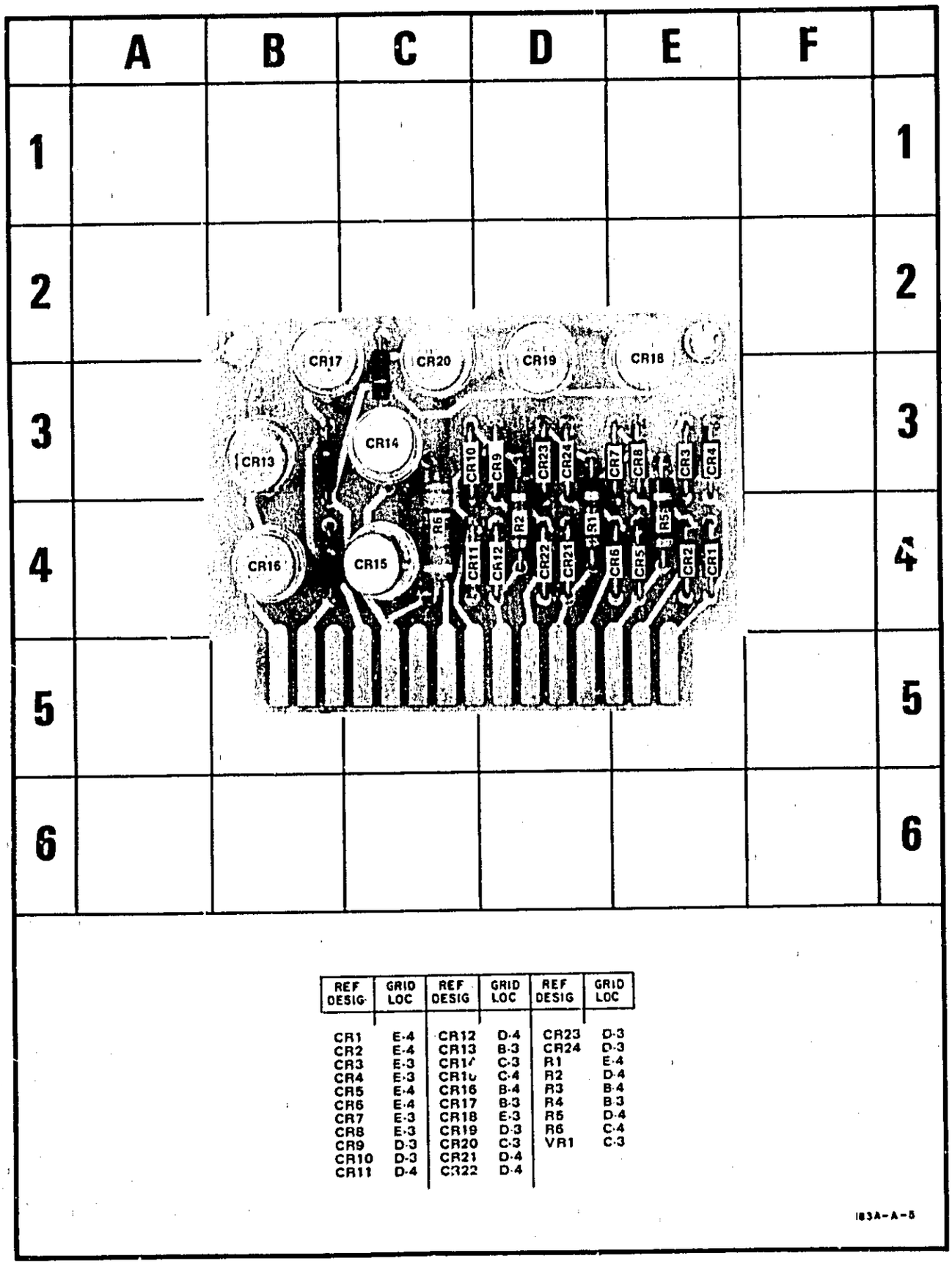
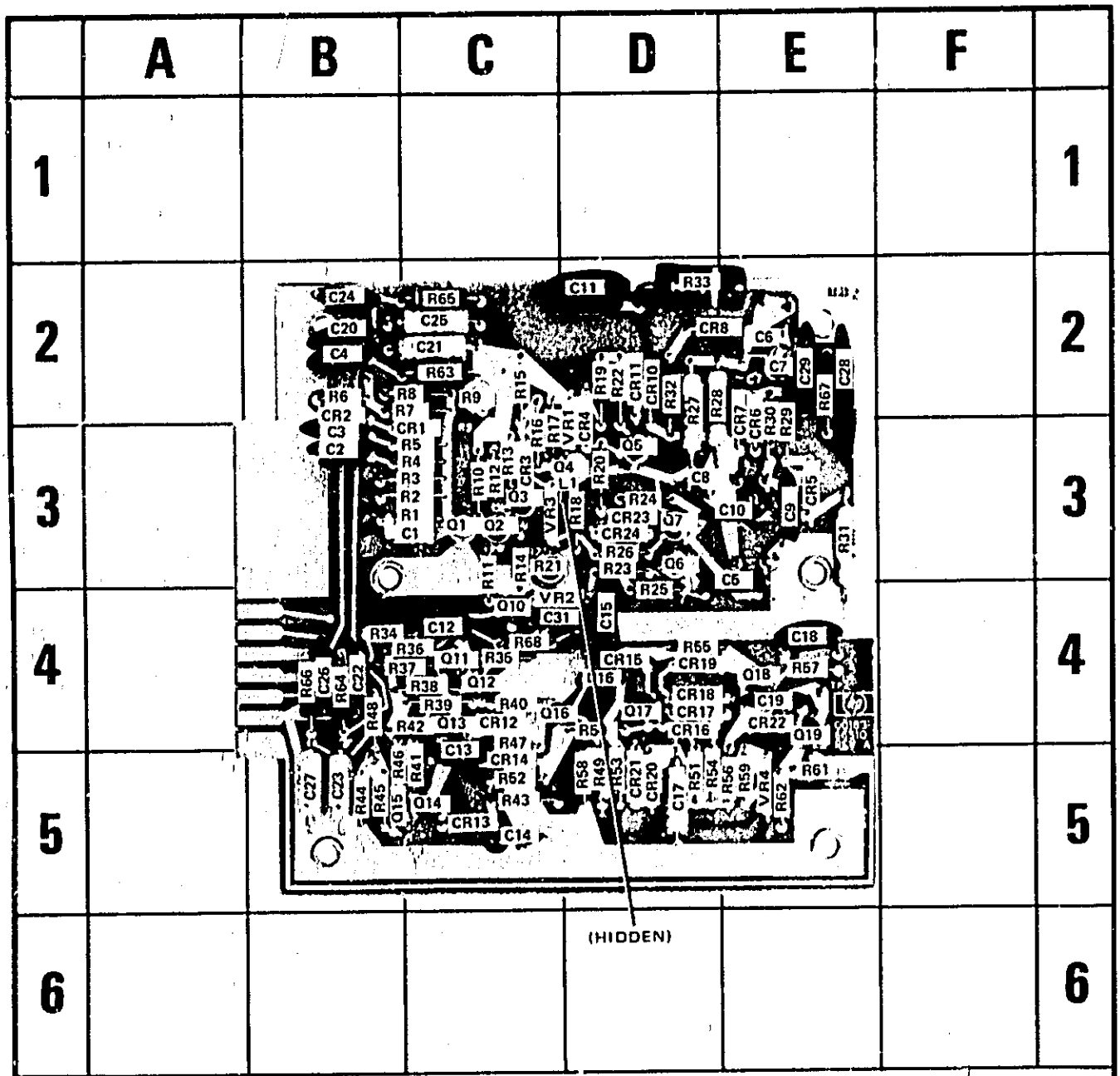


Figure 7-6. Line Filter



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
CR1	E-4	CR12	D-4	CR23	D-3
CR2	E-4	CR13	B-3	CR24	D-3
CR3	E-3	CR14	C-3	R1	E-4
CR4	E-3	CR15	C-4	R2	D-4
CR5	E-4	CR16	B-4	R3	B-4
CR6	E-4	CR17	B-3	R4	B-3
CR7	E-3	CR18	E-3	R5	D-4
CR8	E-3	CR19	D-3	R6	C-4
CR9	D-3	CR20	C-3	VR1	C-3
CR10	D-3	CR21	D-4		
CR11	D-4	CR22	D-4		

Figure 7-7. Component Locations, LVPS Rectifier Board A1A2



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	R65	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	VR1	D-3
C14	C-5	CR2	B-2	CR21	D-5	Q16	C-4	R15	C-2	R33	D-2	R51	D-5	VR2	C-4
C15	D-4	CR3	C-3	CR22	E-4	Q17	D-4	R16	C-3	R34	B-4	R52	C-5	VR3	C-3
C16	D-4	CR4	D-3	CR23	D-3	Q18	E-4	R17	C-3	R35	C-4	R53	D-5	VR4	E-5
C17	D-5	CR5	E-3	CR24	D-3	Q19	E-4	R18	D-3	R36	B-4	R54	D-5		
C18	E-4	CR6	E-3	L1	D-3	R1	C-3	R19	D-2	R37	B-4	R55	D-4		

183A-A-9B

Figure 7-8. Component Locations, Gate Amplifier Board A13A1

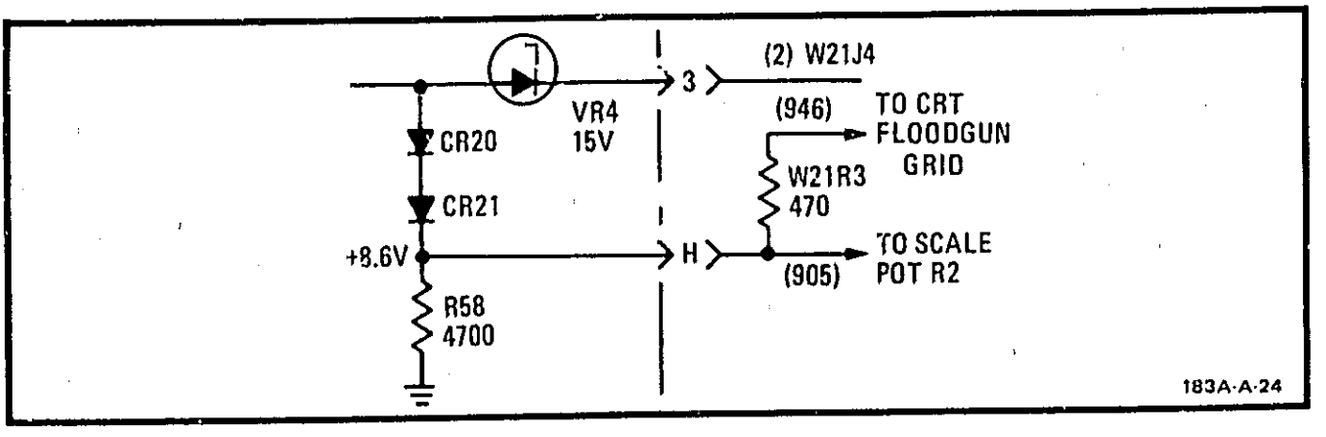


Figure 7-9. Gate Amplifier Schematic A13A1 Changes

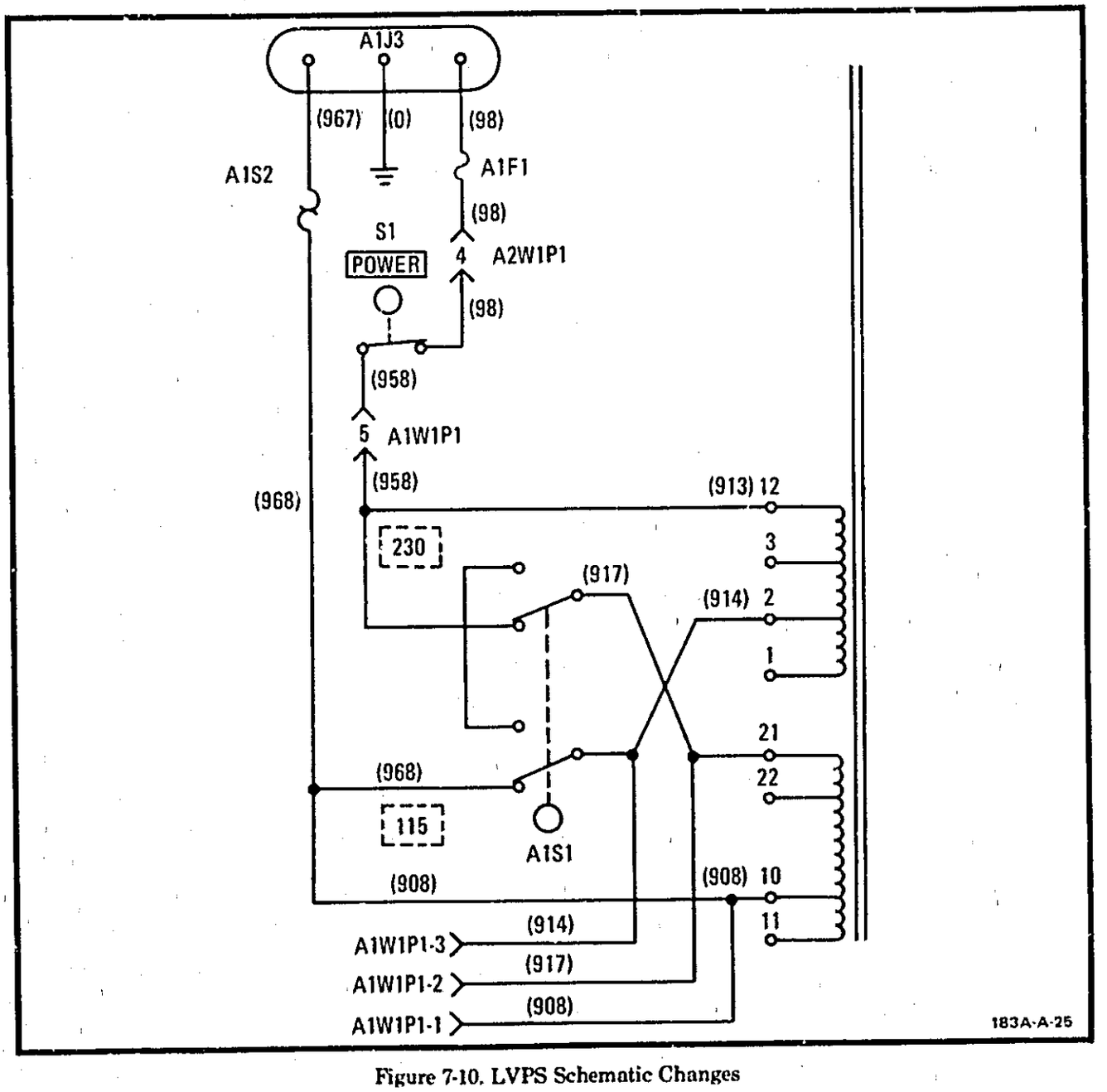


Figure 7-10. LVPS Schematic Changes

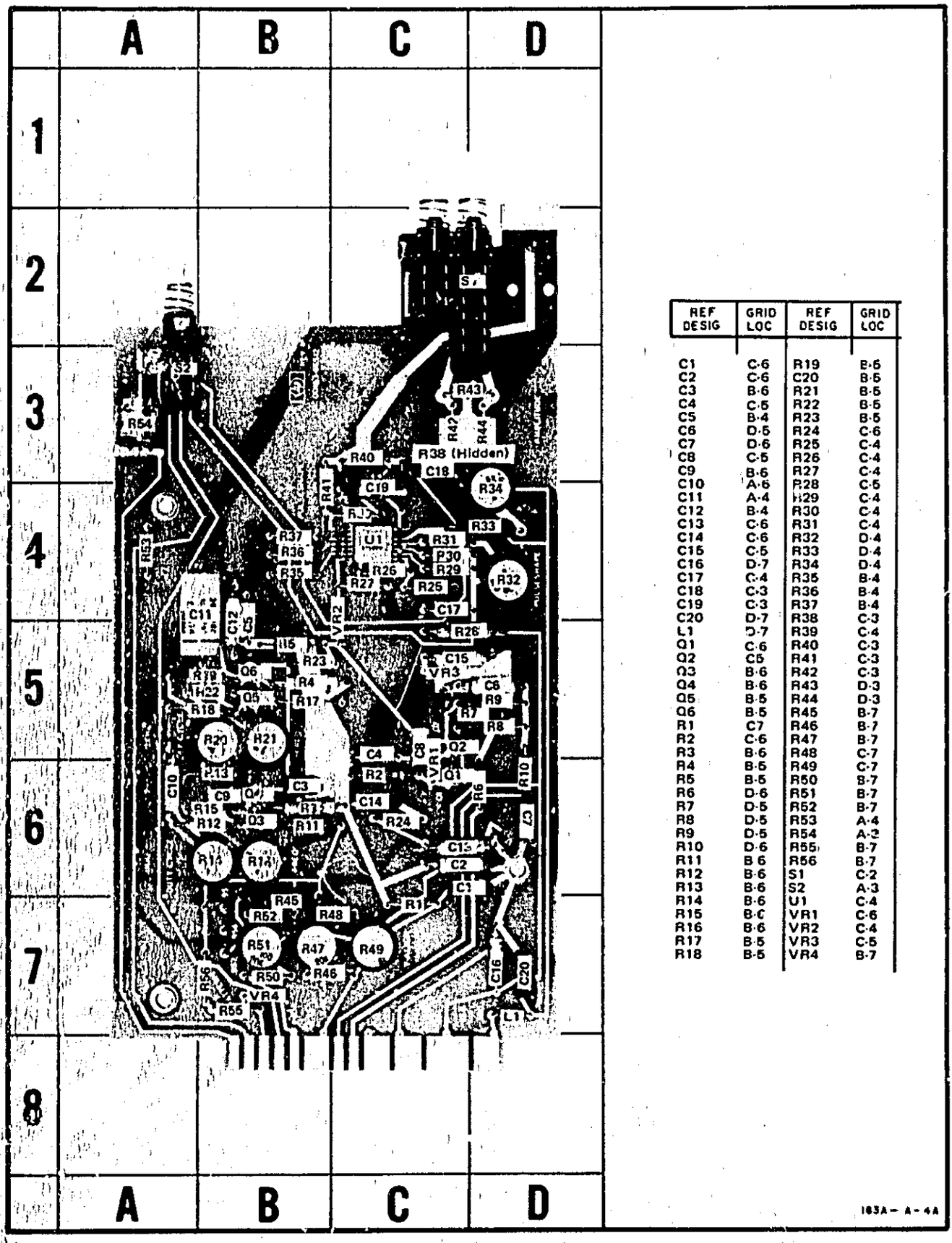
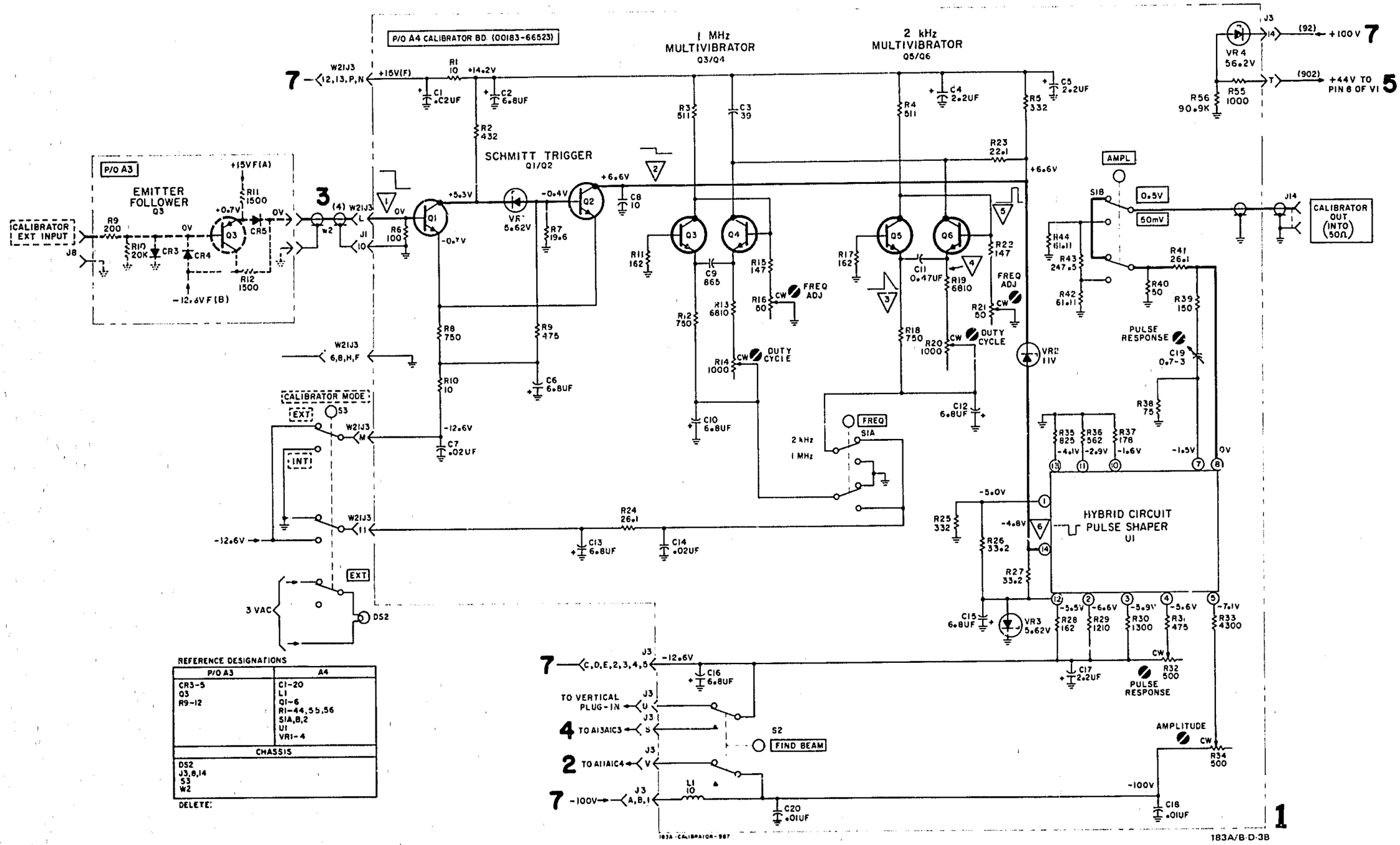


Figure 7-11. Component Locations, Calibrator Board A4

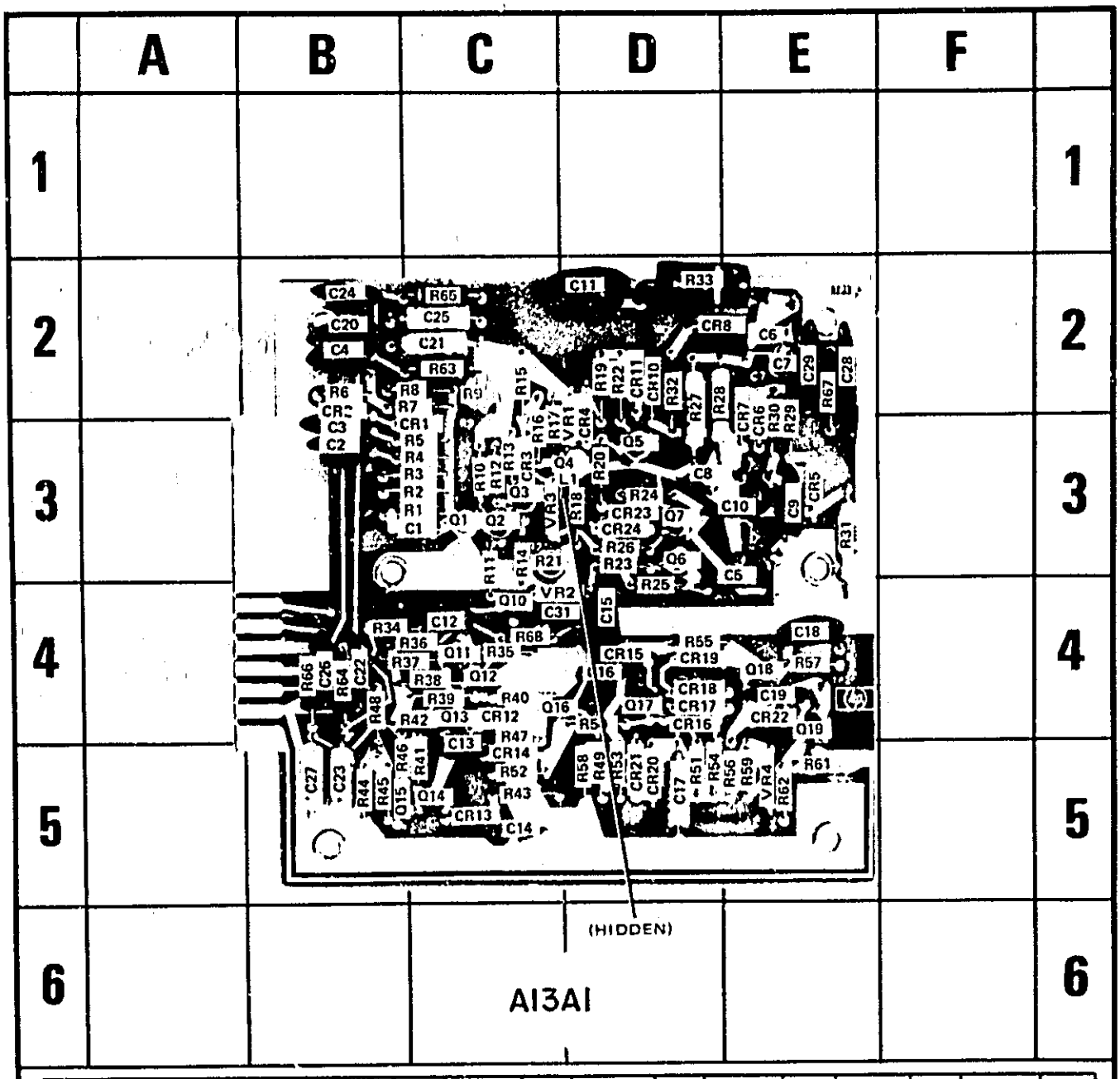


REFERENCE DESIGNATIONS

P/O A3	A4
CR3-5 Q3 R9-12	C1-20 L1 Q1-6 R1-44,55,56 S1A,B,2 U1 VR1-4
CHASSIS	
DS2 J3,8,14 S3 W2	

DELETE:

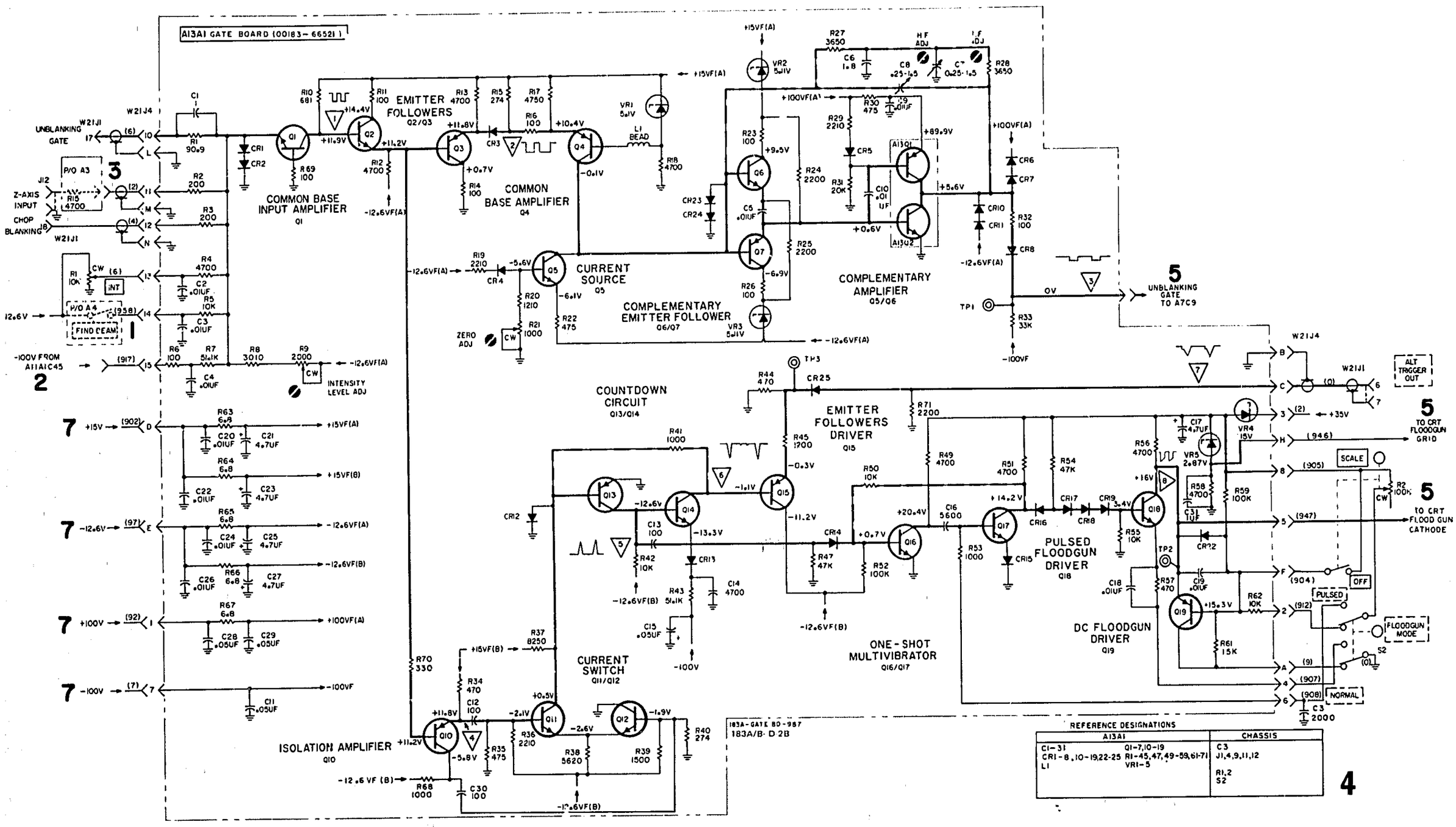
Figure 7-12.
Calibrator Schematic A4



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-3	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	R65	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	VR1	D-3
C14	C-5	CR2	B-2	CR21	D-5	Q16	C-4	R15	C-2	R33	D-2	R51	D-5	VR2	C-4
C15	D-4	CR3	C-3	CR22	E-4	Q17	D-4	R16	C-3	R34	B-4	R52	C-5	VR3	C-3
C16	D-4	CR4	D-3	CR23	D-3	Q18	E-4	R17	C-3	R35	C-4	R53	D-5	VR4	E-5
C17	D-5	CR5	E-3	CR24	D-3	Q19	E-4	R18	D-3	R36	B-4	R54	D-5		
C18	E-4	CR6	E-3	L1	D-3	R1	C-3	R19	D-2	R37	B-4	R55	D-4		

183A-A-9B

Figure 7-13. Component Locations, Gate Amplifier Board A13A1



7-14.
Gate Amplifier Schematic A13A1
7-17/(7-18 blank)

SCHEMATIC DIAGRAMS

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. Table 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 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 that 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 table on each schematic lists all reference designations for components shown on the schematic. Component reference designators that have been deleted from the schematic are listed below the table.

8-7. All components within the bordered areas of a schematic are physically located on etched circuit boards. Components not physically located on an etched circuit board are shown in the unbordered 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 that are not part of an assembly have only the basic reference designation. Components that 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 subassembly breakdown.

8-12. COMPONENT LOCATIONS.

8-13. Locations of components on assemblies and subassemblies are illustrated in photographs 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 photograph 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.

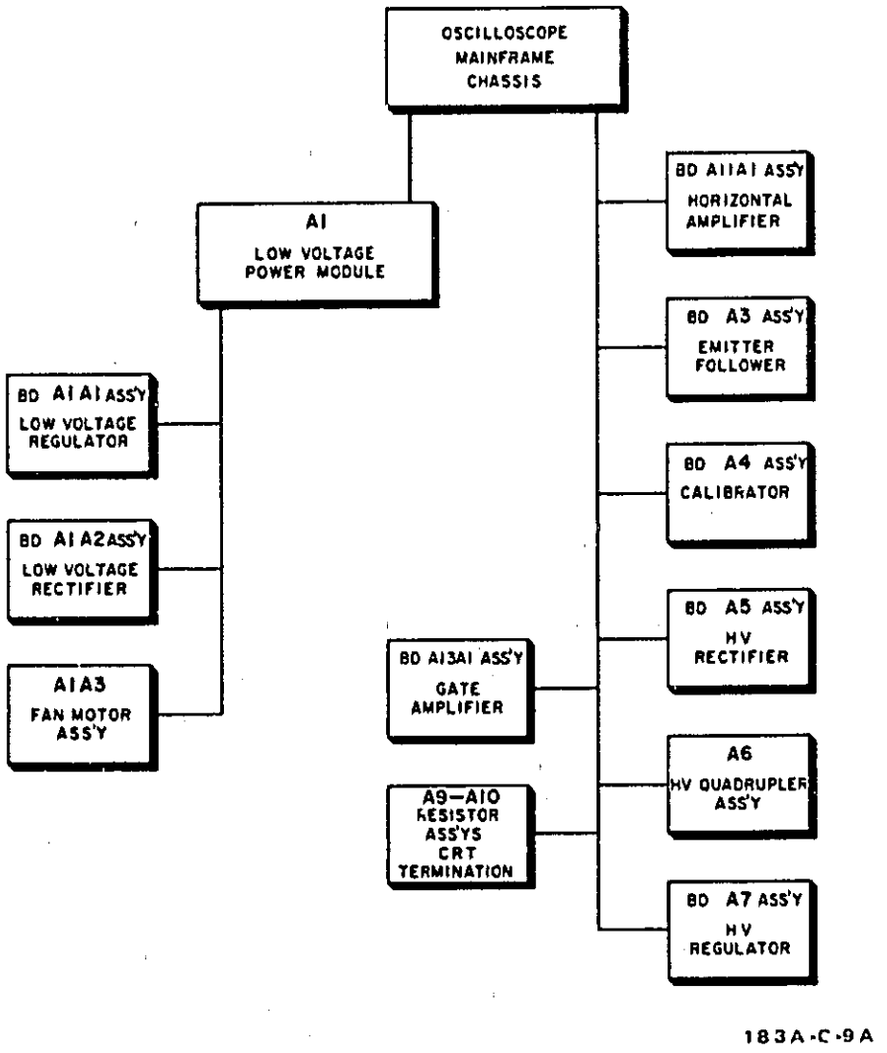


Figure 8-1. Model 183A/B Subassembly Breadown

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 A1W1P (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 severly 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 malfunctions.

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 quadrupler 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 A13A1Q1 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 (CTR 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 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 in each end.

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

c. Connect the jumper between the bases of A11Q3 and A11Q4.

NOTE

Transistors A11Q3 and A11Q4 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 A11A1R52 and A11A1R56.

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 A11A1-Q7 and A11A1Q8. Check the operation according to step d.

g. Proceed as in step d to differential pair A11A1Q5, A11A1Q6 and also A11A1Q3, A11A1Q4.

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.

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

Trouble	Probable Cause	Isolation Procedure
No Output (pilot lamp out)	Open fuse.	Replace line fuse.
	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.

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

Trouble	Probable Cause	Isolation Procedure
No voltage from +15V or −12.6V supply	SCR turned on, shorting out supply.	Turn off supply and restart. Use variable transformer 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 that 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.	
+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 appropriate 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.

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 at collector of Q2	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 0.2 ohm continuity across collector winding.
	Open base circuit in HV oscillator.	Measure 0.1 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.

8-53. REMOVAL AND REPLACEMENT PROCEDURES.

8-54. The following paragraphs describe removal and replacement of assemblies and components of the Model 183A/B. Steps that do not specify Model 183A or Model 183B 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 183A, or bottom cover on Model 183B.

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.

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. 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).	Measure waveform input to base of Schmitt trigger transistor A4Q1. Input should be −0.8V to trigger. (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 (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.
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.	
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.
(EXT mode only)	Faulty component in Schmitt trigger circuit.	Check and replace faulty component.
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.

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.

Table 8-4. Troubleshooting Chart, Gate Amplifier

Trouble	Probable Cause	Isolation Procedure
No main gate or alternate trigger output	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.	Measure amplitude of waveform at TP 3.
	NOTE Amplitude of waveform at TP 3 should be adjustable from 0 to approximately 80 volts with INT control.	Measure dc voltages from TP 1 through TP 3. Check A13A1Q1.
Leading edge of waveforms too dim on fast sweep speeds	Rise time of gate signal too slow.	Check adjustment of A13A1C7 and A13A1C8, refer to Section V for procedure.
No alternate trigger or pulsed floodgun. Main gate output OK	Transistor failure Q10 through Q13. Faulty component.	Check waveforms and measure dc voltages TP 1 through TP 3.
		Check waveforms and measure dc voltages TP 4 through 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.

8-57. HVPS COMPONENT 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 quadrupler 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 183A or top cover on Model 183B.

WARNING

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

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

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

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

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

g. On Model 183A disconnect square pins from HV rectifier board and remove HV quadrupler assembly.

h. On Model 183B disconnect square pins at same time as you are removing HV quadrupler assembly.

i. If removal of HV rectifier board is desired, disconnect wires from quadrupler 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 183A, or left cover and side casting on Model 183B.

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.

g. Remove board by sliding 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's (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 that 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 watts or less with 1/8-inch tip).

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 substitution.
	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.

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 183A or top and left cover of 183B.

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

d. Discon ect plug from circuit baord.

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 that will create powder 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 plug from HVPS quadrupler box, short exposed end of plug to chassis to discharge CRT.

j. With insulated long-nose pliers, disconnect HV plug from HVPS quadrupler 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 183A or top and bottom covers on Model 183B.

c. On Model 183B remove horizontal amplifier cover by removing one screw toward rear of cover and loosen three screws at the front. Cover fits on 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 183B, 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 in solid form. Do not file, scrape, or alter the material in a manner that will create powder or dust. It is harmful if inhaled.

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

Table 8-6. Schematic Notes

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

1. Etched circuit board
2. Assembly
3. Etched circuit board on assembly
4. Front-panel marking
5. Rear-panel Marking
6. Front-panel control
7. Screwdriver adjustment
8. P/O — Part of
9. CW — Clockwise end of variable resistor
10. NC — No connection
11. (3) Waveform test point (with number)
12. Clamp type connector
13. Single-pin connector on board
14. Pin of a plug-in board (with letter or number)
15. Coaxial cable connected directly to board
16. Wire connected to pressure-fit socket on board
17. Main signal path
18. Primary feedback path
19. Secondary feedback path
20. Test point
21. Field-effect transistor (N-type base) (G, D, S)
22. Breakdown diode (voltage regulator)
23. Light emitting diode (LED)
24. Step-recovery diode
25. 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.
26. (925) Wire colors are given by numbers in parentheses using the resistor color code [(925) is wht-red-grn]

0 - black	5 - Green
1 - Brown	6 - Blue
2 - Red	7 - Violet
3 - Orange	8 - Grey
4 - Yellow	9 - White

27. * Optimum value selected at factory, typical value shown; part may have been omitted.
28. Unless otherwise indicated: resistance in ohms capacitance in picofarads inductance in microhenries

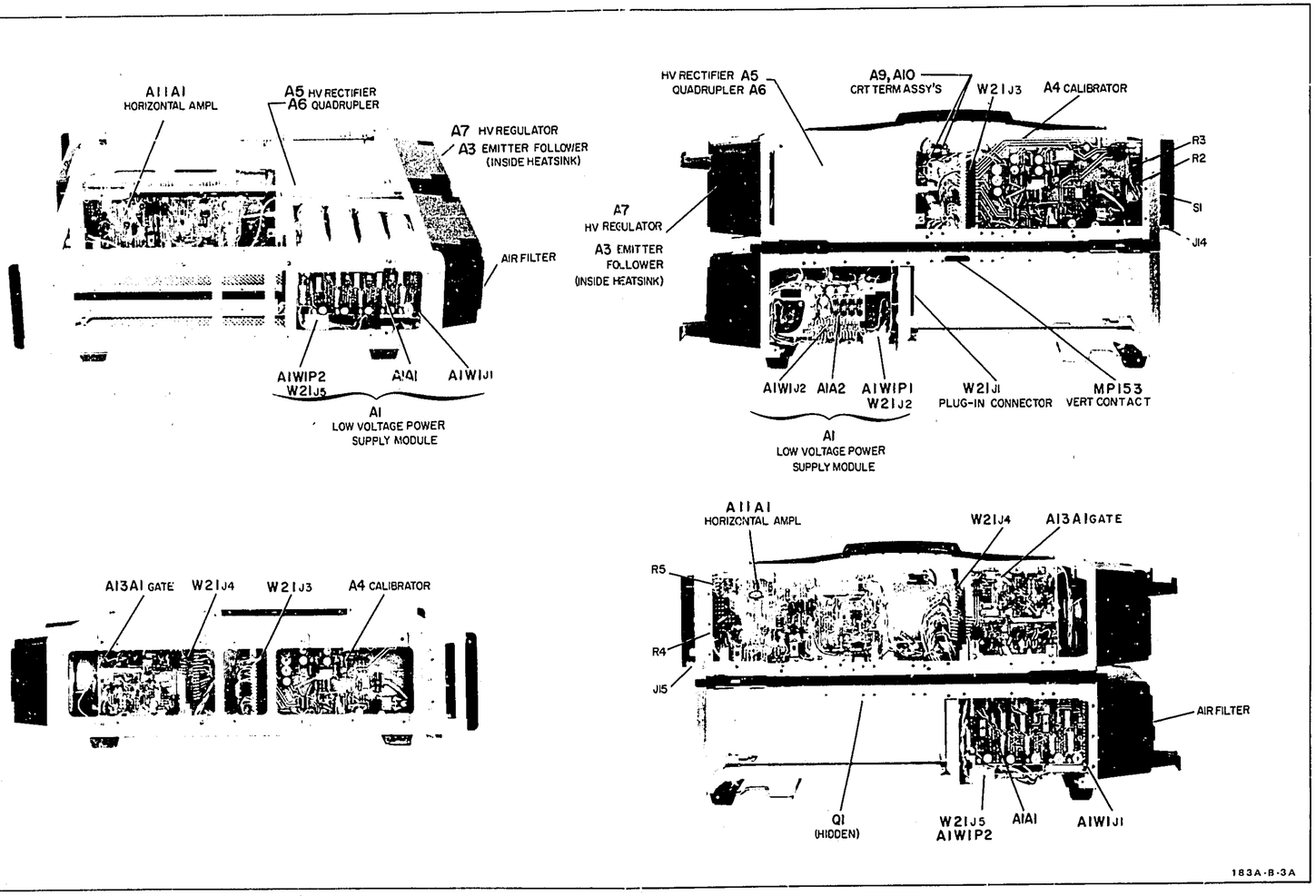


Figure 8-2.
Chassis Component Locations

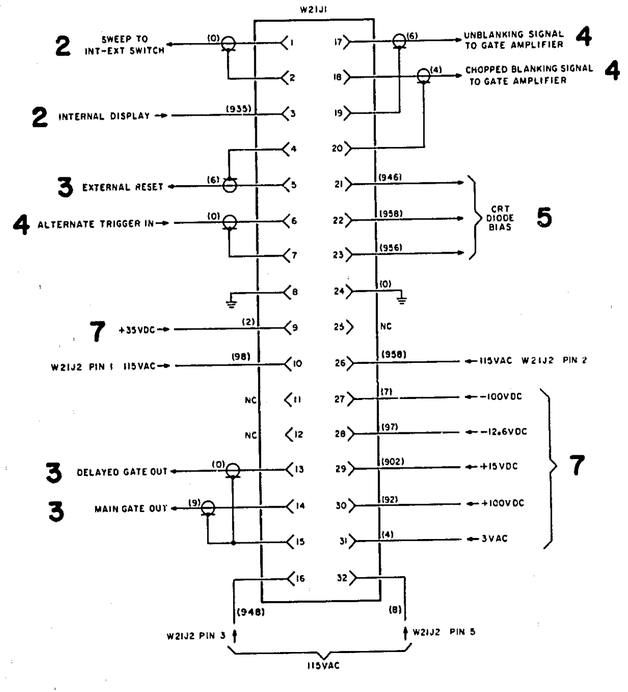


Figure 8-3. Jack Connections

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.

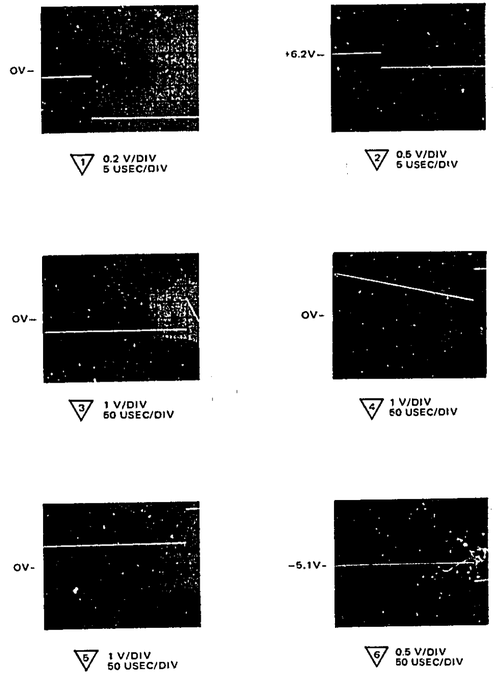
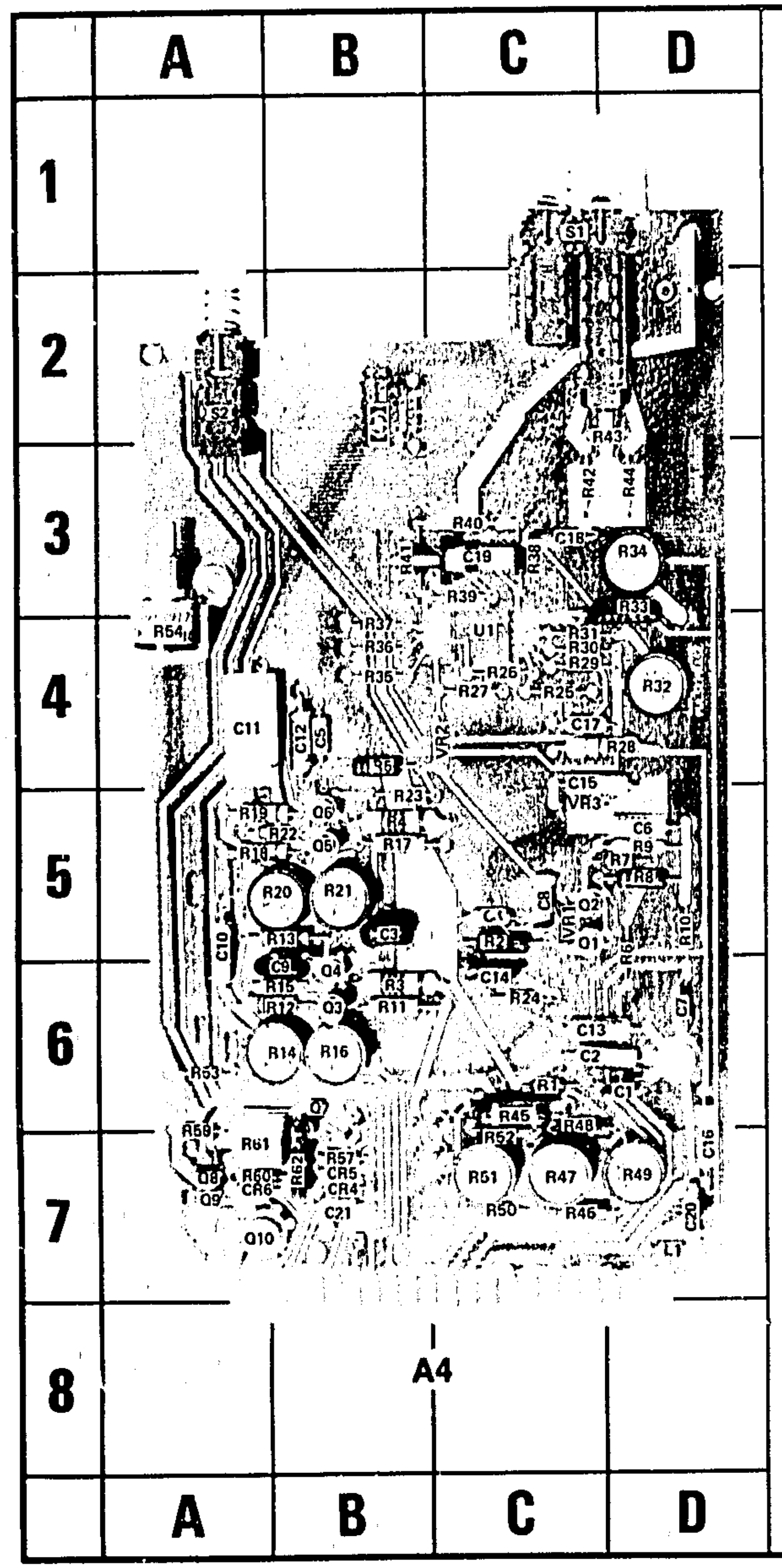


Figure 8-4. Calibrator Waveforms and Voltage Measurement Conditions



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

Figure 8-5. Component Locations, Calibrator Board A4

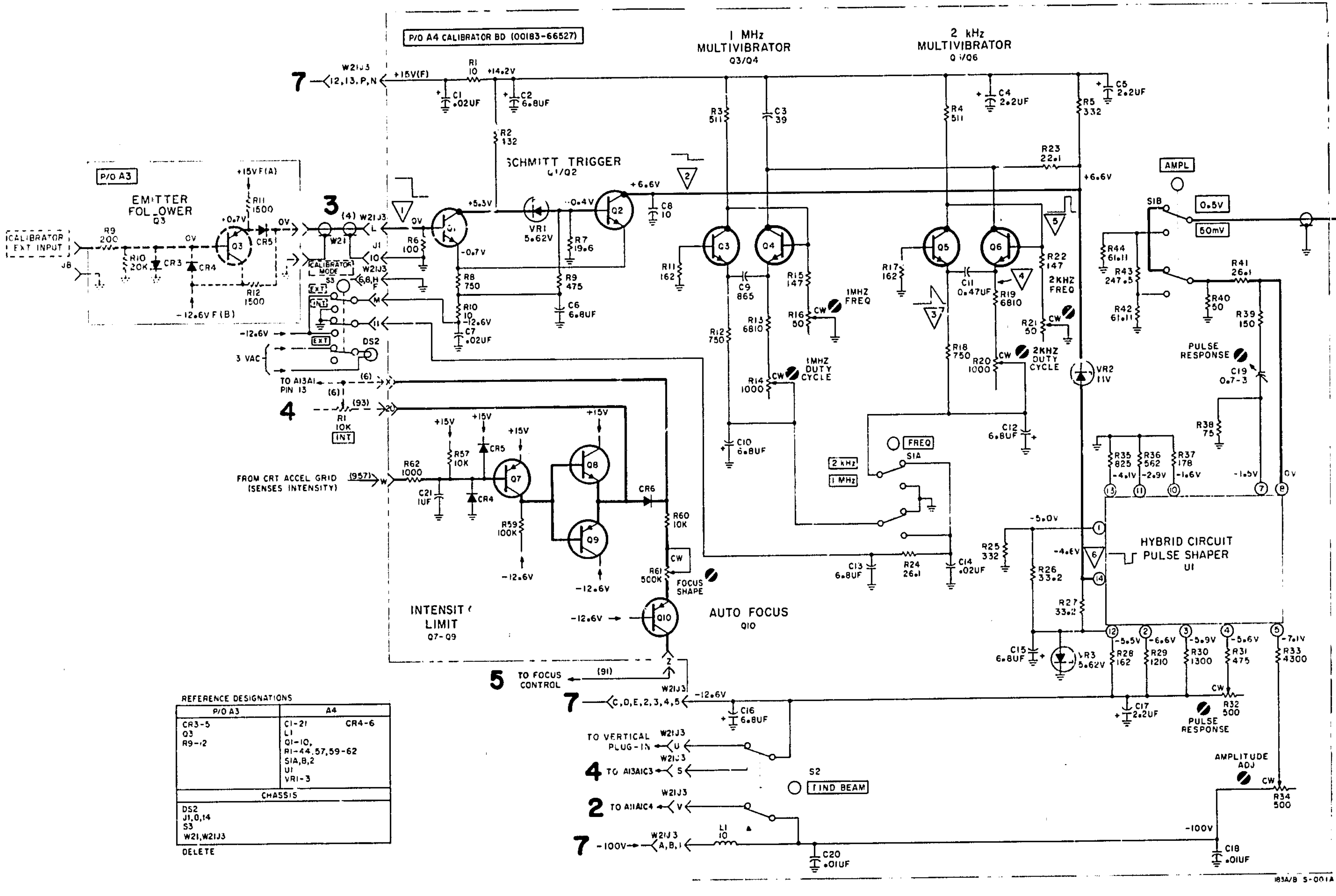


Figure 8-6. Calibrator Schertic A4

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

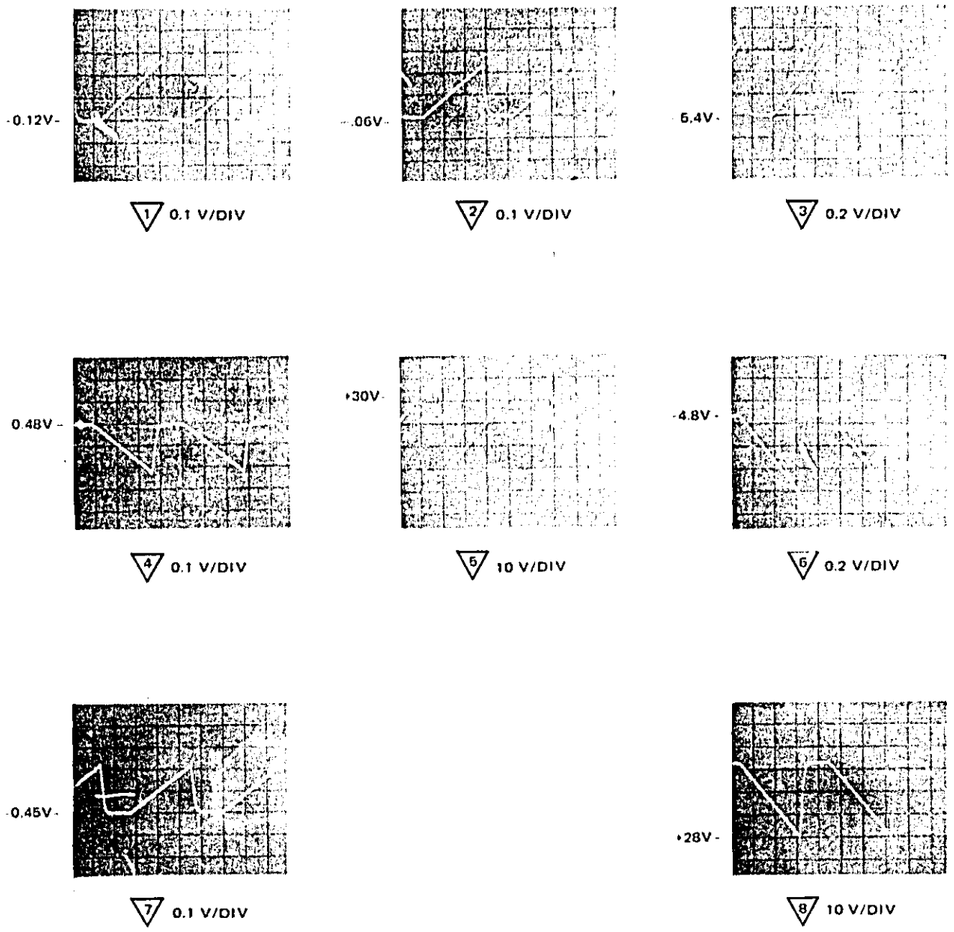
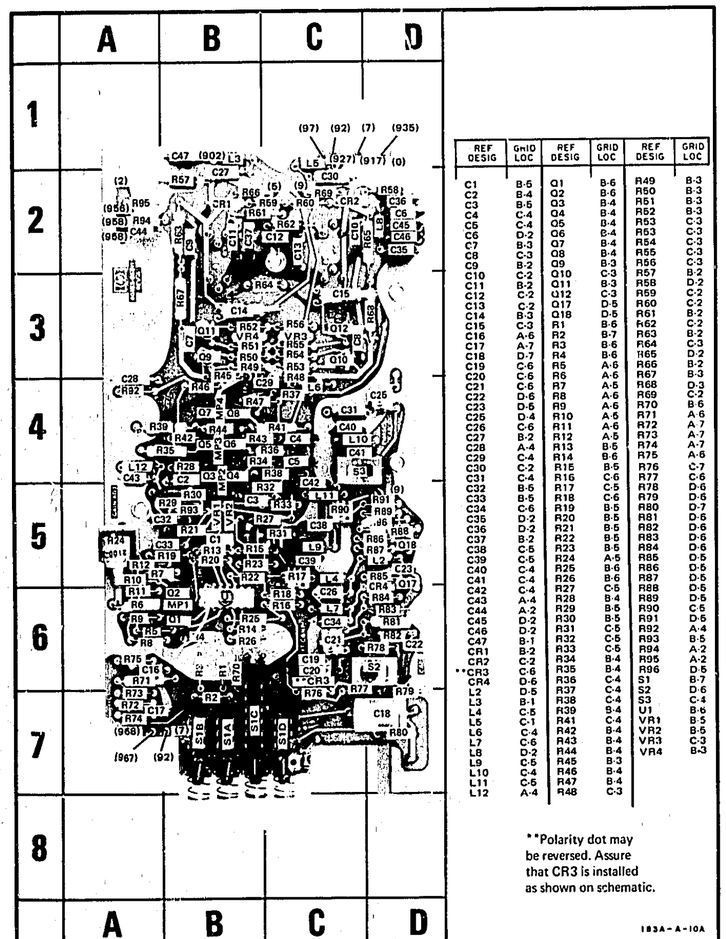


Figure 8-7. Horizontal Amplifier Waveforms and Voltage Measurement Conditions



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	C-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-5	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	B-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-5	R75	A-6
C29	A-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-5	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-5
C41	C-4	R26	B-6	R88	D-5
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-5
**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-5
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 A11A1

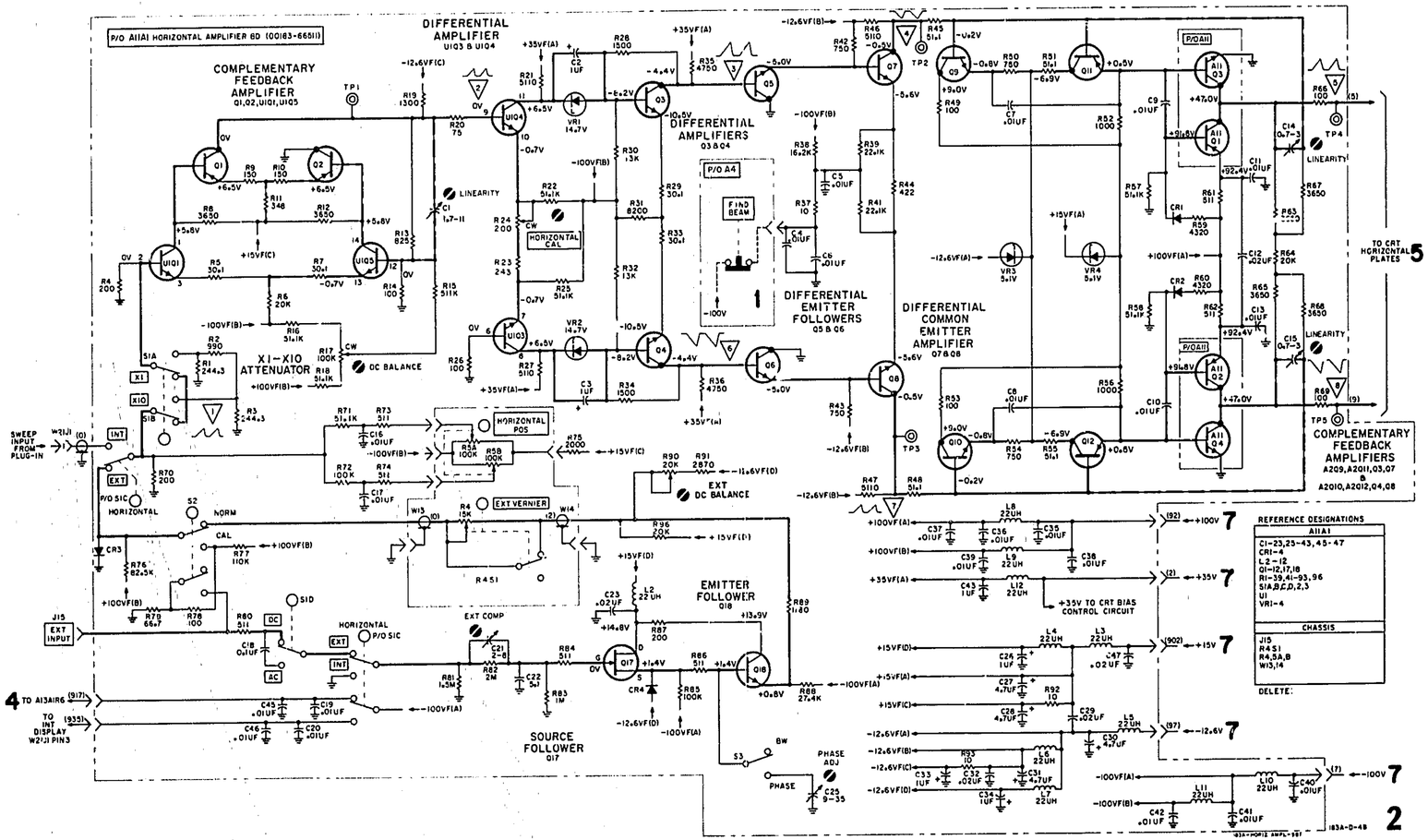


Figure 8-9.
Horizontal Amplifier Schematic A11A1

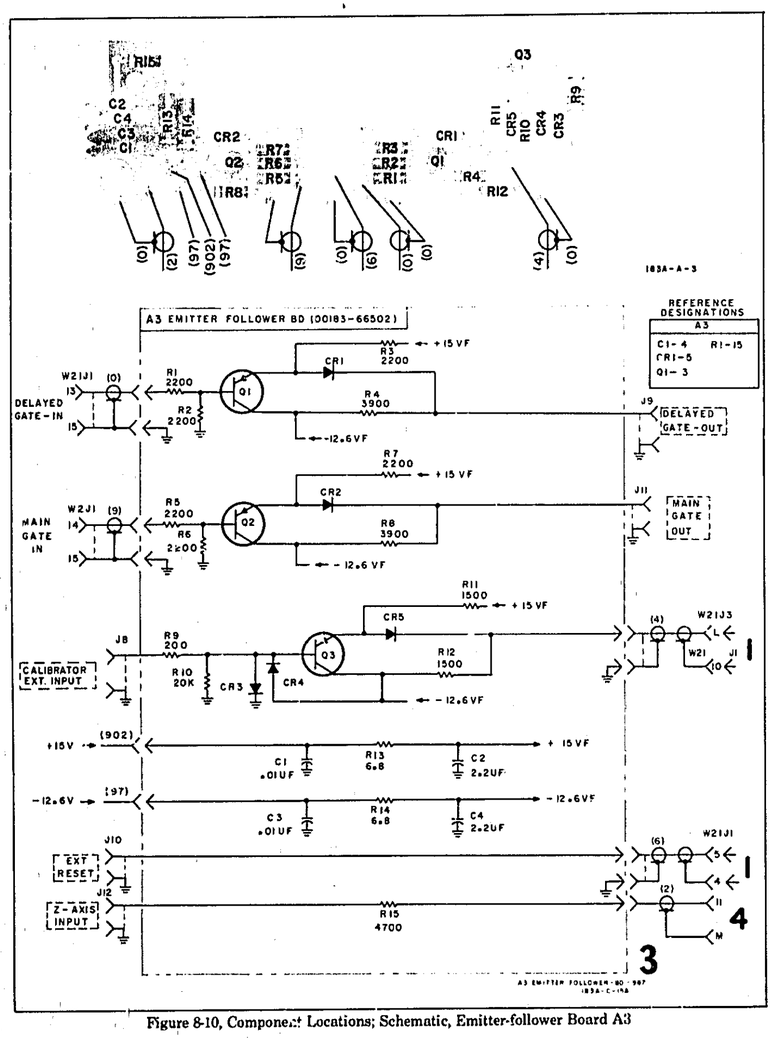


Figure 8-10, Component Locations; Schematic, Emitter-follower Board A3

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 po: (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

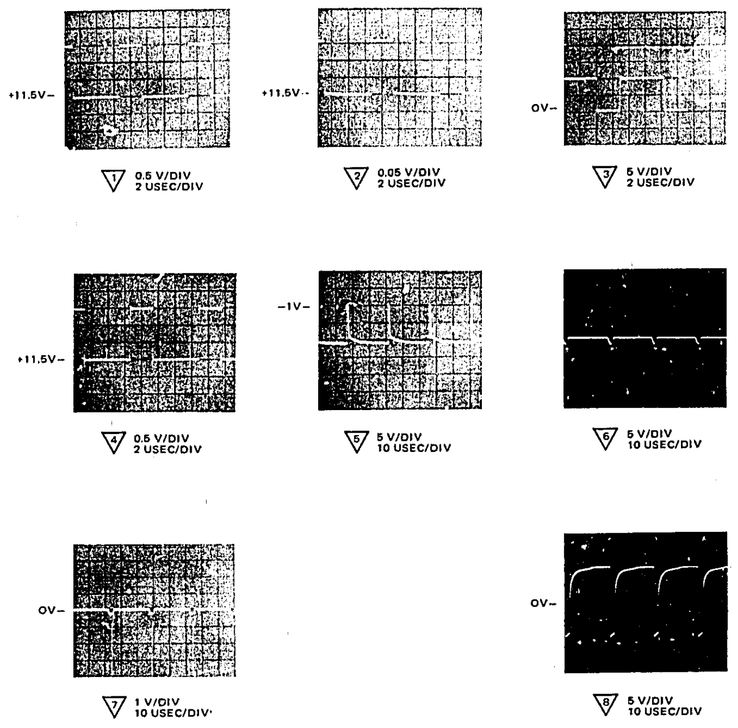
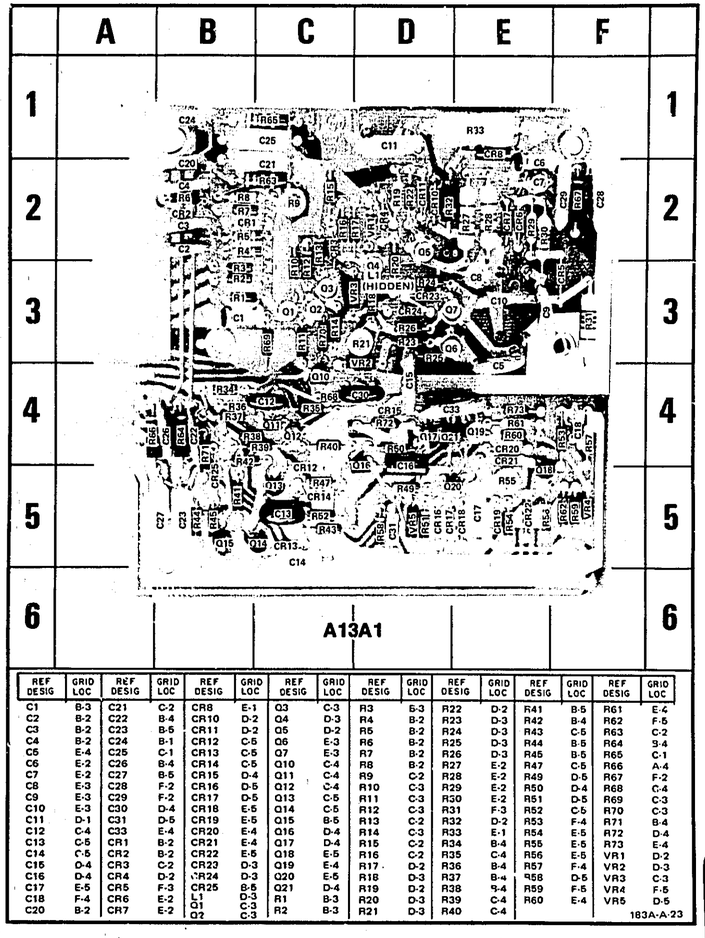


Figure 8-11. Gate Amplifier Waveforms and Voltage Measurement Conditions



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	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-6	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	L1	D-3	R1	B-3	R20	D-3	R39	C-4	R60	E-4	VR5	D-5
C20	B-2	CR7	E-2	Q1	C-3	R2	B-3	R21	D-3	R40	C-4				
				Q2	C-3										

183A-A-23

Figure 8-12. Component Locations, Gate Amplifier Board A13A1

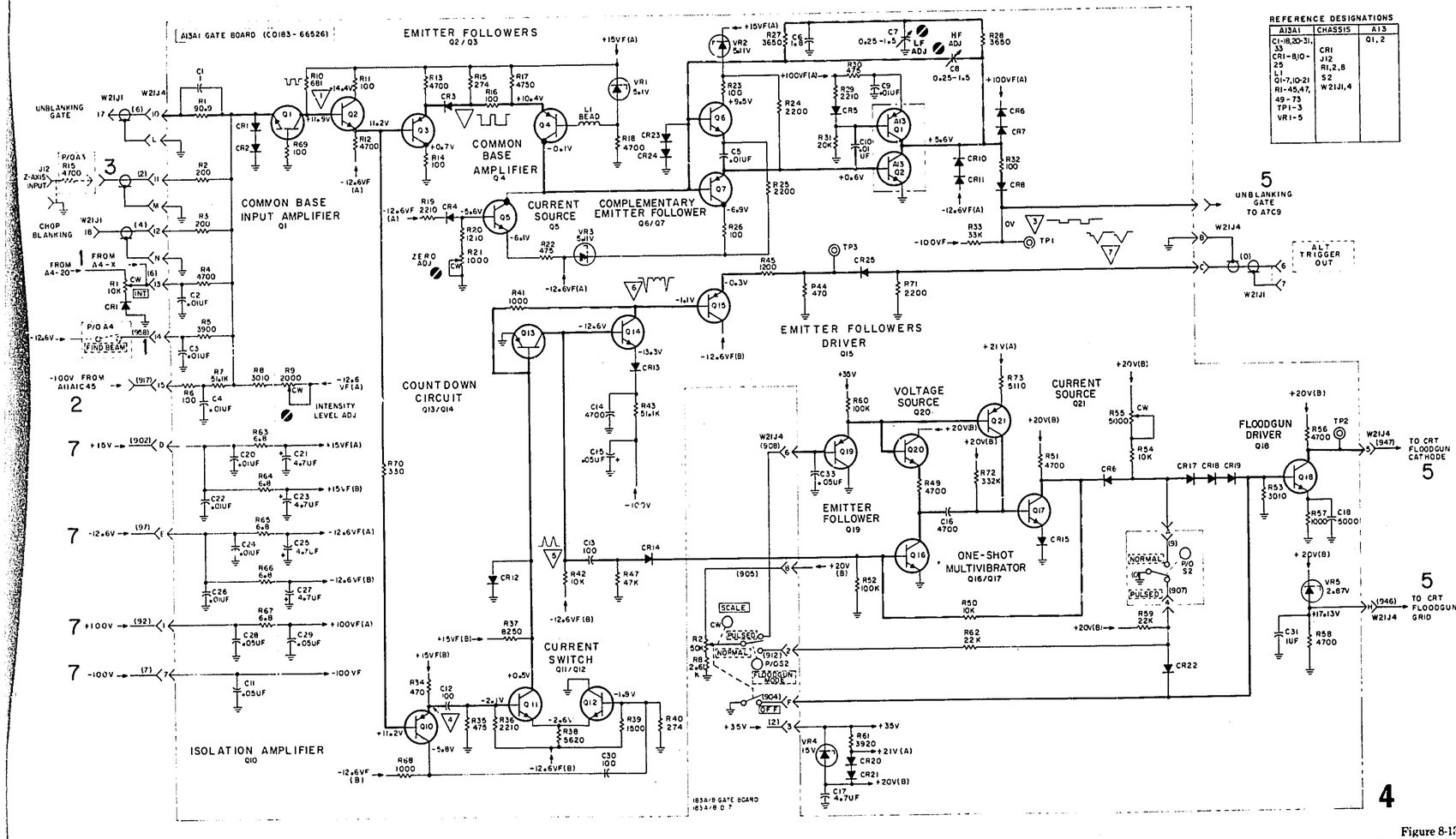


Figure 8-13.
Gate Amplifier Schemati A13A1
8-21

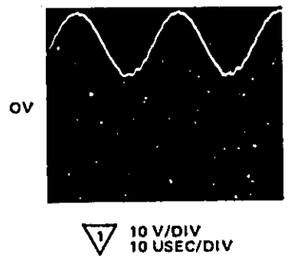
WAVEFORM MEASUREMENT CONDITIONS

a. Set Model 183A/8 Oscilloscope:

Turn power on.

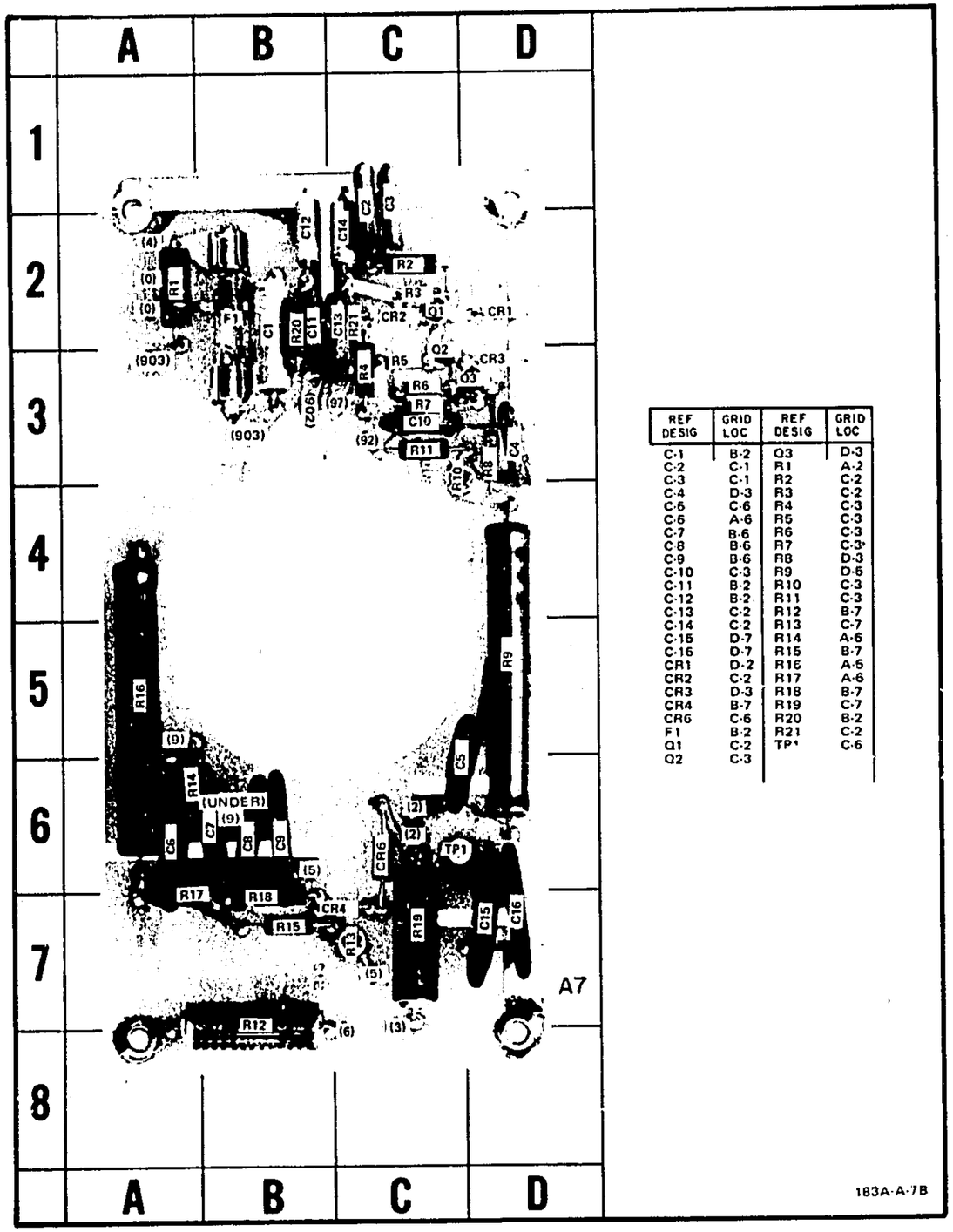
b. Set monitor oscilloscope:

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



183A-A-16

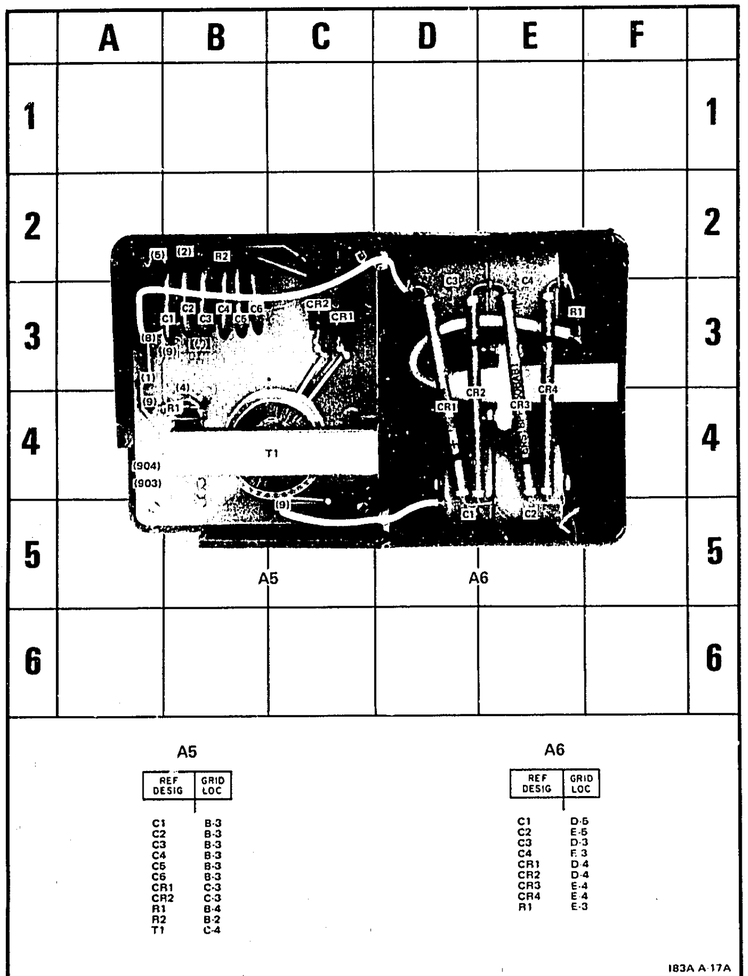
Figure 8-14. HVPS Waveforms



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	C-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
CR6	C-6	R20	B-2
F1	B-2	R21	C-2
Q1	C-2	TP*	C-6
Q2	C-3		

183A-A-7B

Figure 8-15. Component Locations, HVPS Regulator Board A7



A5

REF DESIG	GRID LOC
C1	B-3
C2	B-3
C3	B-3
C4	B-3
C5	B-3
C6	B-3
CR1	C-3
CR2	C-3
R1	B-4
R2	B-2
T1	C-4

A6

REF DESIG	GRID LOC
C1	D-5
C2	E-5
C3	D-3
C4	E-3
CR1	D-4
CR2	D-4
CR3	E-4
CR4	E-4
R1	E-3

Figure 8-16. Component Locations, HVPS Rectifier A5 and Quadrupler A6

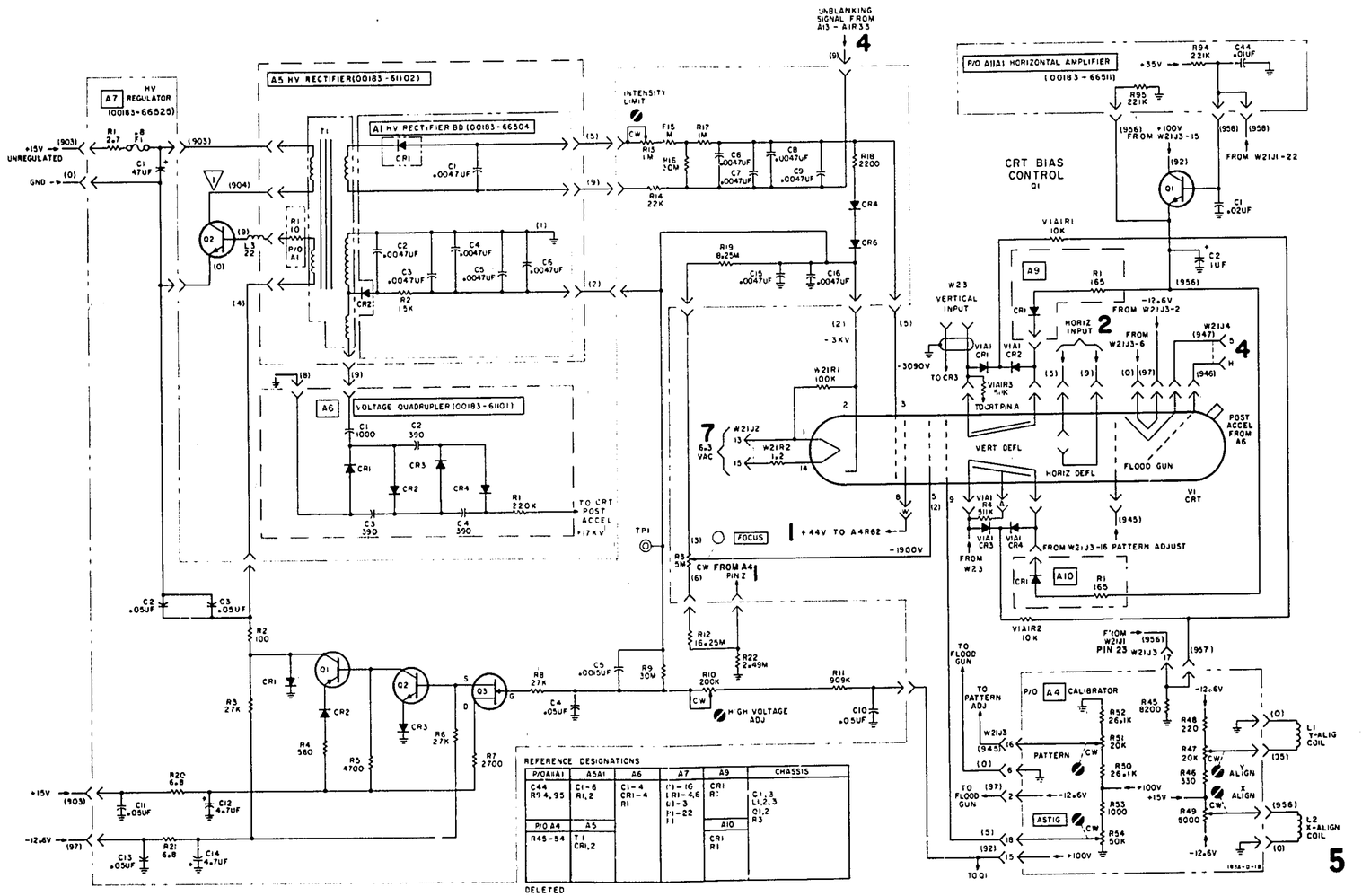


Figure 8-17.
HVPS Schematic
8-23

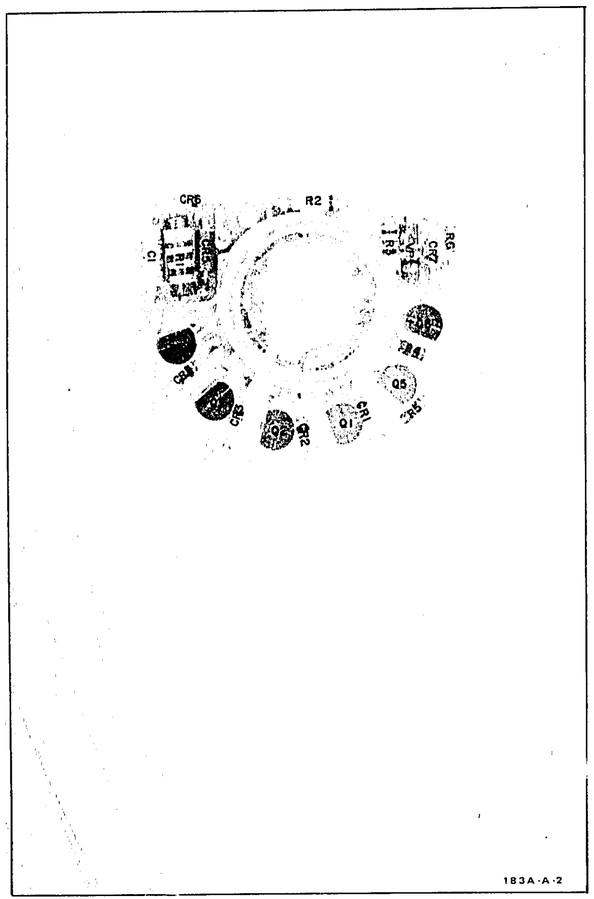


Figure 8-18. Component Location, Blower Motor Assembly A1A3

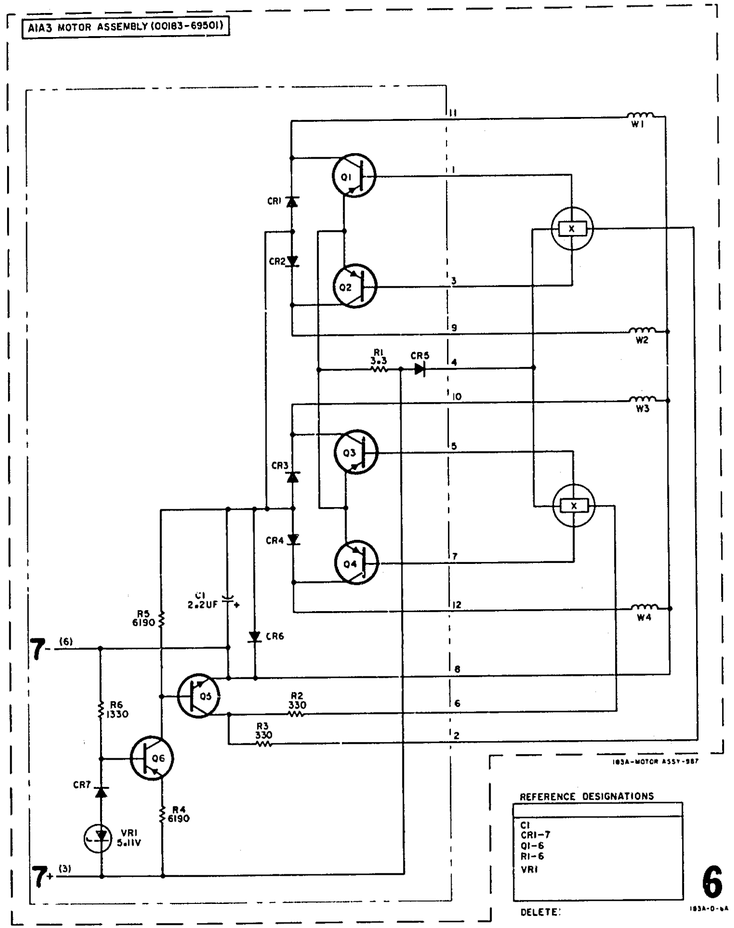
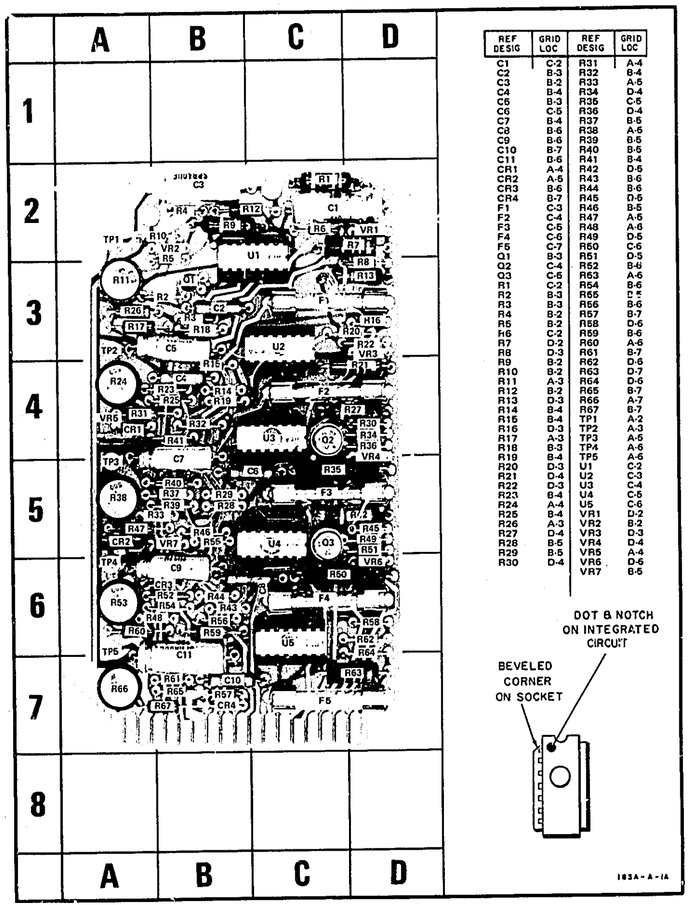
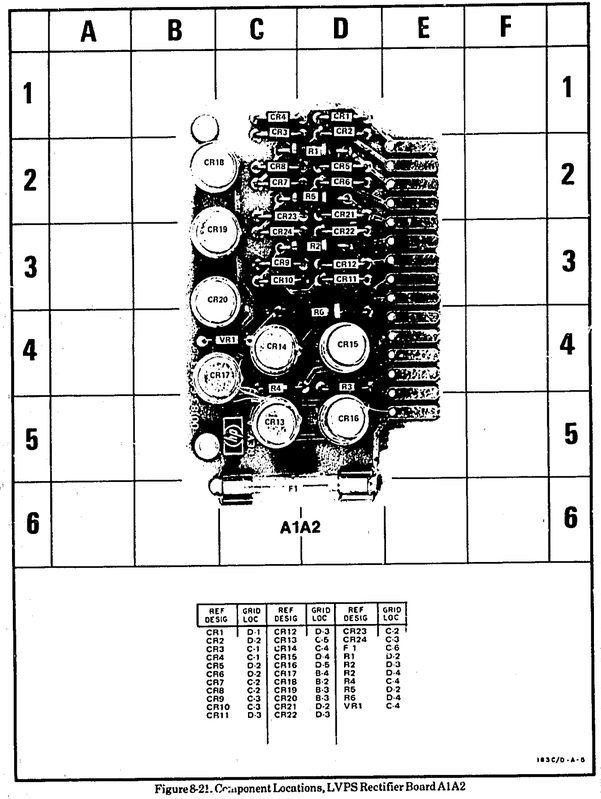


Figure 8-19. Blower Motor Schematic A1A3



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	D-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-6	R53	A-6
R1	C-2	R54	B-6
R2	B-3	R55	D-5
R3	B-3	R56	B-6
R4	B-2	R57	B-7
R5	B-2	R58	D-6
R6	C-2	R59	B-6
R7	C-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 A1A1



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
CR1	D-1	CR12	D-3	CR23	C-2
CR2	D-2	CR13	C-5	CR24	C-3
CR3	C-1	CR14	C-4	F1	C-6
CR4	C-1	CR15	D-4	R1	D-2
CR5	D-2	CR16	D-5	R2	D-3
CR6	D-2	CR17	B-4	R3	D-4
CR7	C-2	CR18	B-2	R4	C-4
CR8	C-2	CR19	B-3	R5	D-2
CR9	C-3	CR20	B-3	R6	D-4
CR10	C-3	CR21	D-2	VR1	C-4
CR11	D-3	CR22	D-3		

Figure 8-21. Component Locations, LVPS Rectifier Board A1A2

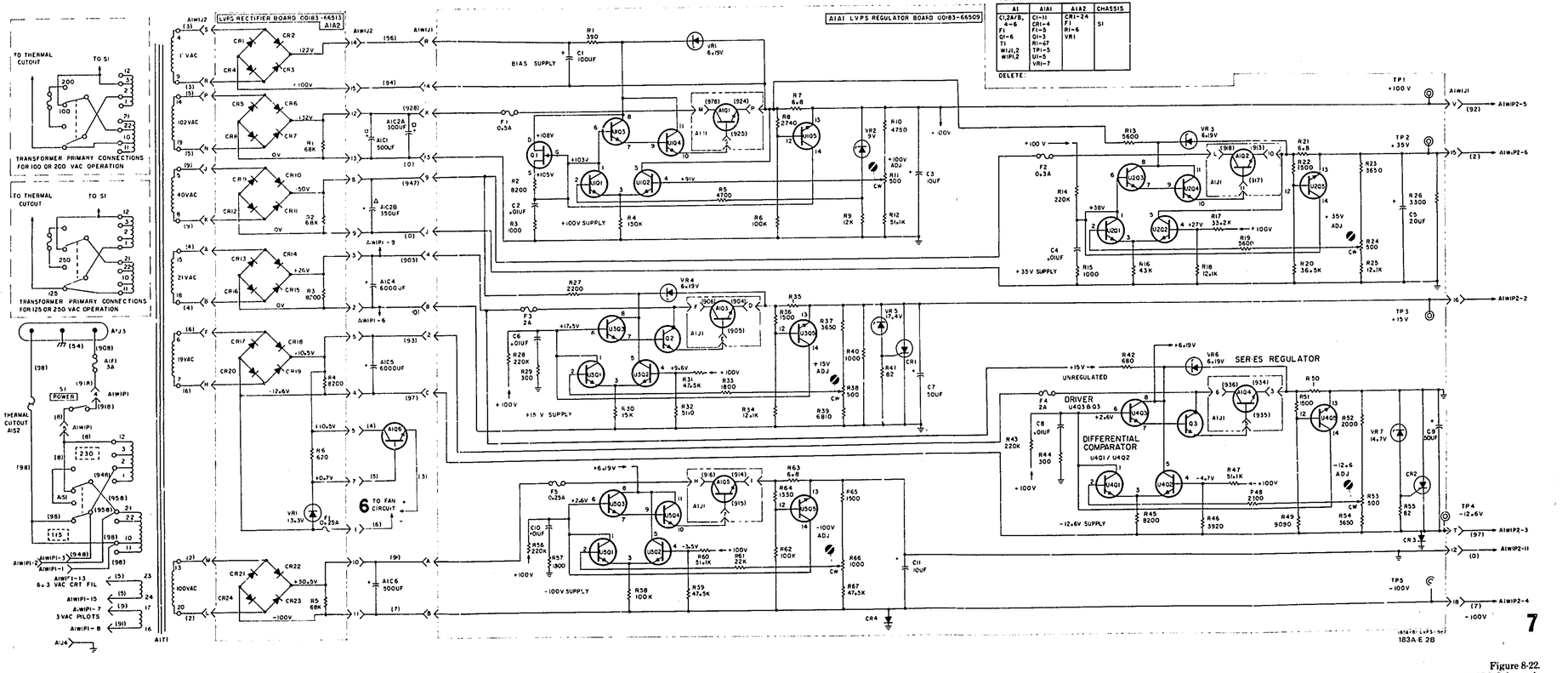


Figure 8-22. LVPS Schematic

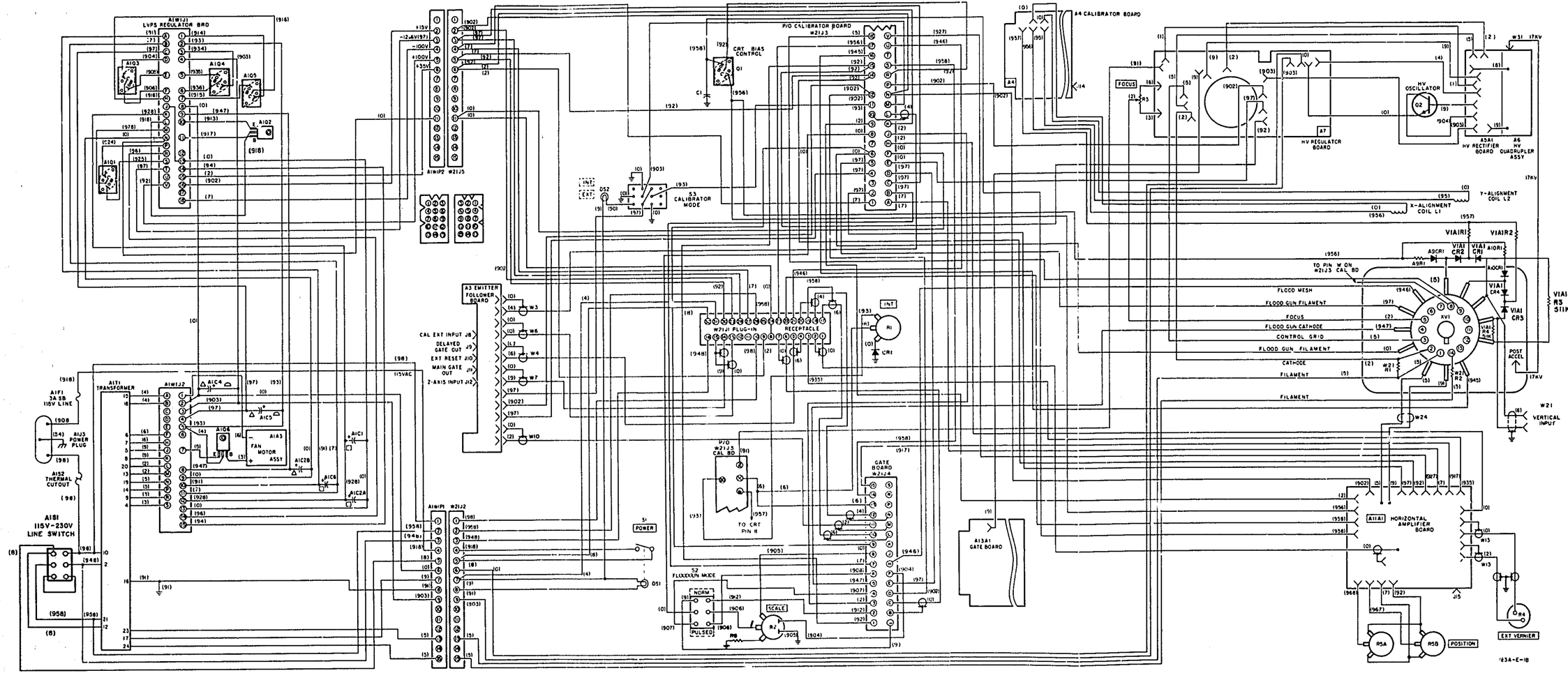


Figure 8-23
Model 183A/B Wiring Diagram
8-27/(8-28 blank)