OPERATING AND SERVICE MANUAL

MODEL 1317A
DISPLAY

(Including Options 005, 006, 008, 050, 051, 052, 053, 054, 055, 604, 607, 639, and 905)

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed **1649A.**

With changes described in Section VII, this manual also applies to instruments with serial numbers prefixed **1406A** through **1542A.**

For additional important information about serial numbers, see INSTRUMENT AND MANUAL IDENTIFICATION in Section I.

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

Manual Part Number 01317-90905
Binder Part Number 9282-0510
Microfiche Part Number 01317-90805

PRINTED: JANUARY 1977

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

LIST OF ILLUSTRATIONS

LIST OF TABLES

LIST OF TABLES (Cont'd)

CERTIFICATION

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

WARRANTY AND ASSISTANCE

This Hewlett-Packard product is warranted against defects in materials and workmanship for a period of one year from the date of shipment. Hewlett-Packard will, at its option, repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard, and provided the preventive maintenance procedures in this manual are followed. Repairs necessitated by misuse of the product are not covered by this warranty. NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANT-ABILITY AND FITNESS FOR A PARTICULAR PURPOSE. HEWLETT-PACKARD IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES.

Service contracts or customer assistance agreements are available for Hewlett-Packard products.

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

C W&A 9/76

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT.

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS.

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

USE CAUTION WHEN EXPOSING OR HANDLING THE CRT.

Breakage of the Cathode-ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, avoid rough handling or jarring of the instrument. Handling of the CRT shall be done only by qualified maintenance personnel using approved safety mask and gloves.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.

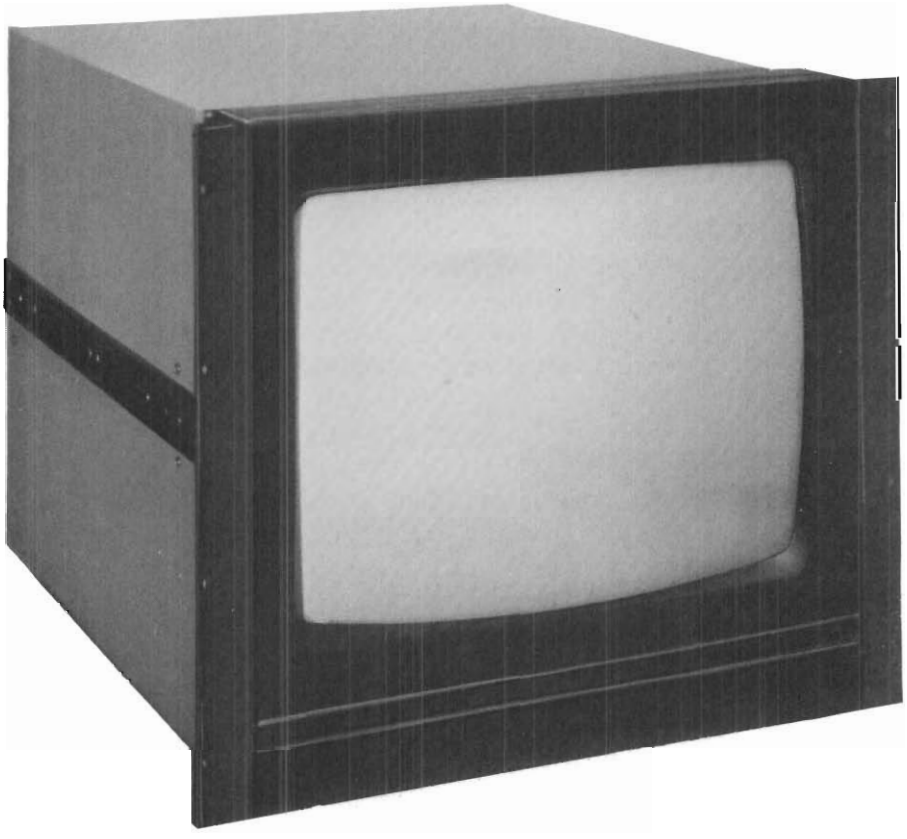
Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DANGEROUS PROCEDURE WARNINGS.

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.



1317A-P-001

Figure 1-1. Model 1317A High Speed Graphic Display

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This manual provides operating and servicing information for the Hewlett-Packard Model 1317A High Speed Graphic Display (figure 1-1). The manual is divided into eight sections, each covering a specific aspect of the instrument. All schematics are located at the rear of Section VIII.

1-3. This section contains general information pertaining to the instrument. Table 1-2 lists the abbreviations used throughout this manual, except in Section VI. The parts list in Section VI is a computer printout and uses computer supplied abbreviations.

1-4. Available options are listed and described in Section VII.

1-5. DESCRIPTION.

1-6. This large-screen, general-purpose graphic display unit has been designed for OEM systems applications. Specifications are listed in table 1-1. Suggested applications are listed in Section III.

1-7. SPECIAL FEATURES.

1-8. Input Modifications. The input circuits to the X, Y, and Z amplifiers are designed to permit easy modification for single-ended or differential operation. Additionally, the input termination resistance and the input attenuation ratio for the X, Y, and Z amplifiers can be changed. Refer to the paragrahs on input modifications in Section III.

1-9. Dynamic Focus-astigmatism. Voltages proportional to the position of the CRT beam are applied to the focus and astigmatism elements of the CRT. This causes spot size and shape to remain constant over the CRT viewing area. Focus is also corrected for changes in intensity level.

1-10. Phosphor Protection. A protection circuit senses slow or static deflection signals and limits beam intensity to prevent burning of the CRT phosphor and mesh.

1-11. CATHODE-RAY TUBE.

1-12. The CRT has an aluminized P31 phosphor and a usable viewing area of approximately 13.5 inch (34,3 cm) x 10.25 inch (26,0 cm). A 28-kilovolt accelerating potential produces a bright display without harmful X-rays.

1-13. Other phosphors, as well as a number of low-reflection contrast filters are available as standard options. Refer to Section VII.

1-14. A rim and tension band are fitted around the faceplate seal line to provide protection against implosion injury.

1-15. Complete CRT specifications are located in table 1-1.

1-16. WARRANTY.

1-17. The instrument is certified and warranted as stated in the front of this manual.

1-18. ACCESSORIES.

1-19. Hewlett-Packard has available a wide range of test equipment and accessories for use with HP instruments and instruments of other manufacturers. Refer to the latest HP catalog or request information from the nearest HP Sales/Service Office.

1-20. INSTRUMENT AND MANUAL IDENTIFICATION.

1-21. This manual applies directly to instruments with a serial prefix as listed on the title page. The serial prefix is the first group of digits in the serial number (figure 1-2). The serial number is on a tag affixed to the rear panel.

Note

The warranty may be void if the serial tag has been removed or mutilated.

1-22. Technical corrections (if any) are contained under errata on an enclosed manual changes sheet (if any).

1-23. INQUIRIES.

1-24. Refer any questions regarding the manual, the change pages, or the instrument to the nearest HP Sales/Service Office. Always identify the instrument by model number, name, and serial number in all correspondence. Refer to the rear of this manual for a world-wide listing of HP Sales/Service Offices.

Table 1-1. Specifications

VERTICAL AND HORIZONTAL AMPLIFIERS

RISE TIME: <70 ns (10% to 90% points) for full screen deflection.
BANDWIDTH: dc to 5 MHz (3db down) for 4 inch (10.2 cm) deflection.
PHASE SHIFT: <0.1° to 50 kHz and <1° to 250 kHz for full screen signal inputs.
DEFLECTION FACTOR: 100 mV/inch (1 Volt peak to peak for 10 inch deflection).
GAIN ADJUST: allows continuous adjustment of deflection factor from approximately 80 mV/inch to 130 mV/inch. (Front panel Gain control has 1.75:1 range.)
POLARITY: positive vertical input moves beam up; positive horizontal input moves beam to the right.
LINEAR WRITING TIME: <100 ns/inch (39,4 ns/cm).
LINEAR WRITING SPEED: >10 inches/μs (25,4 cm/μs).
DIAGONAL SETTLING TIME: signal settles to within 1 spot diameter of final value in <1 μs for any on or off screen movement. Off-screen deflection not to exceed one screen diameter.
REPEATABILITY: <0.15% error (of full screen) for re-addressing a point from any direction on or off screen. Off screen deflection not to exceed one screen diameter.
SEQUENTIAL POINT PLOTTING TIME: signal settles to within 0.010 inch (0,254 mm) of final value in <200 ns for any 0.10 inch (2,54 mm) step.
CROSSTALK: <0.015 inch (0,381 mm) with one input terminated in 50Ω and the other excited by a 1V 500 kHz signal.
SPOT JITTER AND MOTION: <0.010 inch (0,254 mm).
INPUTS: through BNC connectors where shield is floating.
INPUT RC: driven side 10kΩ shunted by approximately 40 pF. Shield input is 47Ω to ground (for differential operation this is replaced by 10kΩ). A switchable 50Ω termination between shield and center conductor is also provided.
MAXIMUM INPUT: ±50V (dc + peak ac) with 10kΩ internal termination, ±5V (dc + peak ac) with 50Ω internal termination.
POSITION: front panel controls allow zero input to be set off-screen in any direction from anywhere within the viewing area.
DYNAMIC RANGE: at least ±1-1/2 screen diameters from center screen.
DRIFT: 0.05 inch/hour (1,27 mm/hour) and 0.10 inch (2,54 mm) in 24 hours with covers installed.

Z-AXIS AMPLIFIER

RISETIME: <20 ns (c.w. bandwidth ≈ 15 MHz).
INPUT: BNC connector.
INPUT RC: approximately 10kΩ shunted by approximately 60 pF. 50Ω termination may be selected with internal switch.
MAXIMUM INPUT: ±50V (dc + peak ac) with 10kΩ internal termination. ±5V (dc + peak ac) with 50Ω internal termination.
BLANKING RANGE: 0 to 1V (see balance).
BLANKING POLARITY: + UNBLANKS.
BALANCE: internal adjustment provides ±1V offset (continuous) to blanking range.
GAIN ADJUST: extends blanking range by over 2.5:1 (continuous).

CATHODE RAY TUBE

TYPE: Post deflection accelerator, 28.5 kV accelerating potential, P31 phosphor, aluminized, is standard (refer to Section VII for additional phosphor selection), electrostatic focus and deflection.
VIEWING AREA: 17 inch (43,2 cm) diagonal CRT, useable viewing area at least 13.5 inch (34,3 cm) x 10.25 inch (26,0 cm).

SPOT SIZE:

INSIDE QUALITY AREA	OUTSIDE QUALITY AREA	QUALITY AREA
0.020 in. (0,51 mm)	Under 0.030 in. (0,76 mm)	10 in. x 10 in. (25,4 cm) x (25,4 cm)

RESOLUTION: Approximately 50 line/inch (19,7 lines/cm) measured with a shrinking raster.
LINE BRIGHTNESS: 50 foot lamberts at a writing speed of 0.1 inch/μs), (0,25 cm/μs), 60 Hz refresh rate, P31 phosphor, 0.020 inch (0,51 mm) spot size.
CONTRAST RATIO: 4:1 or greater measured by photometrically summing the trace and background brightness.
GEOMETRY: <3% pincushion and barrel distortion over useable display area.
LINEARITY: <3% of full scale along major axes.
PHOSPHOR PROTECTION: automatically detects absence of deflection and limits beam current to a safe but viewable level.
DYNAMIC FOCUS: built-in circuitry automatically corrects spot geometry for position location and beam intensity (video drive level).
TRACE ALIGN: Rotates X-axis into geometric alignment with the CRT viewing area.

Table 1-1. Specifications (Cont'd)

SAFETY PROTECTION

IMPLOSION: exceeds safety requirements of IEC 348 (IEC 65) and ANSI C39.5 for Electronic Measuring Apparatus.

HIGH VOLTAGE: anode lead is permanently bonded to CRT, minimizing shock hazard. All high potentials are completely enclosed or covered in compliance with UL recommendations.

X-RAY EMISSION: <0.1 mr/hr. Measured with Victoreen Model 440 RF/C in background noise.

GENERAL

X, Y, AND Z INPUT CONNECTORS: BNC type mounted to rear panel.

DIMENSIONS: See outline drawing.

FRONT PANEL CONTROLS: Brightness, Position X, Gain X, Position Y, Gain Y, Trace Align, Orthogonality, Focus, and Astigmatism located below CRT and hidden behind a control door.

LINE INDICATOR: lamps mounted behind front panel door and on rear panel.

POWER: selectable to 100 Vac, 120 Vac, 220 Vac and 240 Vac +5 % —10%, 48 Hz to 440 Hz, 100 VA maximum.

ENVIRONMENT

TEMPERATURE: —40°C to +70°C non-operating. 0°C to +50°C operating.

HUMIDITY: 50-95% relative humidity from 25°C to 40°C. (per MIL-E-16400E, class 3 and 4.)

ALTITUDE: 25,000 feet non-operating. 15,000 feet operating.

VIBRATION: vibrated in three planes for 15 minutes each with 0.010 to 0.060 peak to peak excursion. 10-55 Hz (per MIL-STD-167).

SHOCK: level 30G; duration 11 ms; shape 1/2 sinewave (Reference MIL-E-4970A, Procedure II).

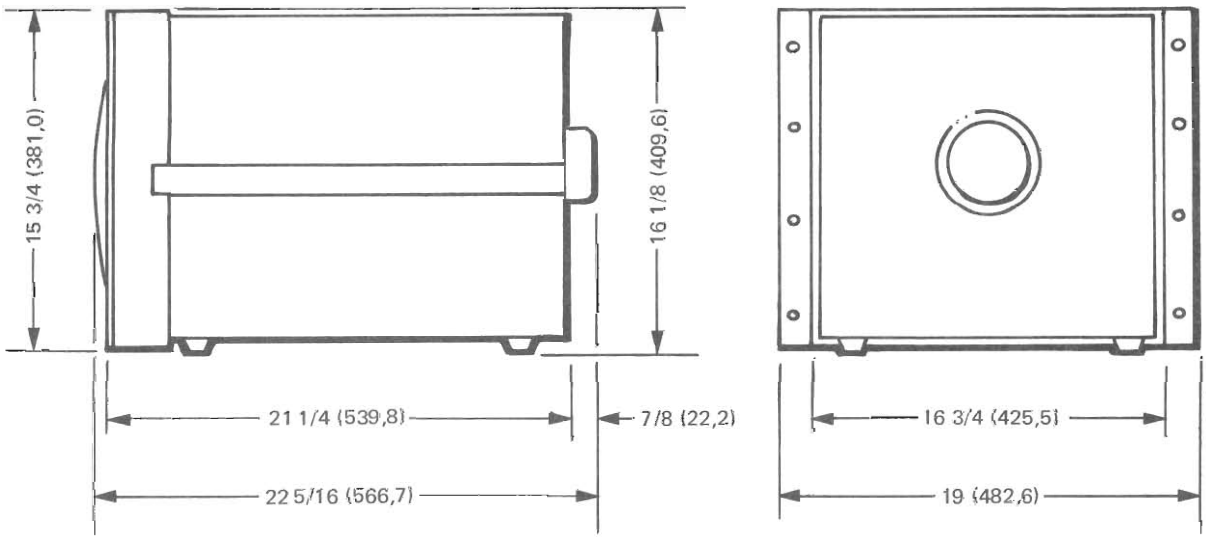


Table 1-2. Reference Designators and Abbreviations

REFERENCE DESIGNATORS

A	ASSEMBLY	E	MISC. ELECTRICAL PART	P	PLUG	U	INTEGRATED CIRCUIT (UNREPAIRABLE)
AT	ATTENUATOR RESISTIVE TERMINATION	F	FUSE	PS	POWER SUPPLY	V	VACUUM TUBE, NEON BULB, PHOTOCELL, ETC.
B	MOTOR, FAN	FL	FILTER	Q	TRANSISTOR	VR	VOLTAGE REGULATOR (DIODE)
BT	BATTERY	H	HARDWARE	R	RESISTOR	W	CABLE
C	CAPACITOR	J	JACK	RT	THERMISTOR	X	SOCKET
CP	COUPLING	K	RELAY	S	SWITCH	Y	CRYSTAL
CR	DIODE	L	INDUCTOR	T	TRANSFORMER	Z	NETWORK
DL	DELAY LINE	LS	SPEAKER	TB	TERMINAL BOARD		
DS	DEVICE SIGNALING (LAMP)	M	METER	TP	TEST POINT		
		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						

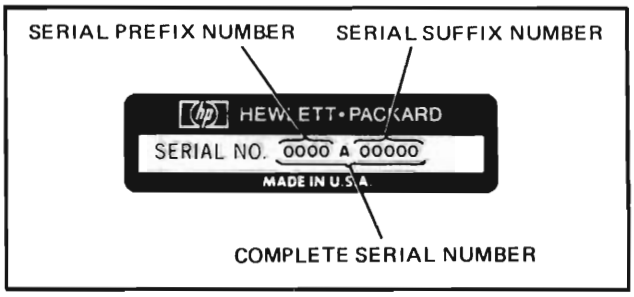


Figure 1-2. Instrument Serial Number

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information and instructions necessary for installing the Model 1317A. Included are initial inspection procedures, power requirements, preparation for use information, and instructions for repacking for shipment.

2-3. INITIAL INSPECTION.

2-4. This instrument was carefully inspected both mechanically and electrically before shipment. It should be free of mars or scratches and in perfect electrical order upon receipt. To confirm this, the instrument should be inspected for physical damage incurred in transit. If the instrument was damaged in transit, file a claim with the carrier. Test the electrical performance of the instrument using the performance test procedures outlined in Section V. If there is damage or deficiency, see the warranty in the front of this manual.

2-5. PREPARATION FOR USE.

2-6. The following paragraphs discuss facts that should be known by the operator before operation of the instrument.

2-7. STATIC ELECTRICITY. Because of the high voltages used, there may be a large static charge buildup on the CRT faceplate. A 2-ounce bottle of type GTC-59 Glass Treatment Compound is shipped with each instrument. To reduce the static charge, apply the compound freely to the CRT faceplate only. Let the faceplate dry, then polish. The charge can also be removed by placing one hand on the frame of the instrument, then wiping the CRT faceplate with the palm of the other hand.

2-8. INSTRUMENT MOUNTING. The instrument is configured to mount directly in a standard 19-inch relay rack. If other mounting configurations are desired, contact the nearest Hewlett-Packard Sales/Service Office (addresses in rear of manual).

2-9. INSTRUMENT COOLING. When the ambient temperature is below 55°C the instrument is adequately cooled by normal air circulation. The instrument should never be mounted so that the air flow around it is completely restricted. Contact the nearest HP Sales/Service Office (addresses in rear of manual) for assistance with particular cooling problems.

2-10. POWER REQUIREMENTS.

2-11. The 1317A operates from any power source supplying 100, 120, 220, or 240 Vac (+5% —10%), single phase, 48 Hz to 440 Hz that can deliver approximatley 115 VA of power.

2-12. The instrument is normally shipped from the factory set to operate at 120 Vac. To operate from any of the other sources, proceed as follows:

a. Remove power cord (if connected).

b. Set switch on rear panel to desired voltage.

c. For 220 Vac or 240 Vac, remove 1.5 ampere fuse and replace with 0.75 ampere fuse.

d. Connect power cord.

2-13. POWER CORDS AND RECEPTACLES.

2-14. Figure 2-1 illustrates the standard configurations used for HP power cords. The HP Part Number directly above each drawing is the part number for an instrument power cord equipped with a connector of that configuration. If the appropriate power cord is not included with the instrument, notify the nearest HP Sales/Service Office and a replacement cord will be provided.

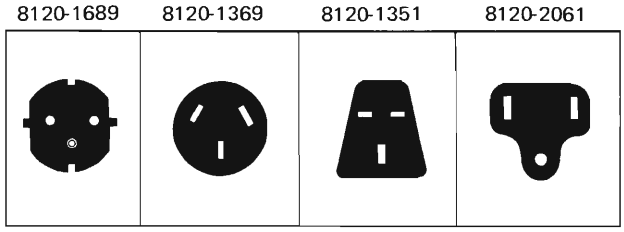


Figure 2-1. Power Receptacles

2-15. REPACKING FOR SHIPMENT.

2-16. If the instrument 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.

2-17. Use the original shipping carton and packing material. If the original packing material is not available, the Hewlett-Packard Sales/Service Office will provide information and recommendations on materials to be used.

SECTION III

OPERATION

3-1. INTRODUCTION.

3-2. This operating section explains the functions of all external controls and connectors of the Model 1317A. It describes typical operating modes and covers operator maintenance and operating instructions for most applications.

3-3. INSTRUMENT CAPABILITIES.

3-4. The Model 1317A is designed so that easy customer-installed modifications adapt the instrument for a wide variety of applications. Refer to Section VII for details.

WARNING

Dangerous voltages capable of causing death are present in this instrument. The following internal adjustments are outlined in Section V of this manual and should be made by qualified service personnel only.

3-5. SELECTABLE INPUT IMPEDANCE. Three manual switches permit selection of either 50 ohms or 10 kilohms input impedance. One switch is located on X-axis Amplifier Assembly A1, another is on Y-axis Amplifier Assembly A3, and the third is on Z-axis Amplifier Assembly A5.

3-6. ADJUSTABLE Z-AXIS GAIN AND BALANCE. These two adjustments are factory set to give optimum Z-axis operation and have no bearing on calibration of the instruments after repair or replacement of parts. Gain adjustment may be set to reduce Z-axis amplifier gain by a factor of 2.5. Balance control is used to adjust offset of positive or negative blanking voltage levels by ±1 V. These adjustments are optional to the user according to Z-axis voltage inputs and attenuation factors required by a specific application.

CAUTION

The phosphor protection circuit protects the CRT against a number of malfunctions. Unless it is absolutely necessary to obtain a brighter display for static or very slow deflection signals, or if the time constants of the X- and Y-input signals cause nonuniform intensity, leave PHOSPHOR PROTECTION switch in the ON position.

3-7. PHOSPHOR PROTECTION CIRCUIT. A phosphor protection circuit is provided which can be enabled or disabled with an internal manual switch. In operation, the phosphor protection circuit detects absence of deflection signals (or slow-speed deflection) and reduces CRT cathode current to a safe level. When deflection signals are restored (or speed increased beyond damage limit), full CRT beam current is also restored.

3-8. OPERATOR MAINTENANCE.

3-9. Operator maintenance should be limited to preoperational adjustment (figure 3-2) and to exterior cleaning of the instrument. Occasional cleaning of the CRT faceplate should be done with alcohol and a soft, nonabrasive wiping material. Plastic instrument covers (if used) can be cleaned with any mild household detergent.

CAUTION

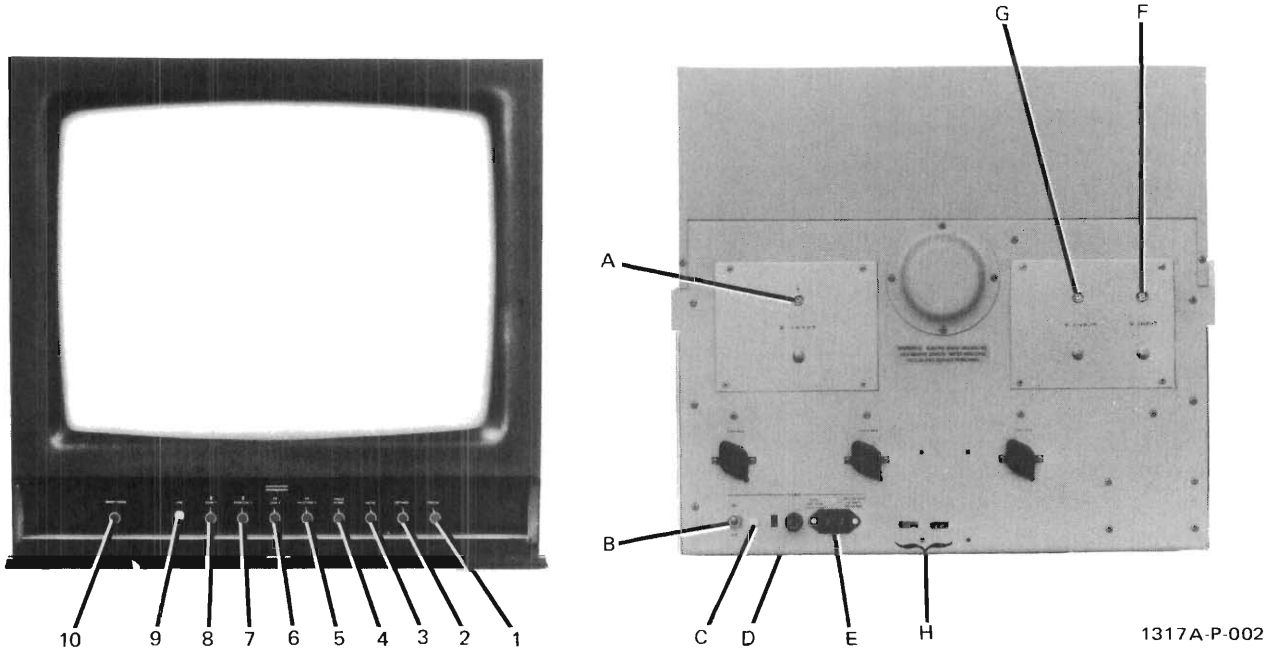
Do not use coarse substances or cleaning tissues containing glass reinforcing fibers on CRT filters. The filters are plastic and easily scratched.

3-10. CONTROLS AND CONNECTORS.

3-11. Front- and rear-panel controls and connectors are illustrated and described in figure 3-1.

3-12. OPERATING PROCEDURES.

3-13. Figures 3-2 and 3-3 contain step-by-step operating procedures. Index numbers on the illustrations correspond to step numbers in the instructions. Only basic techniques are covered. These techniques can be modified or combined to provide a number of unique operating requirements.



1. FOCUS. Focuses the trace; used in conjuction with ASTIG control to provide the best CRT display.

2. ORTHO. Used to adjust perpendicularity of X and Y traces. Operates in conjunction with TRACE ALIGN control.

3. ASTIG. Control which adjusts the roundness of the spot.

4. TRACE ALIGN. Rotates X and Y traces about screen center. Aligns Y trace to vertical graticule line and X trace to horizontal graticule line. Used in conjunction with ORTHOG control which aligns vertical trace perpendicular to horizontal trace.

5. POSITION X. Adjusts the trace position horizontally.

6. GAIN X. Adjustment for varying the gain of the X-amplifier. Gives 1.75:1 range of adjustment.

7. POSITION Y. Adjusts the trace position vertically.

8. GAIN Y. Adjustment for varying the gain of the Y-amplifier. Gives 1.75:1 range of adjustment.

9. LINE. Light indicating power is applied to the instrument.

10. BRIGHTNESS. Adjust the brightness of the display.

A. X INPUT. X-axis input connector.

B. ON/OFF switch. Applies ac power to the instrument.

C. power indicator lamp.

D. line FUSE.

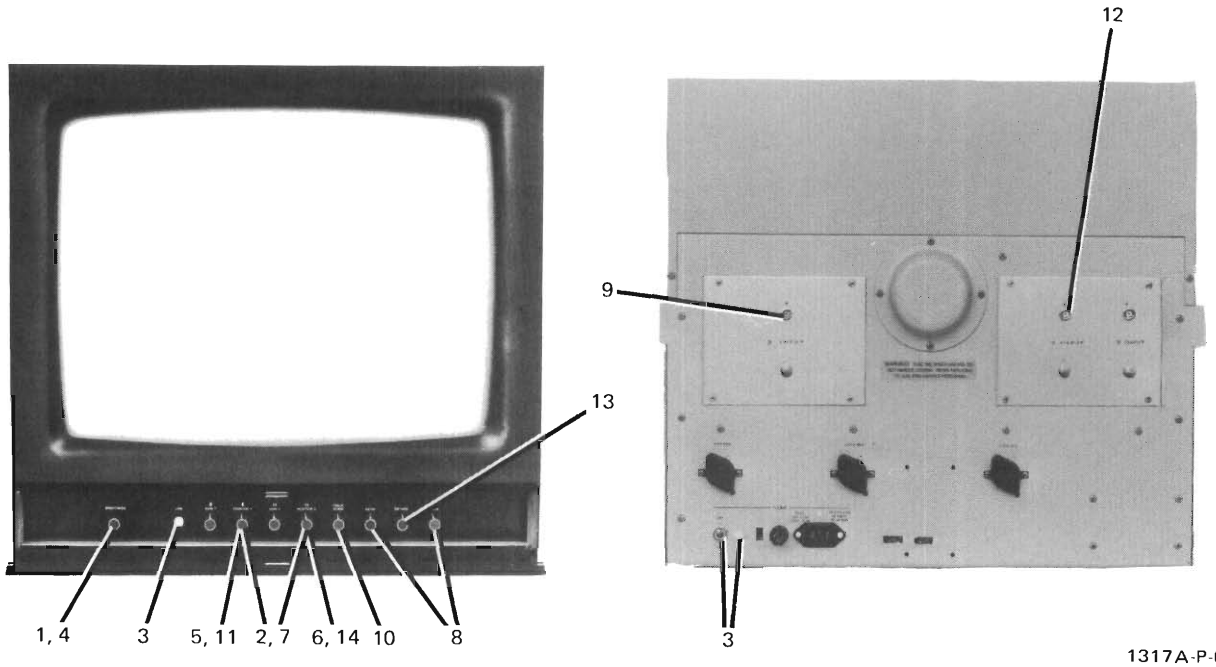
E. input ac power cord connector.

F. Z-INPUT. Z-axis input connector.

G. Y INPUT. Y-axis input connector.

H. LINE VOLTAGE SELECT. 100 Vac, 120 Vac, 220 Vac, 240 Vac.

Figure 3-1. Controls and Connectors



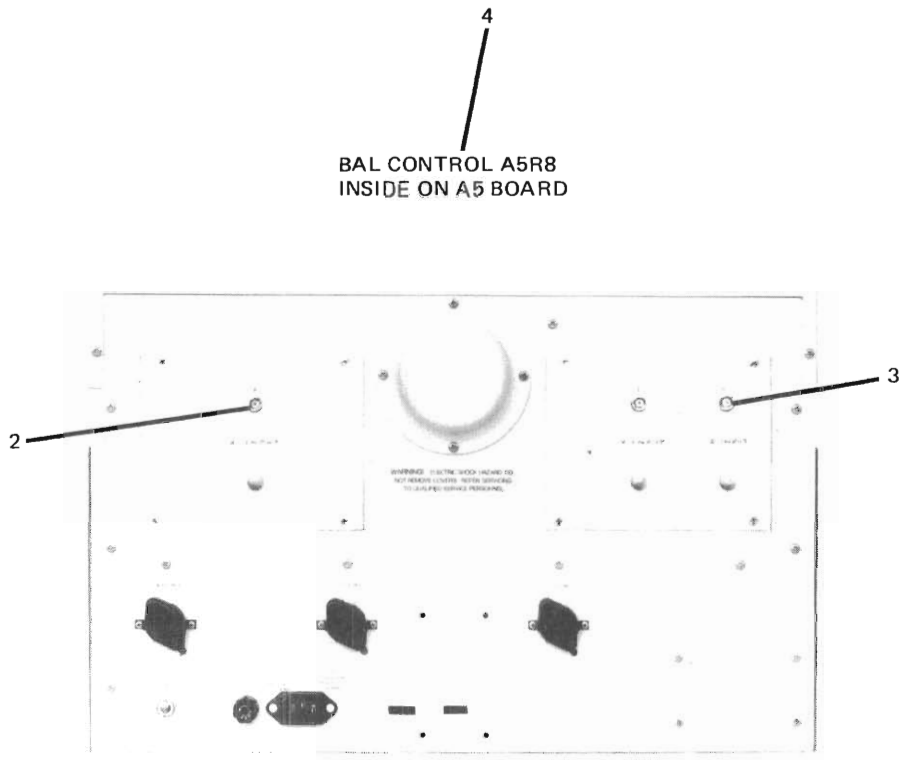
1. Set BRIGHTNESS fully ccw.
2. Set POSITION X and POSITION Y to midrange.
3. Set power switch to ON and observe that LINE and power indicator lamps light.

CAUTION

A high-intensity display over an extended period will burn the CRT phosphor.

4. Adjust BRIGHTNESS control. Display dot brightness should vary from completely extinguished in full ccw position to an acceptable viewing brightness as control is turned cw. Adjust for comfortable viewing brightness of display dot.
5. Adjust POSITION Y control through its full range. Display dot will move vertically on the CRT. Dot will disappear from the viewing area at either extreme of the control.
6. Adjust POSITION X control through its full range. Display dot will move horizontally across the CRT. Dot will disappear from the viewing area at either extreme of the control.
7. Set POSITION X and POSITION Y controls to center display dot on CRT.
8. Set FOCUS and ASTIG for smallest display dot size.
9. Apply a 1-kHz, 1-volt p-p signal to X INPUT connector. A horizontal trace should appear on the CRT.
10. Adjust TRACE ALIGN, if necessary, to align trace horizontally.
11. Set GAIN X for trace length of exactly 10 inches.
12. Move input signal to Y INPUT.
13. Adjust ORTHOG, if necessary, to align trace vertically.
14. Set GAIN Y for trace length of exactly 10 inches.

Figure 3-2. Preoperational Procedure



1. Perform preoperational procedure (figure 3-4).
2. Apply signal to X INPUT connector.
3. Apply desired Z-axis signal (intensification/ blanking) to the Z INPUT connector.
4. If the Z-axis signal has a positive or negative dc level, adjustment of the Z BAL potentiometer will compensate for dc level of the signal over a range of ±1 volt.

Figure 3-3. Z-axis Operation

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. This section contains function descriptions of Model 1317A, keyed to an overall block diagram. The block diagram and schematics are located in Section VIII.

4-3. BLOCK DIAGRAM DISCUSSION.

4-4. This discussion illustrates the function of each circuit group (block) and the relationship of the blocks to each other. It is based on the overall block diagram, figure 8-2. The conditioning and calibrating controls, as shown on the block diagram, illustrate the association of the control with a particular block and are not necessarily an accurate representation of the control's action.

4-5. LOW VOLTAGE POWER SUPPLIES.

4-6. This block (A11) provides operating power to all the other blocks, including the high voltage power supply and some of the CRT elements. Three regulated dc outputs are provided: +250 V, +15 V, and —15 V. The +250 V supply and the —15 V supply are adjustable. The +15 V supply is referenced to the —15 V supply. Several other voltages are derived from the +250 V supply by means of voltage dividers and avalanche diodes. Additionally, an unregulated dc output to the high voltage oscillator and a 6.3 Vac output to the CRT filament are provided.

4-7. HIGH VOLTAGE POWER SUPPLY.

4-8. The high voltage power supply (on A12 and A13) provides the high operating potentials for the CRT. The rf output of the high voltage oscillator is stepped up by the high voltage transformer and conditioned by the other components on A12. A sample of the high voltage output drives the error detector. The error detector controls the conduction angle of the high voltage oscillator to accomplish regulation.

4-9. DEFLECTION SYSTEM.

4-10. The X-axis amplifiers (on A1 and A2) and the Y-axis amplifiers (on A3 and A4) are identical. They drive the horizontal and vertical deflection plates of the CRT proportionally to the signals applied to the X INPUT and Y INPUT.

4-11. FOCUS AND ASTIGMATISM CIRCUITS.

4-12. Samples from the X and Y amplifiers, proportional to the CRT beam position, drive the focus and astigmatism circuits (on A6). These circuits develop correction voltages for the focus and astigmatism elements of the CRT. The astigmatism element is directly controlled by the output of the astigmatism driver. The focus element is connected to the —3400 V output of the high voltage power supply. This supply is returned to (and controlled by) the output of the focus driver. The focus driver also receives a sample from the Z-axis amplifier and causes focus corrections for changes in beam intensity.

4-13. PHOSPHOR PROTECTION CIRCUITS.

4-14. The phosphor protect control circuits (on A1 and A3) detect static or slow moving deflection voltages and activate the phosphor protection circuit (on A5). The phosphor protection circuit limits the output of the Z-azis amplifier and protects the CRT mesh and phosphor from damage that a static, high-intensity beam could cause.

4-15. Z-AXIS AMPLIFIER.

4-16. The high voltage supply for the CRT control grid is returned to (and controlled by) the output of the Z-axis amplifier (on A6). Consequently, the voltage applied to the Z INPUT controls CRT beam intensity. The Z-axis amplifier can be switched to permit blanking by either a positive or negative voltage at the Z INPUT.

4-17. CIRCUIT DETAILS.

4-18. PHOSPHOR PROTECT CIRCUITS. Phosphor protect circuits in the X axis and Y axis are identical in operation so only the X-axis circuits will be described (schematics 1 and 2).

4-19. Excessive intensity caused by a slow-moving or static beam can cause damage to the CRT expansion mesh or phosphors. When deflection speeds are reduced to a potentially harmful level (less than approximately 76 mm/ms (3 in./ms), the phosphor protect circuits limit CRT cathode current. This current limiting action occurs because of circuit actions described below.

4-20. Differential output, from the X-axis voltage differential amplifier stage (schematic 1), is applied to X-axis emitter follower stage (schematic 2). Differential output of this stage is proportional to the beam position in the X-axis direction, and is applied to the voltage sensor stage. A voltage change at the collector of either voltage sensor reduces the voltage on A1C19. When the voltage on A1C19 is sufficiently reduced, the phosphor protect control is activated and produces a positive voltage at its output.

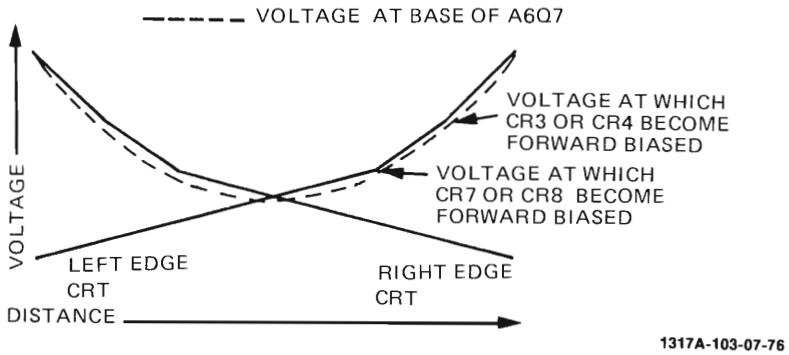


Figure 4-1. Parabolic Correction Voltage

4-21. When a slow-moving or static beam is detected and the phosphor protect control is activated, the positive output from the voltage sensors is applied to the input of the phosphor protection circuit on the Z-axis assembly (schematic 7). A positive voltage at this point causes A5VR4 to clamp the Z-axis output at approximately 14 V.

4-22. During periods when the beam is being deflected at a safe rate, the X-axis phosphor protect control grounds input to the phosphor protection circuit, the voltage clamp is removed, and the Z-axis output operates over its full range.

4-23. Some applications make it necessary to obtain a bright display of a slow-moving or static beam. Setting the phosphor protection switch to the OFF position disables the phosphor protection circuit by grounding all inputs to the circuit.

4-24. DYNAMIC FOCUS/ASTIGMATISM CIRCUITRY. The circuits that change focus and astigmatism voltages with reference to beam position are quite similar. Only dynamic focus circuits are described here, and reference to dynamic astigmatism is made only where circuit variation is involved.

4-25. Circuit action of dynamic focus is identical for the X axis and Y axis so only the X axis is discussed here. The differential voltage proportional to beam position is taken from the input of the X-axis amplifier emitter follower stage (schematic 2) and applied to the X-input amplifier stage on the dynamic focus assembly (schematic 8). In the dynamic focus assembly, the output of the X-input amplifier is applied to a diode shaping network that generates a parabolic voltage as a function of beam position (figure 4-1).

4-26. With A6FX1 and A6FX2 adjustments in full ccw position (schematic 8), the diode shaping network is reverse biased and the X-input amplifier collector voltages will vary linearly as the differential voltages change on their bases (figure 4-2). Adjusting A6FX1 and A6FX2 as described in Section V establishes a reference voltage level on X-input amplifiers at which linearity of the voltage ramp is altered.

4-27. The output voltage of the diode shaping network is applied to a current amplifier and converted to a current signal. These current signals from X- and Y-input amplifiers are summed and applied to a complementary output amplifier. The complementary-output amplifier output is a correction voltage applied to the floating focus supply in the high voltage power supply (schematic 11). These circuit effects serve to adjust beam focus automatically in relationship to beam position on the CRT face.

CAUTION

If a pattern consisting of only a few dots is present on the CRT, the phosphor protection circuit will detect deflection and disable the phosphor protection circuit. If the beam current is high and the duty cycle is near 100%, the average current at each dot may be sufficient to damage the CRT. Therefore, caution must be used in setting the INTENSITY control.

4-28. Dynamics focus and dynamic astigmatism vary only in that the dynamic focus circuit is designed to provide a relatively low output impedance to suppress noise feedback from the normal focus circuit.

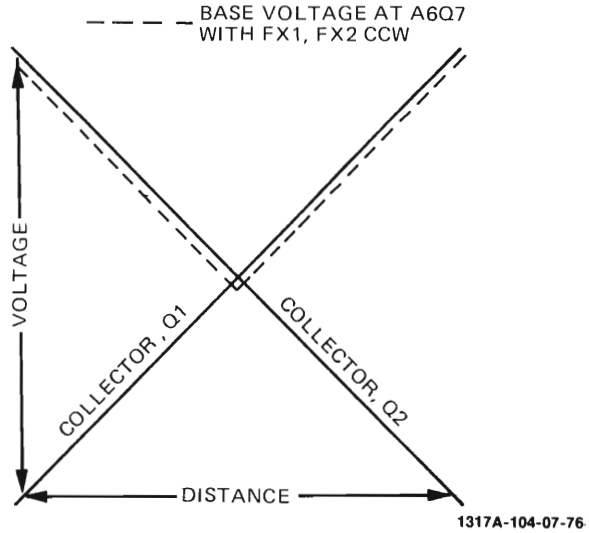


Figure 4-2. Differential Input Voltage

Table 5-1. Recommended Test Equipment

Instrument Type	Recommended Model	Required Characteristics	Required For
Monitor Oscilloscope	HP Model 180C/ 1808A/1820C	75 MHz vertical BW, dual channel, 1 MΩ input resistance, external-sync input, sweep-ramp output	Performance Checks Adjustments
Constant Amplitude Signal Generator	HP Model 651B	Frequency: 50 kHz to 5 MHz Distortion: <3%	Performance Checks Adjustments
Square Wave Generator	HP Model 211B	Frequency: 10 kHz to 100 kHz Amplitude: 1V p-p Risetime: < 5 ns Output Z: 50Ω	Performance Checks Adjustments
Pulse Generator	HP Model 8004A	Variable pulse width, amplitude, polarity, and frequency	Performance Checks
Digital Voltmeter	HP Model 3465A	Voltage range: −15 to +250V Accuracy: ±0.1%	Adjustments
Voltmeter Calibrator	Customer's Choice	Frequency: 400 Hz Voltage: 1V p-p Accuracy: ±0.1%	Performance Checks
10:1 Divider Probe (2)	HP Model 10004D	Voltage division ratio: 10:1 Accuracy: ±3%	Performance Checks
1000:1 Divider Probe	HP Model K05-3440A	Voltage division ratio: 1000:1 Voltage rating: 10 kV Input Z: 100MΩ	Adjustments
Optical Comparator	Edmond Scientific Junior Comparator	Measure down to 0.005 inch	Performance Checks

7000-A-19A

SECTION V

PERFORMANCE CHECKS AND ADJUSTMENTS

5-1. INTRODUCTION.

5-2. This section contains step-by-step procedures for checking Model 1317A specifications as shown in Section I of this manual. A table (performance check record) is provided at the end of the performance checks for recording the measurements taken during the first running of the procedure. The procedures for making all internal adjustments are covered following the performance check procedures. A photograph showing the locations for all adjustment controls is located at the end of this section.

5-3. The procedures assume that the instrument will perform as specified. Should there be a failure to obtain the desired result during either the checkout procedures or the adjustment procedures, the cause should be found and corrected before proceeding further. Refer to the adjustments in this section and to the instructions on troubleshooting in Section VIII of this manual.

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

5-5. PERFORMANCE CHECKS.

WARNING

Do not attempt to operate this instrument until the safety summary, located just before Section I, has been read and understood.

5-6. The following paragraphs describe procedures to determine if the instrument meets the specifications listed in the specification table located in Section I. These procedures can be used as part of an incoming inspection, as a periodic operational test, or to check calibration after repairs or adjustments have been made. Any one of the following checks can be made separately, if desired.

5-7. The first time the performance checks are made, enter the results on the performance check record. Be sure to enter the instrument serial number on the record for identification. Remove the record and file it for future reference.

5-8. DEFLECTION AMPLIFIER RISETIME.

5-9. Required Result. Risetime, measured between the 10% and 90% points on the displayed waveform, shall be equal to or less than 70 nanoseconds for both the x and y amplifier.

5-10. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

c. Connect equipment as shown in figure 5-1.

d. Set frequency of square wave generator to 100 kHz.

e. Adjust monitor oscilloscope and amplitude of square wave generator output for full scale vertical deflection on monitor oscilloscope.

f. Observe risetime between 10% and 90% points (dotted lines on monitor oscilloscope).

g. Disconnect square wave generator from X INPUT and connect to Y INPUT.

h. Disconnect probes from horizontal deflection plates and connect to vertical deflection plates.

i. Repeat steps e and f.

5-11. DEFLECTION AMPLIFIER BANDWIDTH.

5-12. Required Result. When comparing equal amplitude 50-kHz and 5-MHz input signals, bandwidth of both the x and y amplifiers shall be down no more than 3 dB at 5 MHz.

5-13. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

c. Connect equipment as shown in figure 5-2.

d. Set frequency of constant amplitude signal generator to 50 kHz.

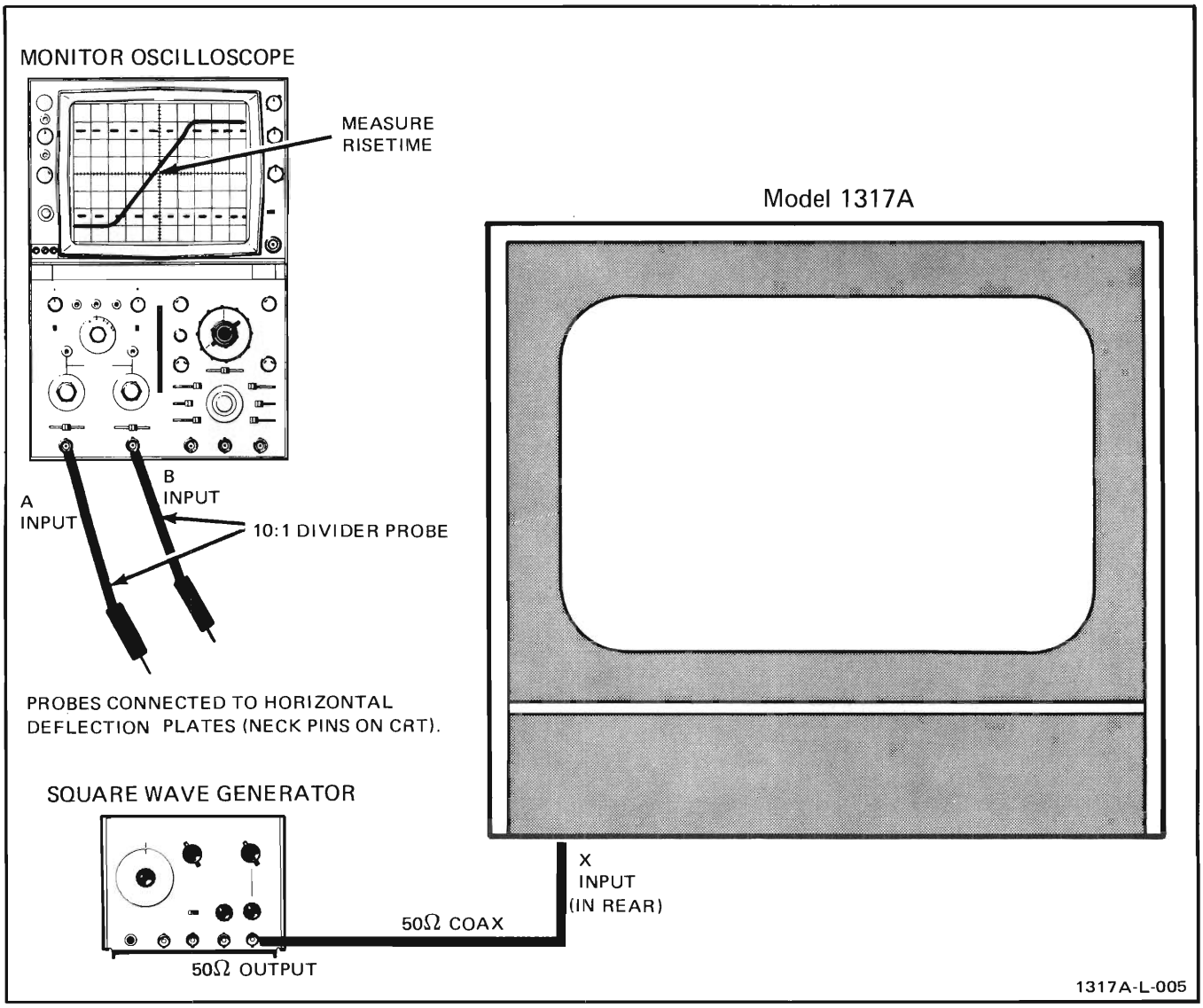


Figure 5-1. Risetime Test Setup

e. Set amplitude of constant amplitude signal generator for 5-inch display on CRT.

f. Using POSITION X and POSITION Y controls, center display on CRT.

g. Change frequency of constant amplitude signal generator to 5 MHz. CRT display shall be equal to or greater than 3.7 inches.

h. Disconnect constant amplitude signal generator from X INPUT and connect to Y INPUT.

i. Repeat steps d through g.

5-14. DEFLECTION AMPLIFIER PHASE SHIFT.

5-15. Required Result. Phase shift between the x and y amplifier shall be less than 0.1 degree to 50 kHz and less than 1 degree to 250 kHz for full screen signals.

5-16. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

c. Connect equipment as shown in figure 5-3.

d. Set frequency of constant amplitude signal generator to 50 kHz.

e. Set amplitude of constant amplitude signal generator for full screen display (corner to corner) on CRT.

f. Using POSITION X and POSITION Y, center display. There shall be no noticeable separation of diagonal trace.

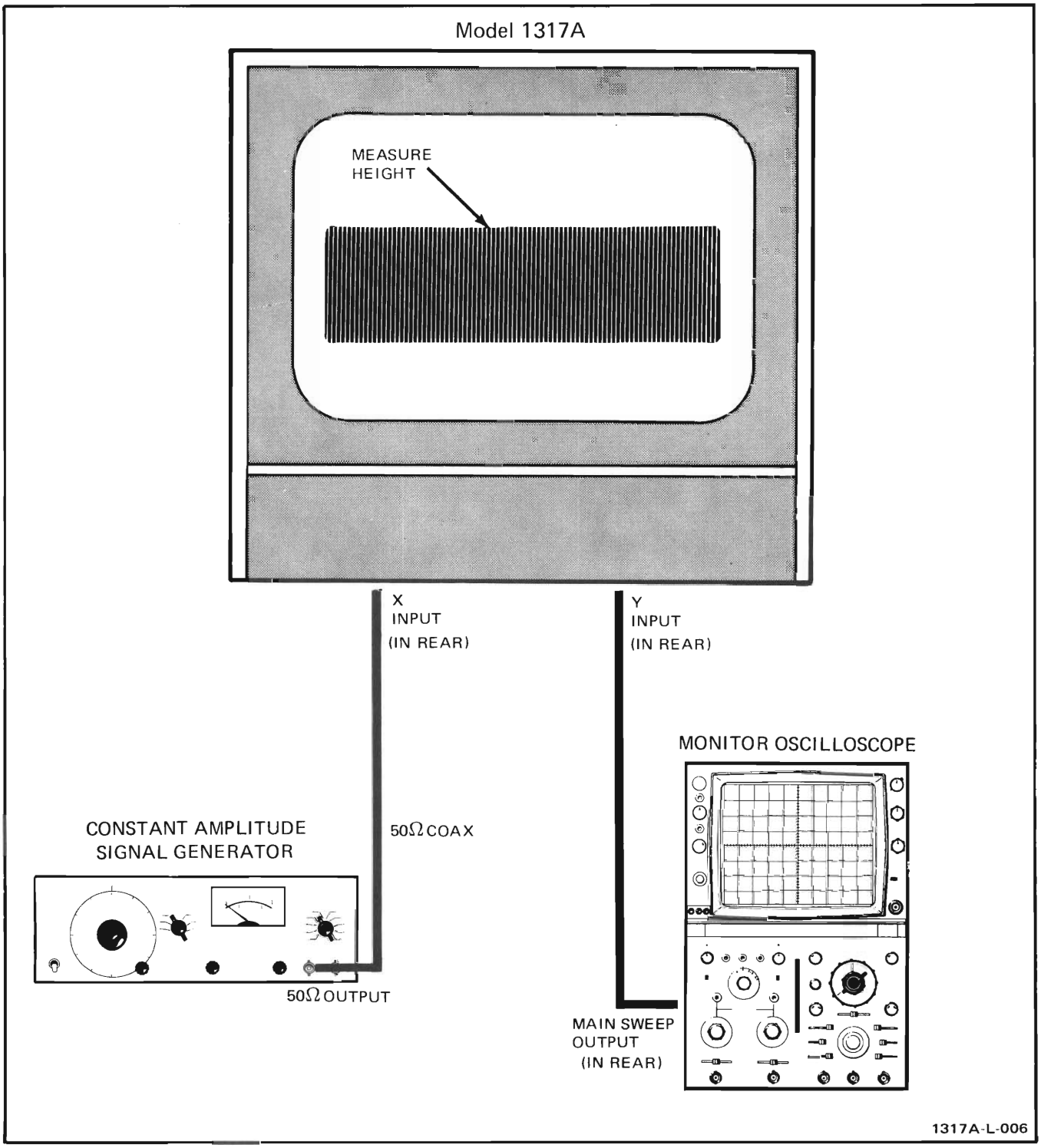


Figure 5-2. Bandwidth Test Setup

g. Increase frequency of constant amplitude signal generator to 250 kHz. Trace separation shall be less than 0.1 inches.

5-17. DEFLECTION FACTOR.

5-18. Required Result. The deflection factor of both the x and y amplifier shall be approximately 100 mV/inch (1V p-p for 10 inch deflection) with front panel gain controls set clockwise. Setting the gain control counterclockwise increases the deflection factor by 1.75:1 (1V p-p for ≈ 5.6 inch deflection).

5-19. Procedure.

a. Set 50Ω/10K switches (on boards A1 and A3) to 10K.

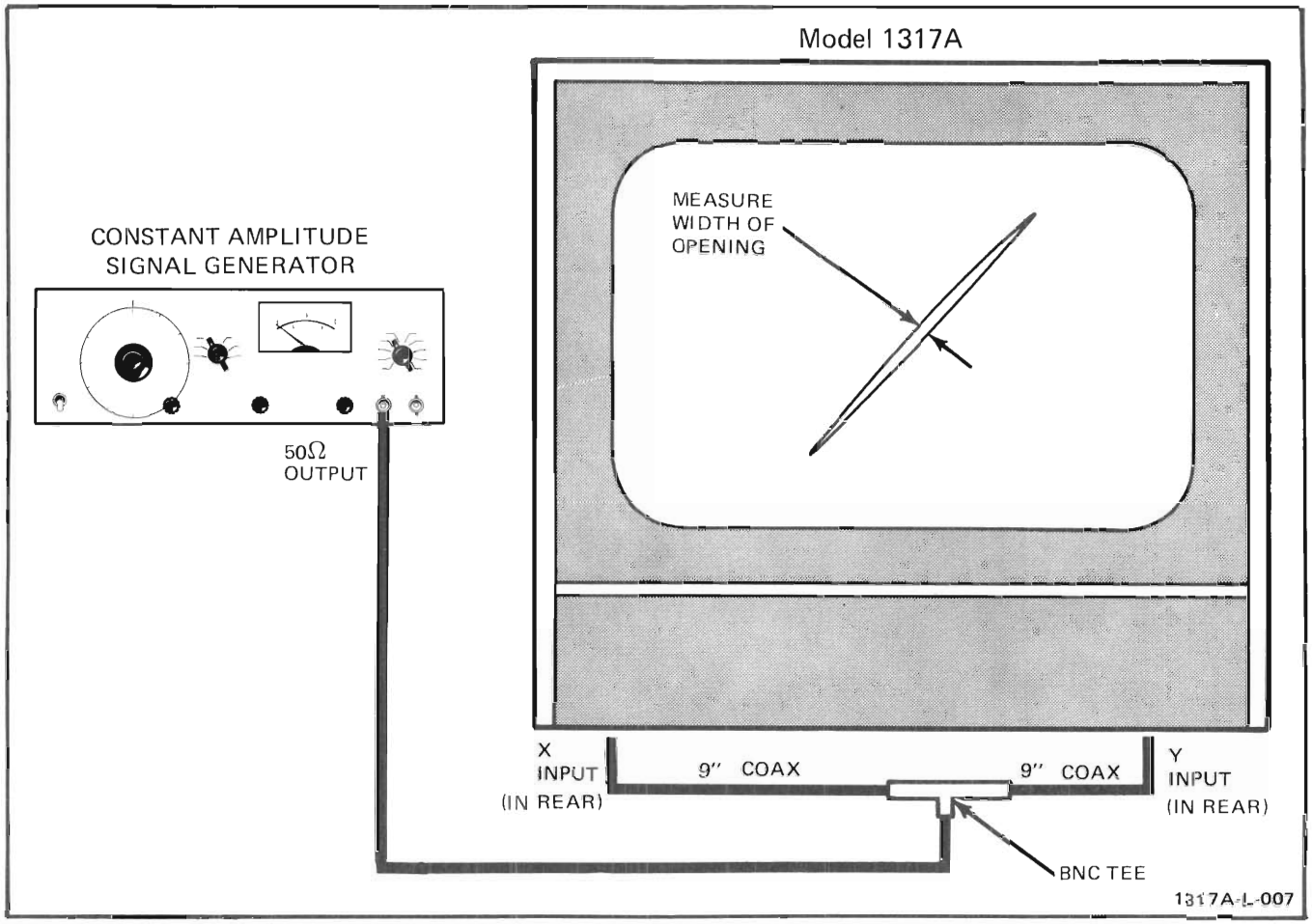


Figure 5-3. Phase Shift Test Setup

b. Connect equipment as shown in figure 5-4.

c. Set voltmeter calibrator for a 400-Hz, 1V p-p output.

d. Set GAIN X ccw. Length of display shall be 5.6 inches or less.

e. Set GAIN X cw. Length of display shall be 10 inches ±3%.

f. Disconnect voltmeter calibrator from X INPUT and connect to Y INPUT.

g. Repeat steps d and e using GAIN Y control.

5-20. DIAGONAL SETTLING TIME.

5-21. Required Result. The CRT beam, when moved from one position to another, must settle to within 1 spot diameter in less than 500 nanoseconds.

5-22. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

c. Connect equipment as shown in figure 5-5. Note that line to Z INPUT is not yet connected.

d. Set square wave generator for 1V p-p, 100-kHz, symmetrical output.

e. Set POSITION and BRIGHTNESS controls for bright dots at diagonal extremes of 10 inch quality area of CRT.

f. Set BRIGHTNESS ccw.

g. Connect Z INPUT.

h. Set pulse generator for 100-kHz, 1V p-p, 1 µsec width pulse output.

i. Set sweep time of monitor oscilloscope to 0.1 µsec/div and display switch to ALT B.

j. Set monitor oscilloscope trigger controls to achieve stable display. If necessary, slightly readjust symmetry control on square wave generator to achieve synchronization between channels A and B.

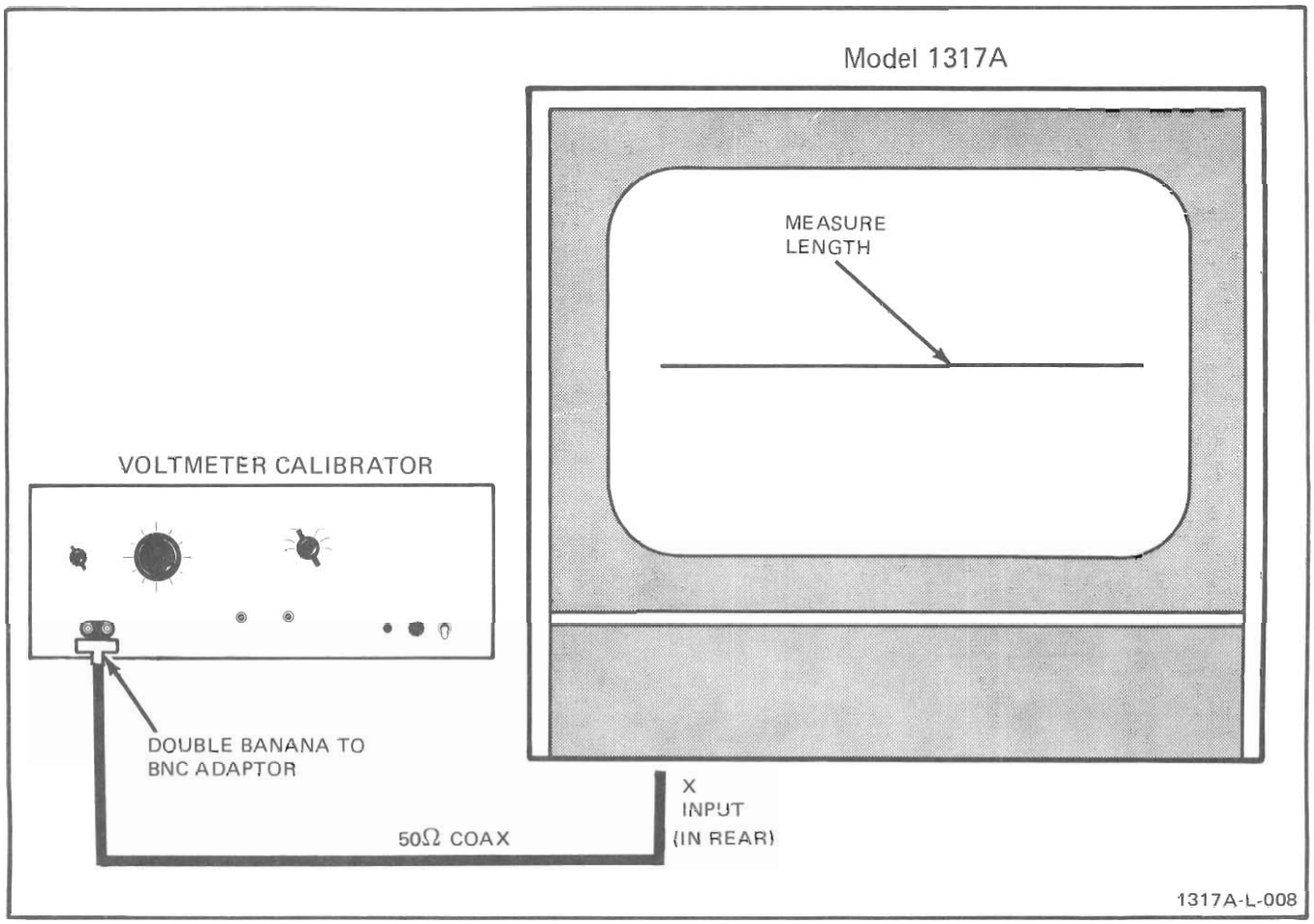


Figure 5-4. Deflection Factor Test Setup

k. Set pulse generator delay to 10 ns and vernier cw. Note clean bright dot on lower left of CRT.

l. Turn delay vernier ccw. Note appearance of distorted trace segment projecting from dot.

m. Adjust delay vernier until length of trace segment is one dot diameter.

n. Measure time difference between two transitions displayed on monitor oscilloscope. Difference shall be equal to or less than 500 ns.

5-23. SEQUENTIAL POINT PLOTTING TIME.

5-24. Required Result. The spot shall settle to within 0.010 inch of final value in less than 200 nanoseconds for any 0.10 inch step.

5-25. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1, A3, and A5) to 50Ω.

c. Connect equipment as shown in figure 5-5. Note that line to Z INPUT is not yet connected.

d. Set square wave generator for 100-kHz symmetrical output.

e. Set amplitude of square wave generator to cause 0.1 inch deflection on CRT.

f. Set BRIGHTNESS ccw.

g. Connect Z INPUT.

h. Set pulse generator for 100-kHz, 1V p-p, 1 μsec width pulse output.

i. Set sweep time of monitor oscilloscope to 0.1 μsec/div and display switch to ALT B.

j. Set monitor oscilloscope trigger controls to achieve stable display. If necessary, slightly readjust symmetry control on square wave generator to achieve synchronization between channels A and B.

k. Set pulse generator delay to 10 ns and vernier cw. Note single clean bright dot.

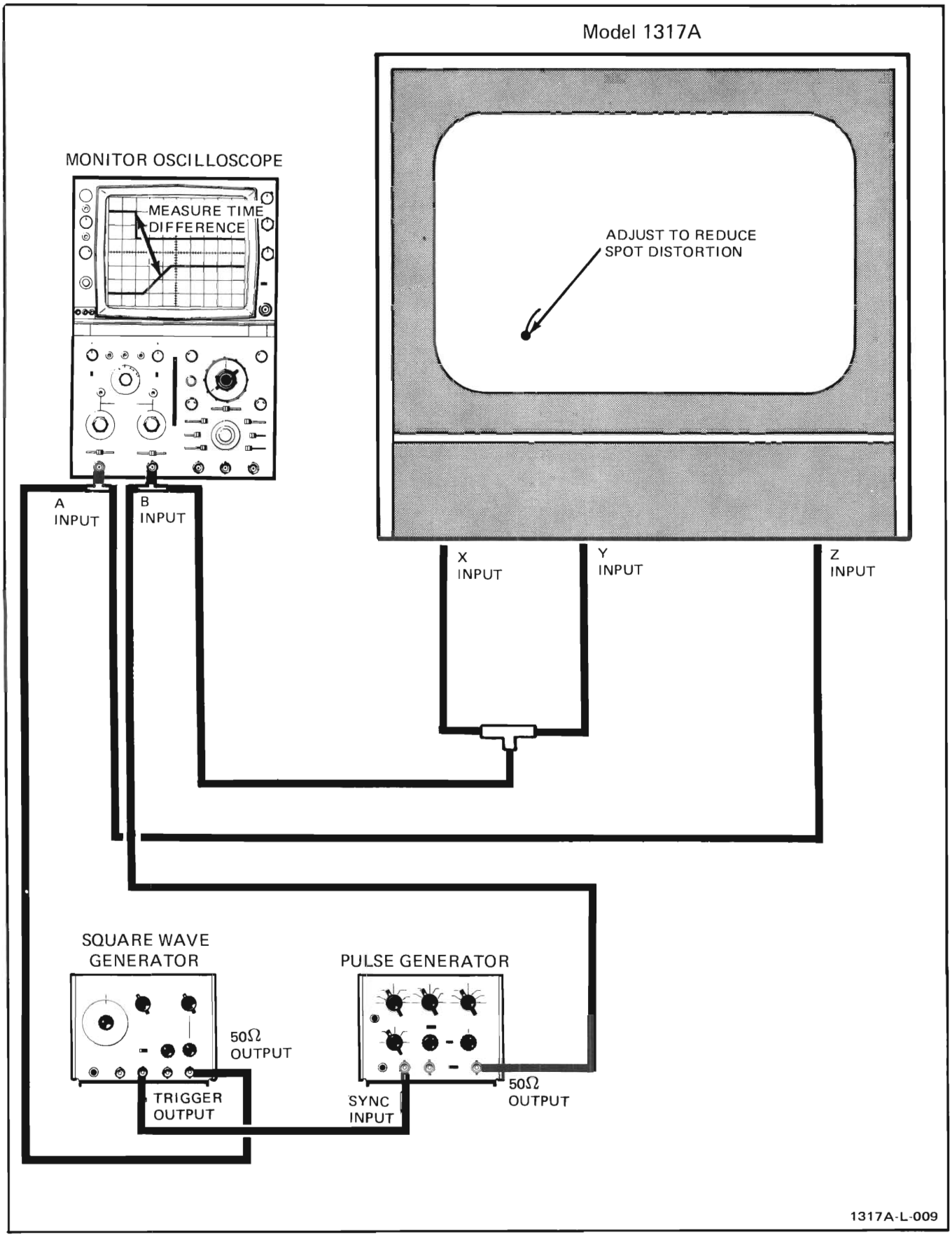


Figure 5-5. Diagonal Setting Time and Sequental Point Plotting Time Test Setup

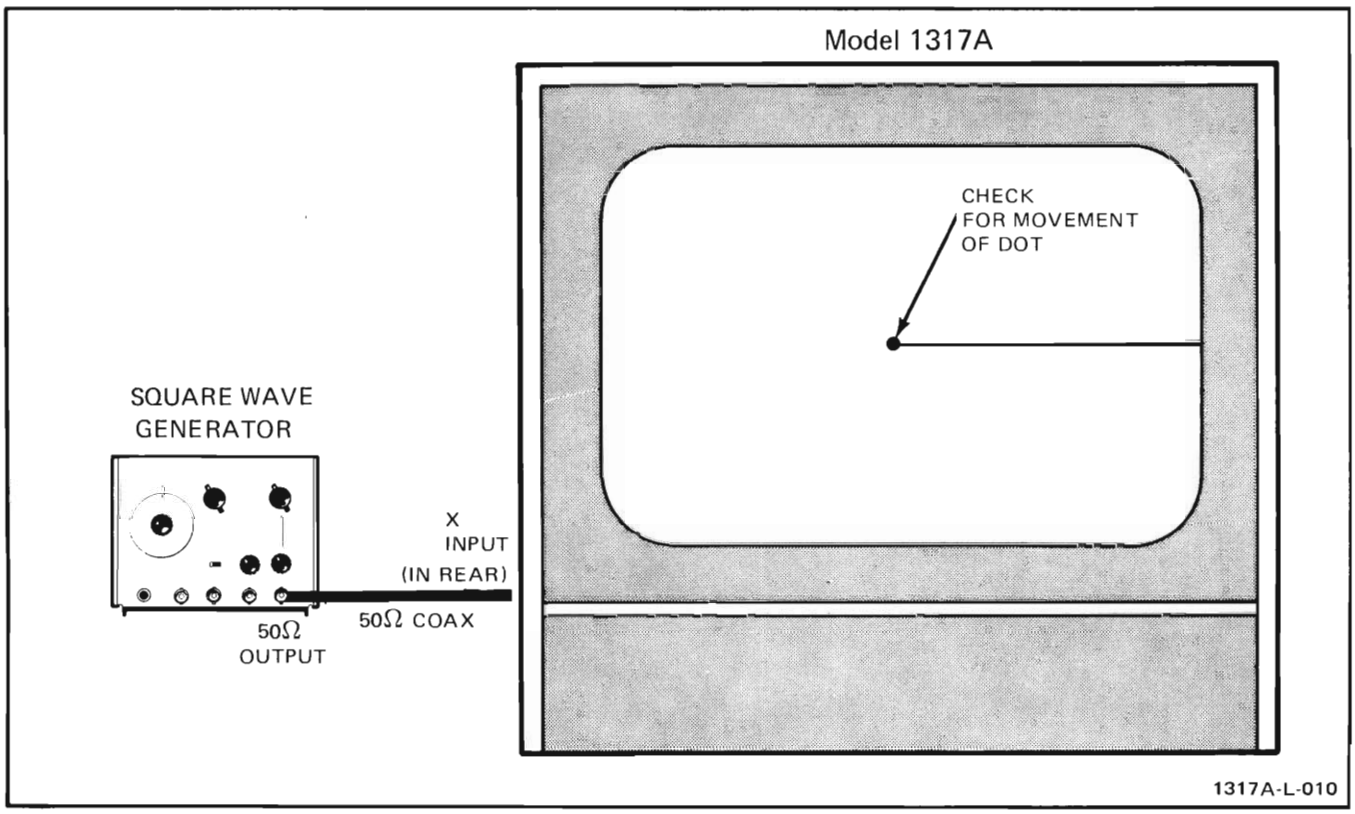


Figure 5-6. Repeatibility Test Setup

l. Turn delay vernier ccw. Note appearance of distorted trace segment projecting from dot.

m. Adjust delay vernier until trace segment just disappears.

n. Measure time difference between two transitions displayed on monitor oscilloscope. Difference shall be less than 200 ns.

5-26. REPEATIBILITY.

5-27. Required Result. There shall be less than 0.15% of full-screen error in readdressing any point on screen from any other point on screen.

5-28. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

c. Connect equipment as shown in figure 5-6.

d. Set frequency of square wave generator to 10 kHz, and center symmetry control.

e. Using position controls, place base line dot to center of CRT.

f. Set amplitude of square wave generator to place maximum excursion dot off screen (not more than one screen diameter).

g. Vary frequency, amplitude and symmetry controls of square wave generator. Base line dot shall remain stationary while controls are being moved.

h. Disconnect square wave generator from X INPUT and reconnect to Y INPUT.

i. Repeat steps e, f, and g.

5-29. CROSSTALK.

5-30. Required Result. Crosstalk between deflection amplifiers shall be less than 0.015 inch with one input terminated in 50 ohms and the other driven by a 1-volt, 500-kHz signal.

5-31. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A and A3) to 50Ω.

c. Connect equipment as shown in figure 5-7.

d. Set output of constant amplitude signal generator for 1-volt p-p, 500 kHz output.

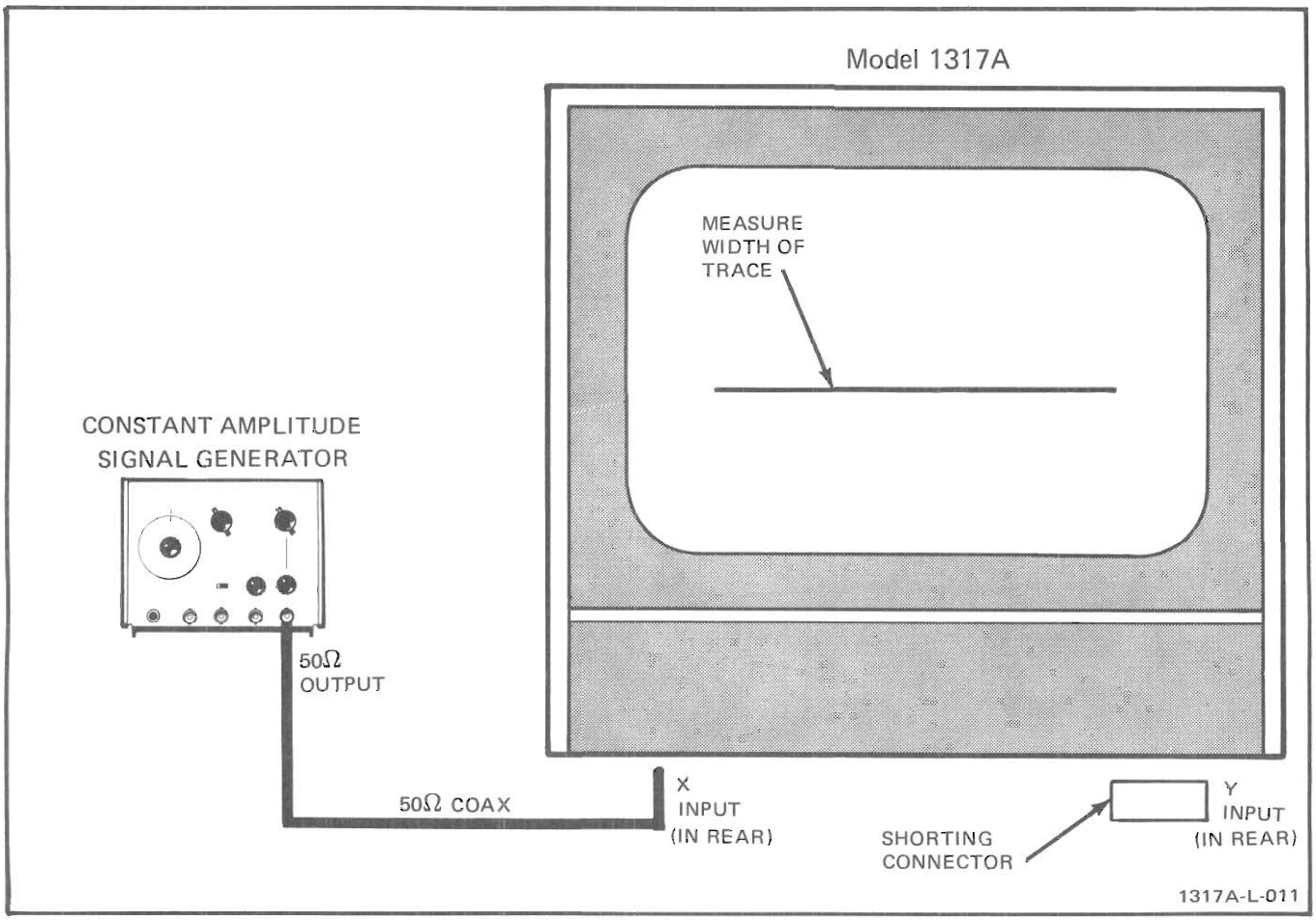


Figure 5-7. Crosstalk Test Setup

e. Set GAIN X and GAIN Y cw. Vertical deflection shall be less than .015 inch.

f. Reverse connection to X INPUT and Y INPUT. Horizontal deflection shall be less than .015 inch.

5-32. SPOT JITTER AND MOTION.

5-33. Required Result. With X INPUT and Y INPUT disconnected, spot jitter and motion shall be less than .010 inch.

5-34. Procedure.

a. Perform preoperational procedure (Section III).

b. Connect equipment as shown in figure 5-8.

c. Set 50Ω/10K switches (on boards A1 and A3) to 10K.

d. Set sweep time/div of monitor oscilloscope to 0.1 MSEC/DIV and sweep mode to auto.

e. Short vertical deflection plates together and observe trace with optical comparator.

f. Remove short from vertical deflection plates and observe increase in trace width. Increase in trace width shall not exceed 0.010 inch.

g. Remove sweep from X INPUT and connect to Y INPUT.

h. Short horizontal deflection plates together and observe trace with optical comparator.

i. Remove short from horizontal deflection plates and observe increase in trace width. Increase in trace width shall not exceed 0.010 inch.

5-35. DEFLECTION AMPLIFIER DYNAMIC RANGE.

5-36. Required Result. The dynamic range shall extend at least to 1½ screen diameters from center screen.

5-37. Procedure

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

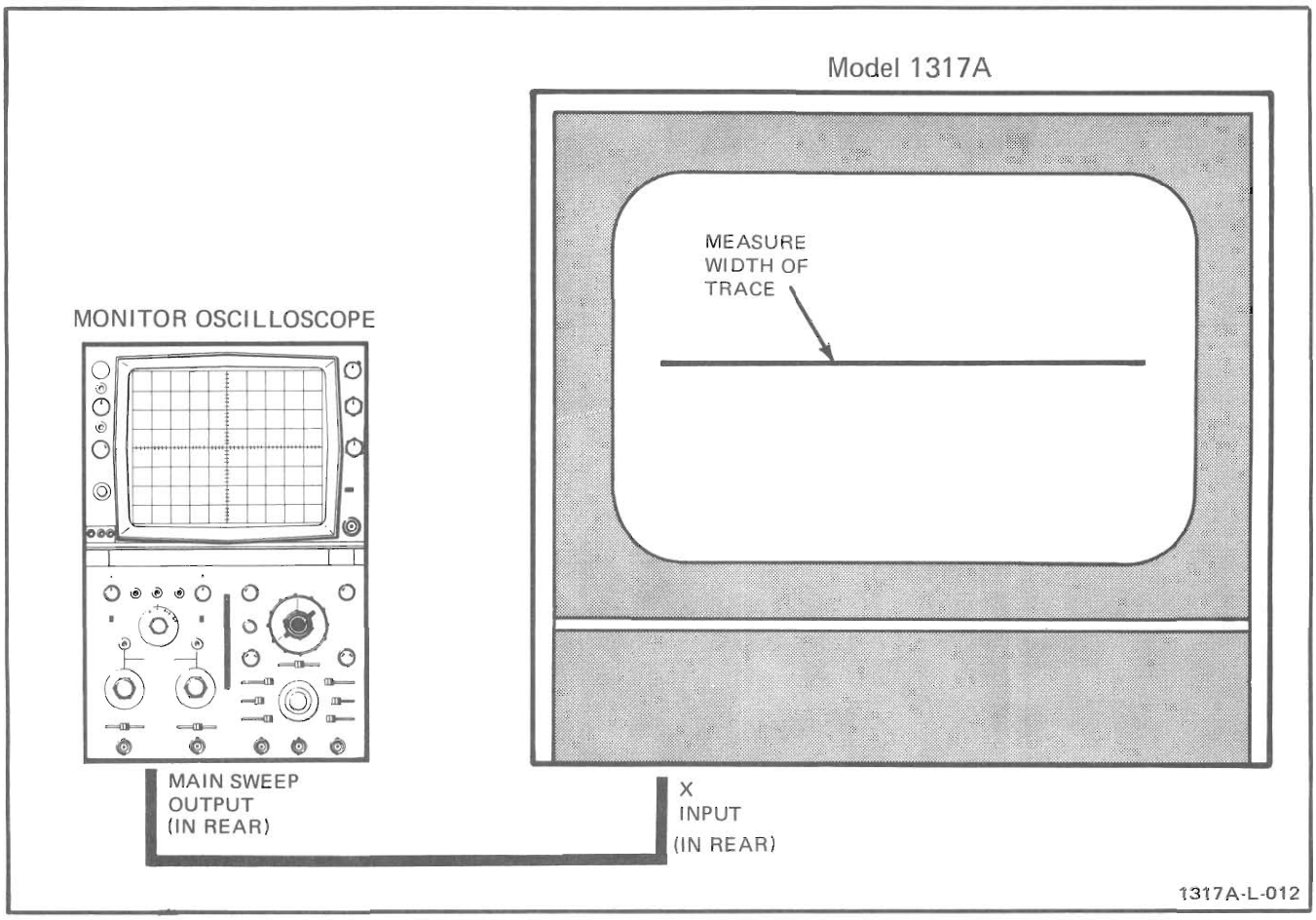


Figure 5-8. Jitter and Motion Test Setup

c. Connect equipment as shown in figure 5-9.

d. Set square wave generator for 500-Hz, 2.5-volt output.

e. Observe displayed waveform. There shall be less than 0.1 inch of rounding on ground side of waveform.

f. Reverse X INPUT and Y INPUT. There shall be less than 0.1 inch of rounding on ground side of waveform.

5-38. Z-AXIS BLANKING POLARITY.

5-39. Required Results. With BRIGHTNESS set to maximum a —1-volt signal at the Z INPUT shall blank the CRT. With BRIGHTNESS set to minimum, a +1-volt signal at the Z INPUT shall cause maximum brightness at the CRT.

5-40. Procedure.

a. Perform preoperational checks (Section III).

b. Set 50Ω/10K switch (on board A5) to 50Ω.

c. Connect equipment as shown in figure 5-10.

d. Set oscillator frequency to 1 MHz and adjust amplitude for full screen deflection.

e. Turn BRIGHTNESS cw. CRT shall be blanked during negative pulse excursions.

f. Set pulse generator polarity to positive.

g. Turn BRIGHTNESS ccw. Intensity shall be maximum during positive excursions.

5-41. Z-AXIS RISETIME.

5-42. Required Result. The risetime of the Z-axis amplifier shall be less than 20 nanoseconds.

5-43. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 10K.

c. Set 50Ω/10K switch (on board A5) to 50Ω.

d. Connect equipment as shown in figure 5-11.

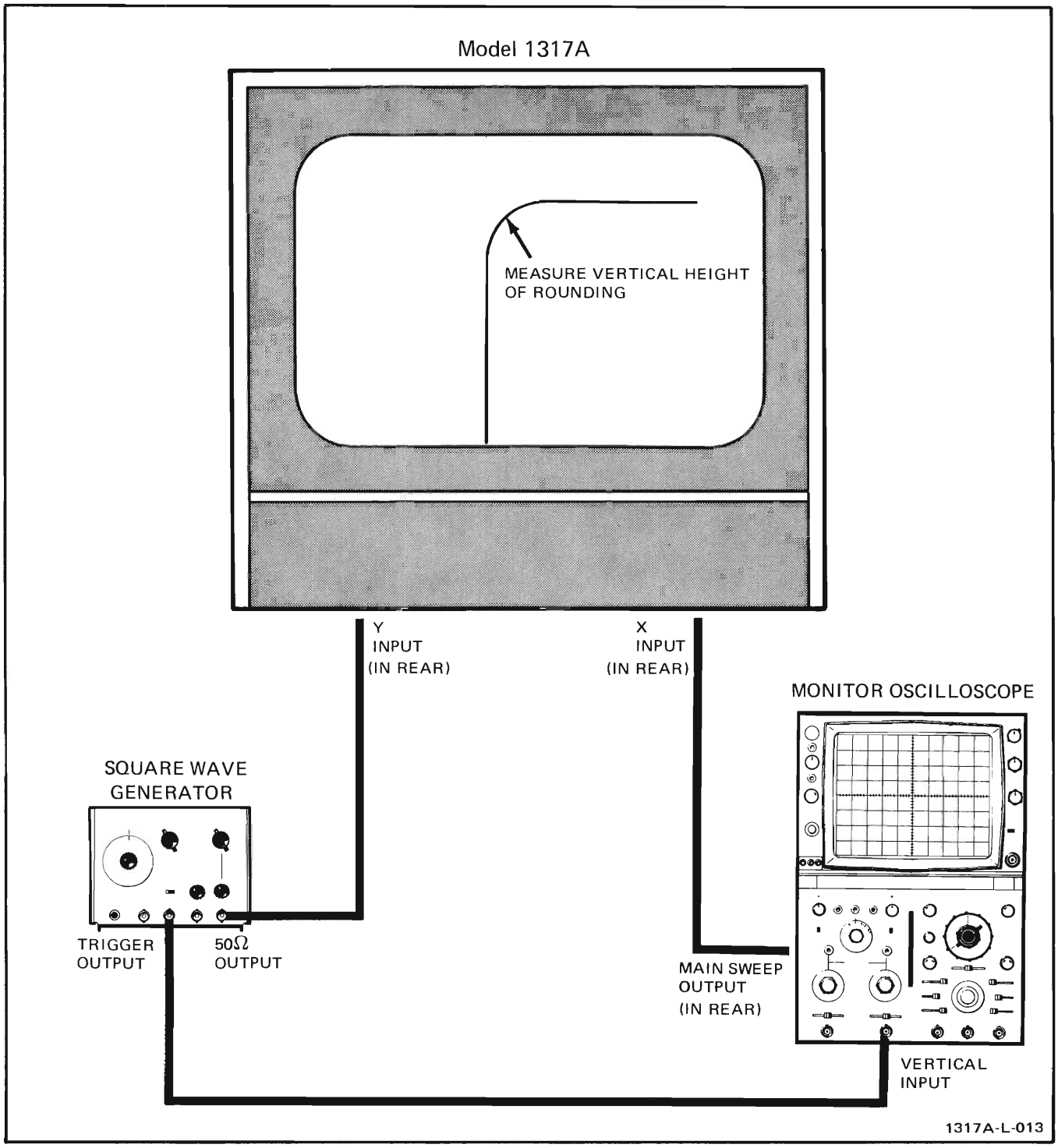


Figure 5-9. Dynamic Range Test Setup

e. Set oscillator frequency to 1 MHz and amplitude to display full screen raster on CRT.

f. Set square wave generator for 100-kHz, 50-volt output at A5TP1.

g. Set monitor oscilloscope to observe leading edge of displayed waveform with display exactly filling vertical graticule.

h. Observe risetime between vertical 10% and 90% points. Risetime shall be less than 20 ns.

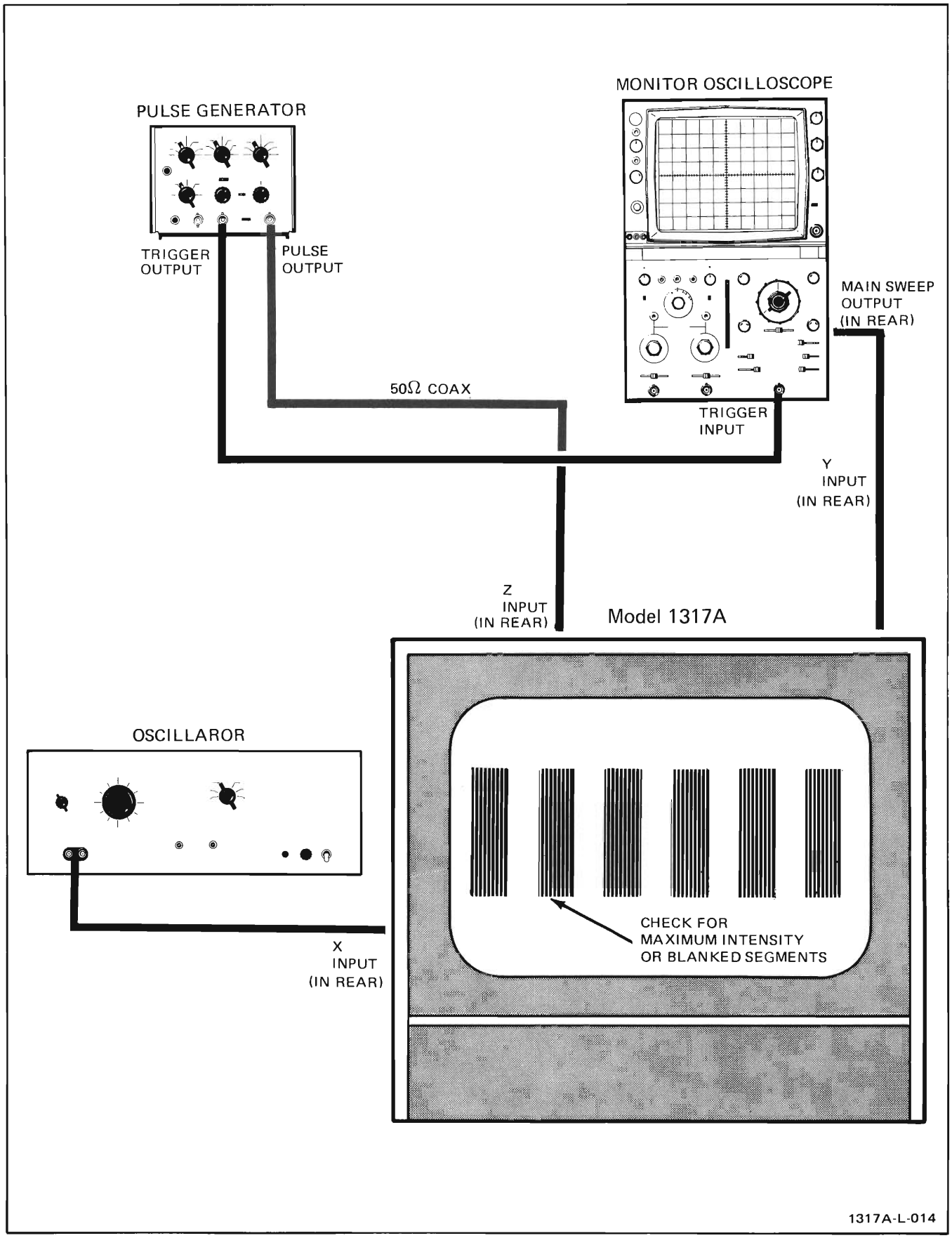


Figure 5-10. Blanking Polarity Test Setup

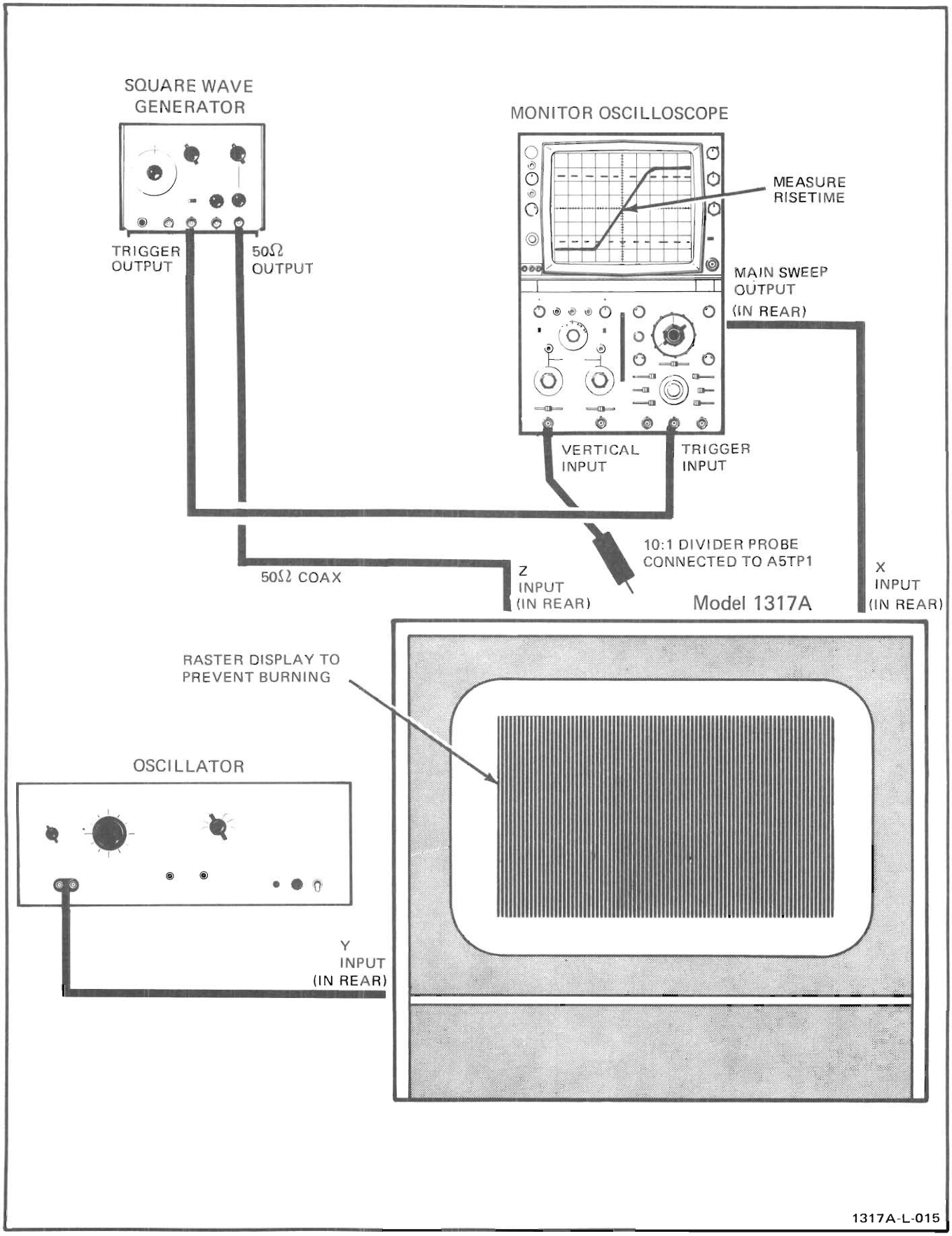


Figure 5-11. Z-axis Risetime Test Setup

PERFORMANCE CHECK RECORD
MODEL 1317A

Instrument Serial Number _____ Date _____

Check	Specification	Measured
DEFLECTION AMPLIFIER RISETIME		
X Amplifier	≤75 ns	_____
Y Amplifier	≤75 ns	_____
DEFLECTION AMPLIFIER BANDWIDTH		
X Amplifier	≥ 3.7 inches	_____
Y Amplifier	≥ 3.7 inches	_____
DEFLECTION AMPLIFIER PHASE SHIFT		
50 kHz	<0.1°	_____
250 kHz	<1°	_____
DEFLECTION FACTOR		
X minimum	≤5.6 inches	_____
X maximum	10 inches ±3%	_____
Y minimum	≤5.6 inches	_____
Y maximum	10 inches ±3%	_____
DIAGONAL SETTLING TIME	<500 ns	_____
SEQUENTIAL POINT PLOTTING TIME	<200 ns	_____
REPEATIBILITY	<0.15%	_____
CROSSTALK	<0.015 inch	_____
SPOT JITTER AND MOTION	<0.010 inch	_____
DEFLECTION AMPLIFIER DYNAMIC RANGE		
X Amplifier	<0.1 inch	_____
Y Amplifier	<0.1 inch	_____

PERFORMANCE CHECK RECORD
MODEL 1317A (Cont'd)

Instrument Serial Number _____ **Date** _____

Check	Specification	Measured
Z–AXIS BLANKING POLARITY per text		
Z–AXIS RISETIME	<20 ns	_____

5-44. ADJUSTMENTS.

WARNING

Do not attempt to operate this instrument until the safety summary, located just before Section I, has been read and understood.

5-45. The following paragraphs describe procedures to calibrate the instrument so that it will perform as specified in Section I. For complete calibration, the entire procedure should be performed in sequence; individual adjustments can be made by following the steps in the appropriate paragraphs. Adjustment controls are shown on a fold-out illustration at the end of this section.

5-46. Remove top and bottom covers before connecting instrument for operation. Turn instrument on and allow 1/2 hour warm-up time. Use a nonmetallic screwdriver and recently calibrated test equipment with characteristics as specified in table 5-1. After adjustments are completed, check instrument performance by accomplishing the performance checks described earlier in this section.

5-47. LOW VOLTAGE POWER SUPPLY ADJUSTMENTS.

5-48. References. Schematic 10, table 5-1, and figure 5-16.

5-49. Procedure.

a. Connect digital voltmeter to red lead on low voltage power supply board A11.

b. Set +250 ADJ A11R12 for reading of exactly +250 volts on digital voltmeter.

c. Alternately connect digital voltmeter to violet lead and white/red lead on low voltage power supply board A11.

d. Set ±15 ADJ A11R29 to divide any error equally between the outputs. Final error on either output must be ±0.1 volts or less.

5-50. HIGH VOLTAGE POWER SUPPLY ADJUSTMENT.

WARNING

Contact with high voltages in this instrument can cause injury or death.

5-51. References. Schematic 7, schematic 11, table 5-1, and figure 5-16.

5-52. Procedure.

a. Monitor +250-volt supply using 1000:1 divider probe and digital voltmeter.

b. Multiply voltage reading from step a by —18.

c. Monitor output of high voltage power supply at HV test point on z-axis board A5.

d. Set HIGH VOLTAGE ADJ A13R2 to obtain voltage reading equal to result in step b.

5-53. TRACE ALIGN AND ORTHOGONALITY ADJUSTMENTS.

5-54. References. Schematic 11, table 5-1, and figure 5-16.

5-55. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 10K.

c. Apply 1-volt p-p signal from voltmeter calibrator to X INPUT.

d. Set TRACE ALIGN A9R4 to cause trace to lie along x axis of CRT. Because the CRT has no graticule, some external means should be devised to accurately locate x axis.

e. Disconnect voltmeter calibrator from X INPUT and connect to Y INPUT.

f. Set ORTHOG A9R9 to cause trace to lie perpendicular to x axis (along y axis). Because the CRT has no graticule, some external means should be devised to accurately locate y axis.

5-56. Z-AXIS ADJUSTMENTS.

5-57. References. Schematic 7, schematic 11, table 5-1, and figures 5-12 and 5-16.

5-58. Procedure.

a. In adjusting Z-axis gain and balance, monitor voltage on the wiper arm of Z-axis balance adjustment A5R65 and adjust for zero volts ±10 mV.

b. Apply —1 volt into Z-input and adjust Z-axis gain A5R20 until spot is just extinguished.

c. Perform preoperational procedure (Section III).

d. Set 50Ω/10K switches (on boards A1 and A3) to 10K.

e. Set 50Ω/10K switch (on board A5) to 50Ω.

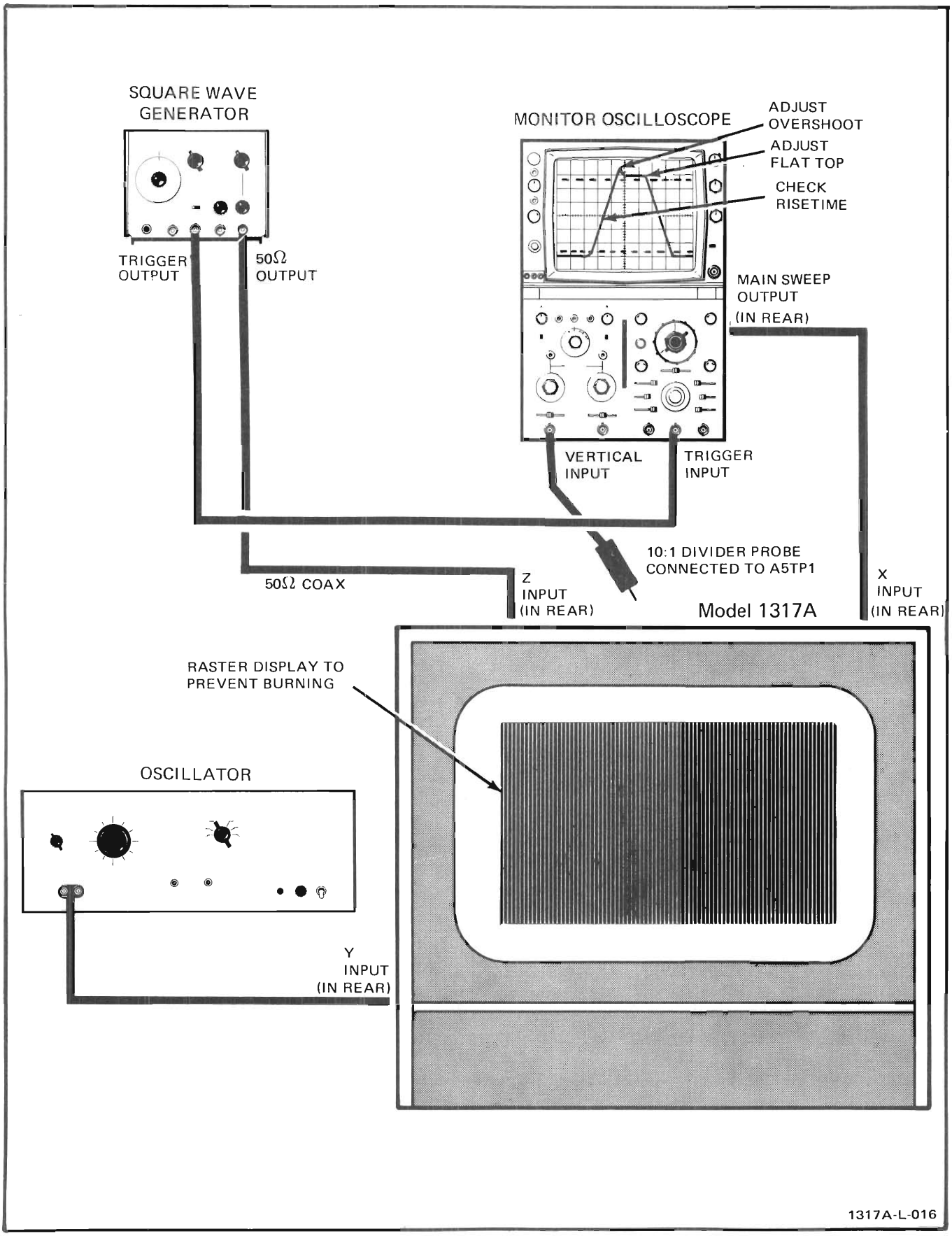


Figure 5-12. Equipment Setup for Z-axis Adjustments

f. Connect digital voltmeter between A5TP1 and chassis ground.

g. Set BRIGHTNESS for +10V reading on digital voltmeter.

h. Set INTS LIMIT A13R16 to barely extinguish a sharply focussed spot.

i. Connect equipment as shown in figure 5-12.

j. Set oscillator frequency to 1 MHz and amplitude for full screen display.

k. Apply 50Ω output of square wave generator to Z INPUT.

l. Connect monitor oscilloscope to A5TP1.

m. Set vertical input coupling of monitor oscilloscope to dc.

n. Set monitor oscilloscope controls to view one square-wave period at A5TP1.

o. Set square wave generator controls for 100-kHz, 50-volt output at A5TP1.

p. Set BRIGHTNESS so that waveform at A5TP1 does not limit.

q. Set monitor oscilloscope controls so that waveform just fills vertical graticule.

r. Set HF ADJ NO. 1 A5C12 for small amount of overshoot (less than 1%) on leading edge positive response.

s. Set HF ADJ NO. 2 A5R37 for flattest response after leading edge transition.

t. Observe risetime. It shall be less than 20 ns.

u. If risetime fails to meet specification, repeat step q, slightly increasing overshoot.

v. Repeat steps s, t, and u until risetime specification is met with minimum overshoot. Overshoot must not be increased to point where amplifier tends to oscillate, and in no case, should it exceed 5%.

5-59. HORIZONTAL AMPLIFIER LOW FREQUENCY ADJUSTMENTS.

5-60. References. Schematic 1, schematic 2, schematic 3, table 5-1, and figure 5-16.

5-61. Procedure.

a. Remove ground strap from digital voltmeter and connect differentially to horizontal deflection plates (neck pins on CRT).

b. Set POSITION X for 0V reading on digital voltmeter.

c. Disconnect digital voltmeter common lead and connect to chassis ground.

d. Set AVERAGE A1R64 for +108V reading on digital voltmeter.

e. Disconnect digital voltmeter. Replace ground strap.

f. Turn GAIN X back and forth between its cw and ccw positions while observing spot on CRT. Set BAL A1R11 to minimize movement of spot. Spot movement shall not exceed 0.3 inch.

g. Set 50Ω/10K switch (on board A5) to 10K.

h. Apply 400 Hz, 1V p-p signal from voltmeter calibrator to X INPUT.

i. Set GAIN X cw.

j. Set GAIN A1R12 for 10 inches deflection on CRT.

5-62. VERTICAL AMPLIFIER LOW FREQUENCY ADJUSTMENTS.

5-63. References. Schematic 4, schematic 5, schematic 6, table 5-1, and figure 5-16.

5-64. Procedure.

a. Remove ground strap from digital voltmeter and connect differentially to vertical deflection plates (neck pins on CRT).

b. Set POSITION Y for 0V reading on digital voltmeter.

c. Disconnect digital voltmeter common lead and connect to chassis ground.

d. Set AVERAGE A3R64 for +108V reading on digital voltmeter.

e. Disconnect digital voltmeter. Replaced strap.

f. Turn GAIN Y back and forth between its cw and ccw positions while observing spot on CRT. Set BAL A3R11 to minimize movement of spot. Spot movement shall not exceed 0.3 inch.

g. Set 50Ω/10K switch (on board A3) to 10K.

h. Apply 400 Hz, 1V p-p signal from voltmeter calibrator to Y INPUT.

i. Set GAIN Y cw.

j. Set GAIN A3R12 for 10 inches deflection on CRT.

5-65. HORIZONTAL AMPLIFIER RESPONSE ADJUSTMENTS.

5-66. References. Schematic 1, schematic 2, schematic 3, table 5-1, figure 5-13, and figure 5-16.

5-67. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

c. Connect equipment as shown in figure 5-13.

d. Set square wave generator controls for 10 kHz, maximum amplitude output signal.

e. Center display with POSITION X and POSITION Y.

f. Set monitor oscilloscope controls for stable, full-screen display of two square-wave periods.

g. Set LF ADJ NO. 1 A2R24, and LF ADJ NO. 2 A2C17 for flattest pulse response on ground side of display.

h. Disconnect square wave generator from X INPUT and connect constant amplitude signal generator.

i. Set frequency of constant amplitude signal generator to 50 kHz and amplitude to cause 5 inches deflection on CRT.

j. Change frequency of constant amplitude signal generator to 5 MHz.

k. Set HF ADJ NO. 1 A2C8 and HF ADJ NO. 2 A2C12 for vertical deflection of 3.7 inches.

5-68. VERTICAL AMPLIFIER RESPONSE ADJUSTMENTS.

5-69. References. Schematic 4, schematic 5, schematic 6, table 5-1, figure 5-14, and figure 5-16.

5-70. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

c. Connect equipment as shown in figure 5-14.

d. Set square wave generator controls for 10 kHz, maximum amplitude output signal.

e. Center display with POSITION X and POSITION Y.

f. Set monitor oscilloscope for stable, full-screen display of two square-wave periods.

g. Set LF ADJ NO. 1 A4R24 and LF ADJ NO. 2 A4C17 for flattest pulse response on ground side of display.

h. Disconnect square wave generator from Y INPUT and connect constant amplitude signal generator.

i. Set frequency of constant amplitude signal generator to 50 kHz and amplitude to cause 5 inches of deflection on CRT.

j. Change frequency of constant amplitude signal generator to 5 MHz.

k. Set HF ADJ NO. 1 A4C8 and HF ADJ. No. 2 A4C12 for vertical deflection of 3.7 inches.

5-71. PHASE SHIFT ADJUSTMENT.

5-72. References. Schematic 3, schematic 6, table 5-1, figure 5-15 and figure 5-16.

5-73. Procedure.

a. Perform preoperational procedure (Section III).

b. Set 50Ω/10K switches (on boards A1 and A3) to 50Ω.

c. Connect equipment as shown in figure 5-15.

d. Set frequency of constant amplitude signal generator to 250 kHz and amplitude for full-screen diagonal line (or ellipse) on CRT.

e. If separation of ellipse at center of display is greater than 0.1 inch, make small adjustments to A2C8, A2C12, A4C8, and A4C12 until ellipse separation is less than 0.1 inch.

Note

The procedures in step d above, in paragraph 5-70 step n, and in paragraph 5-67 step n are interactive. Repeat these procedures until the requirements of all three are satisfied.

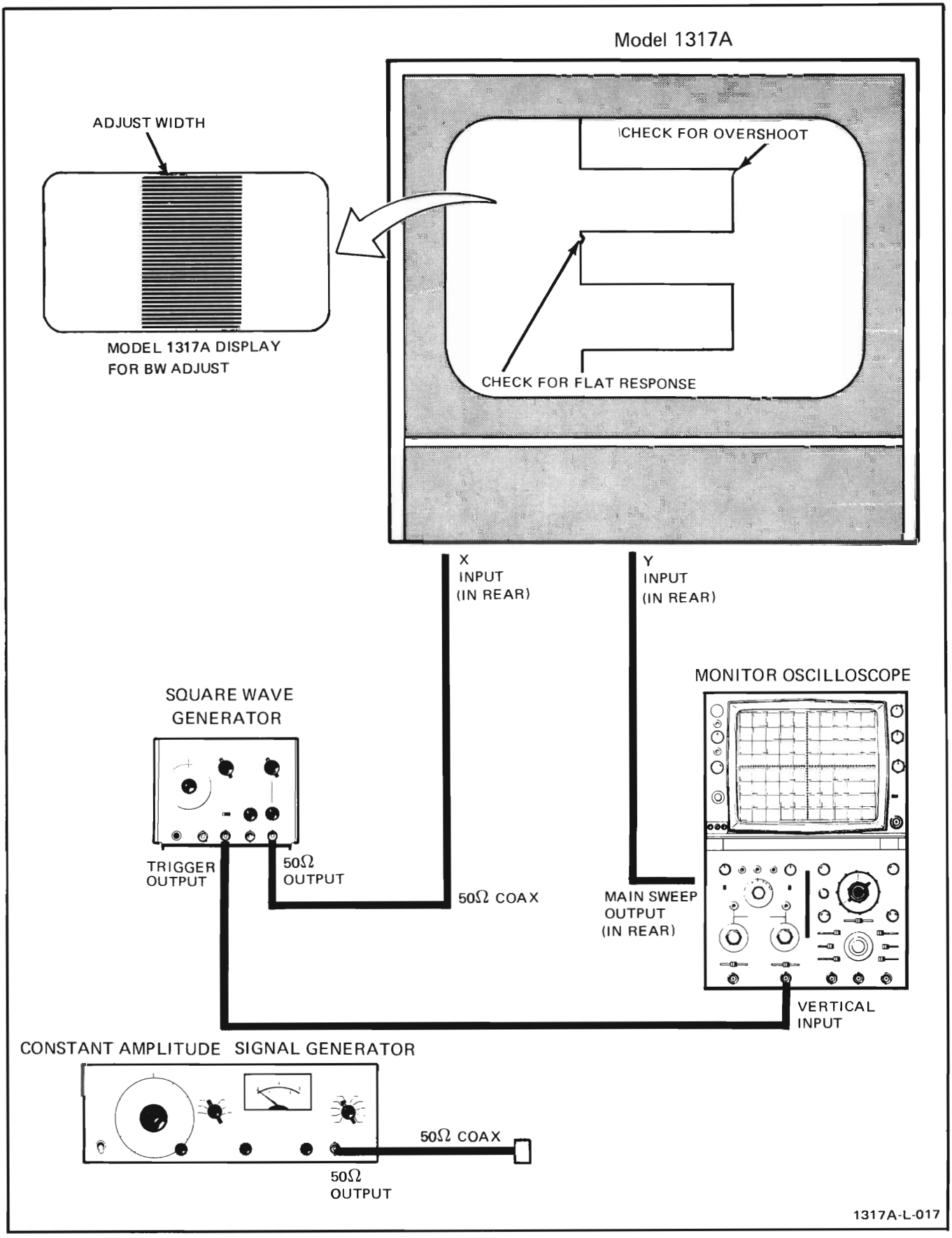


Figure 5-13. Equipment Setup for Horizontal Amplifier Response Adjustments

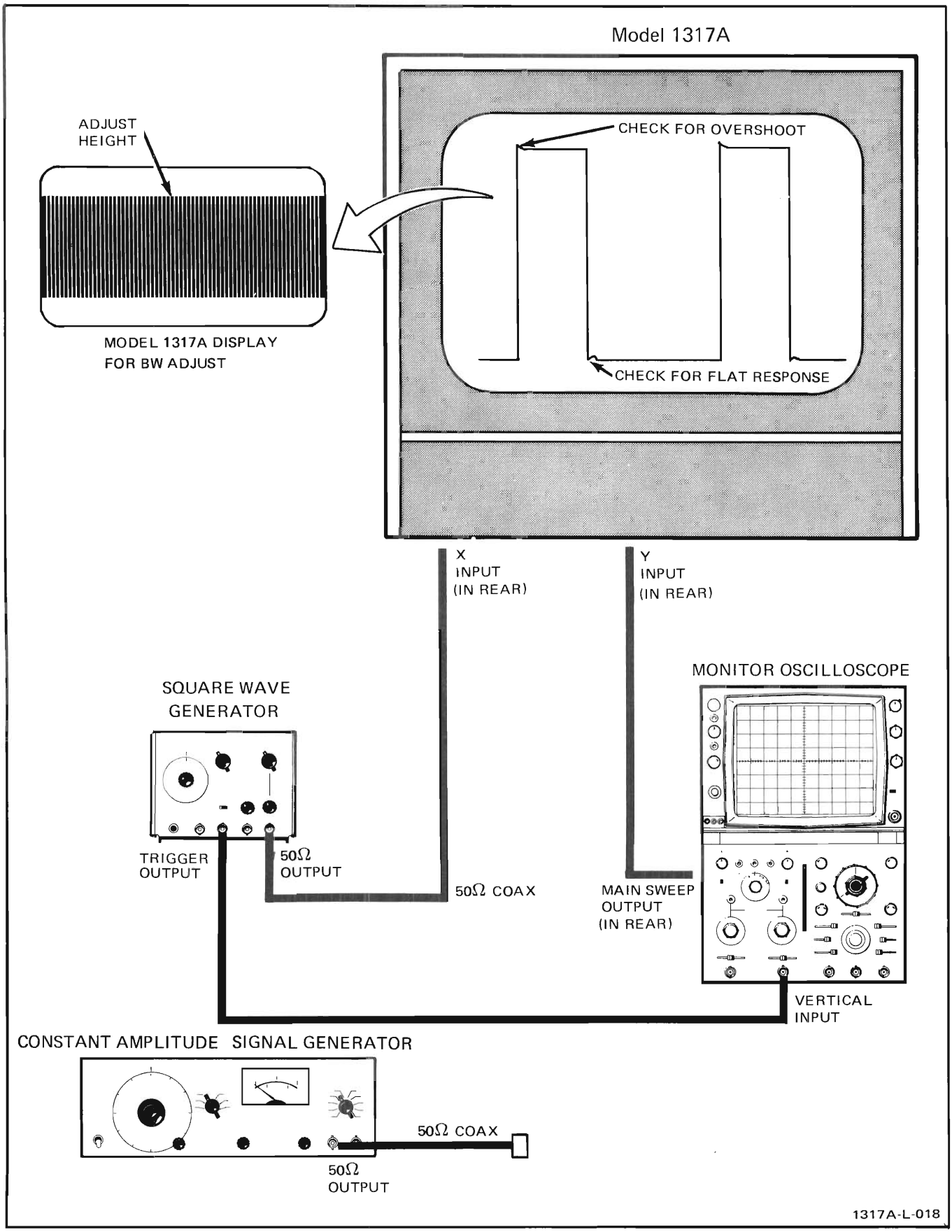


Figure 5-14. Equipment Setup for Vertical Amplifier Response Adjustments

5-74. FOCUS AND ASTIGMATISM ADJUSTMENTS.

WARNING

Contact with high voltages in this instrument can cause injury or death.

5-75. References. Schematics 7, 8, 9, and 11. Tables 5-1 and 5-2. Figures 5-16, 5-17, and 5-18.

5-76. Procedure.

a. Set BRIGHTNESS for dim spot on CRT.

b. Center spot with POSITION X and POSITION Y.

c. Connect digital voltmeter between A6R108/A6R110 junction and ground.

d. Set FOCUS for +10V reading on digital voltmeter.

e. Set ASTIG and FOCUS LIMIT A12R6 for smallest, most round spot.

f. Disconnect digital voltmeter.

g. Set FY1A6R10, FY2A6R11, FX1A6R23, FX2A6R24, AY1A6R61, AY2A6R62, AX1A6R74, AX2A6R75, and DRIVE FOCUSING ADJUST A6R43 ccw.

h. Center FOCUS and ASTIG.

i. Adjust F BAL A6R44 and A BAL A6R90 for best focused spot.

j. Use felt tip pen to mark face of CRT as shown in figure 5-17.

k. Position spot to point 1.

l. Set FOCUS and ASTIG for smallest, best-defined spot.

m. Position spot to point 2.

n. Set FX1A6R23 and AX1A6R74 for smallest, best-defined spot.

o. Repeat steps m and n for each point listed in table 5-2.

p. Center FOCUS and ASTIG.

q. Connect equipment as shown in figure 5-18.

r. Set pulse generator for positive-going, 0.5 usec wide, 20 kHz, 1V p-p output.

s. Adjust F BAL A6R44 to set most negative excursion, as displayed on monitor oscilloscope, to +5V.

t. Readjust ASTIG and FOCUS LIMIT A12R6 for best-defined spot.

u. Disconnect pulse generator from Z INPUT.

v. Adjust GAIN A6R43 for focused spot.

w. Repeat steps s through v several times; alternating between bright spot (pulse generator connected to Z INPUT) and dim spot (pulse generator disconnected) until best compromise between two conditions is reached.

x. Connect 1kHz sine wave from constant amplitude signal generator to both X and Y INPUT.

y. Set amplitude to cause a diagonal line display from corner to corner on CRT.

z. Connect pulse generator to Z INPUT. Note that pulse (as displayed on monitor oscilloscope) does not limit at top or bottom.

aa. If limiting occurs in step 3, readjust F BAL A6R44 until the waveform does not limit; then readjust FOCUS LIMIT A12R6 for best defined spot.

5-77. FOCUS RESPONSE ADJUSTMENT.

5-78. References. Table 5-1, figures 5-16, 5-18, and schematic 7.

5-79. Procedure.

a. Connect equipment as shown in figure 5-18.

b. Set pulse generator for positive-going, 0.5 usec wide, 20 kHz, 1V p-p pulse output.

c. Synchronize monitor oscilloscope to negative-going edge of pulse.

d. Set HF ADJ NO. 1 A5C12 and HF ADJ NO. 2 A5R37 for fastest transition with less than 5% overshoot.

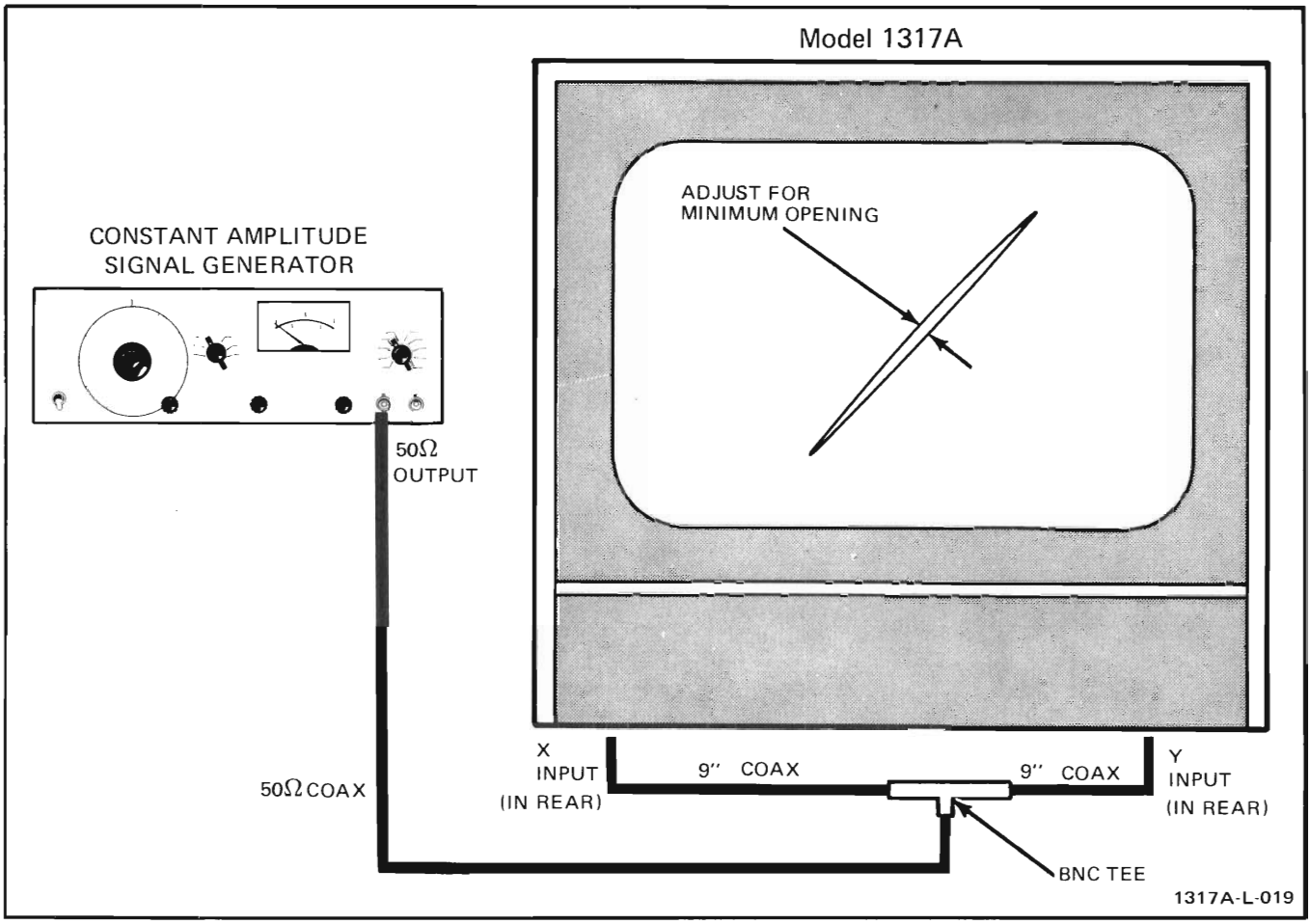
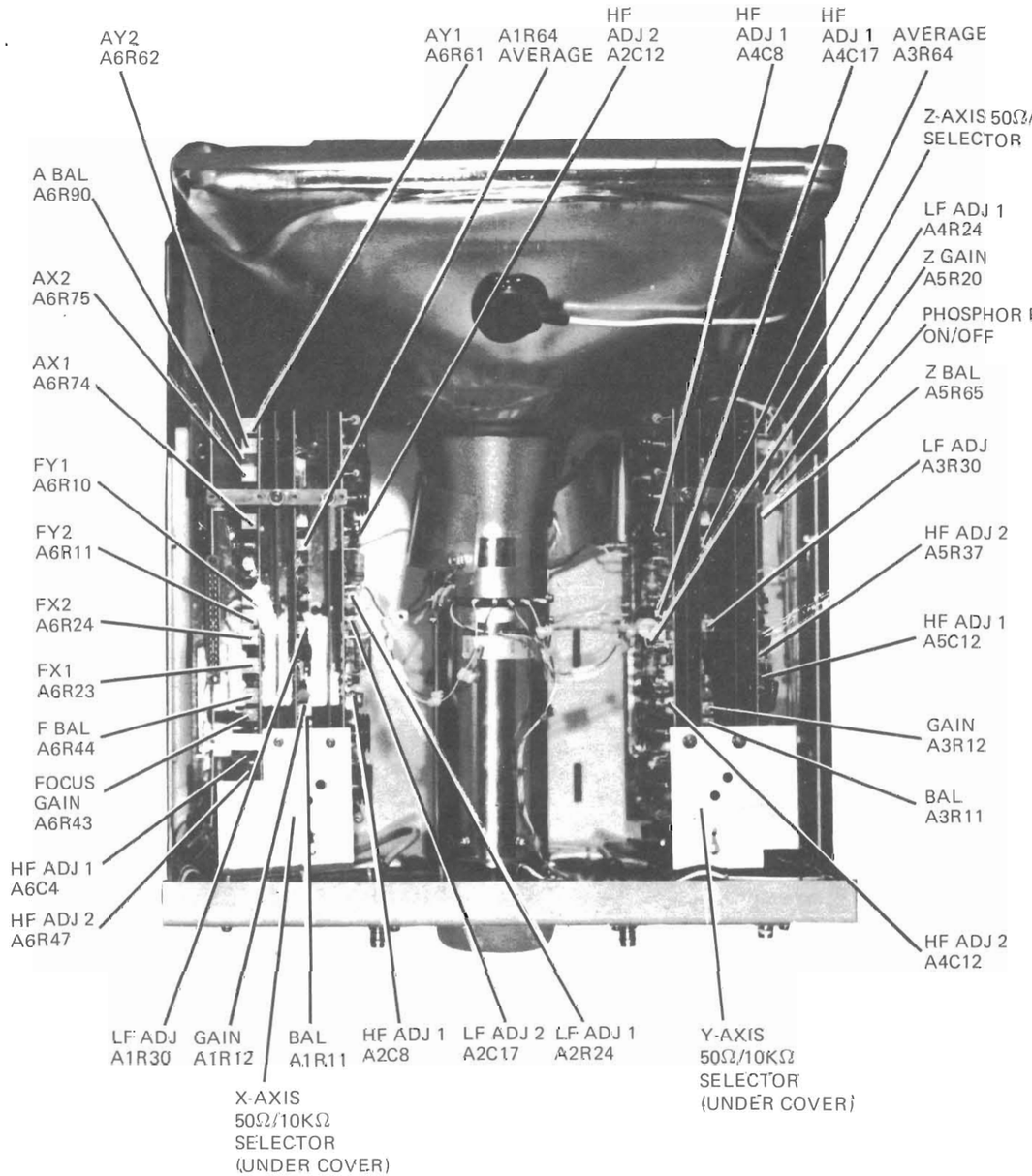
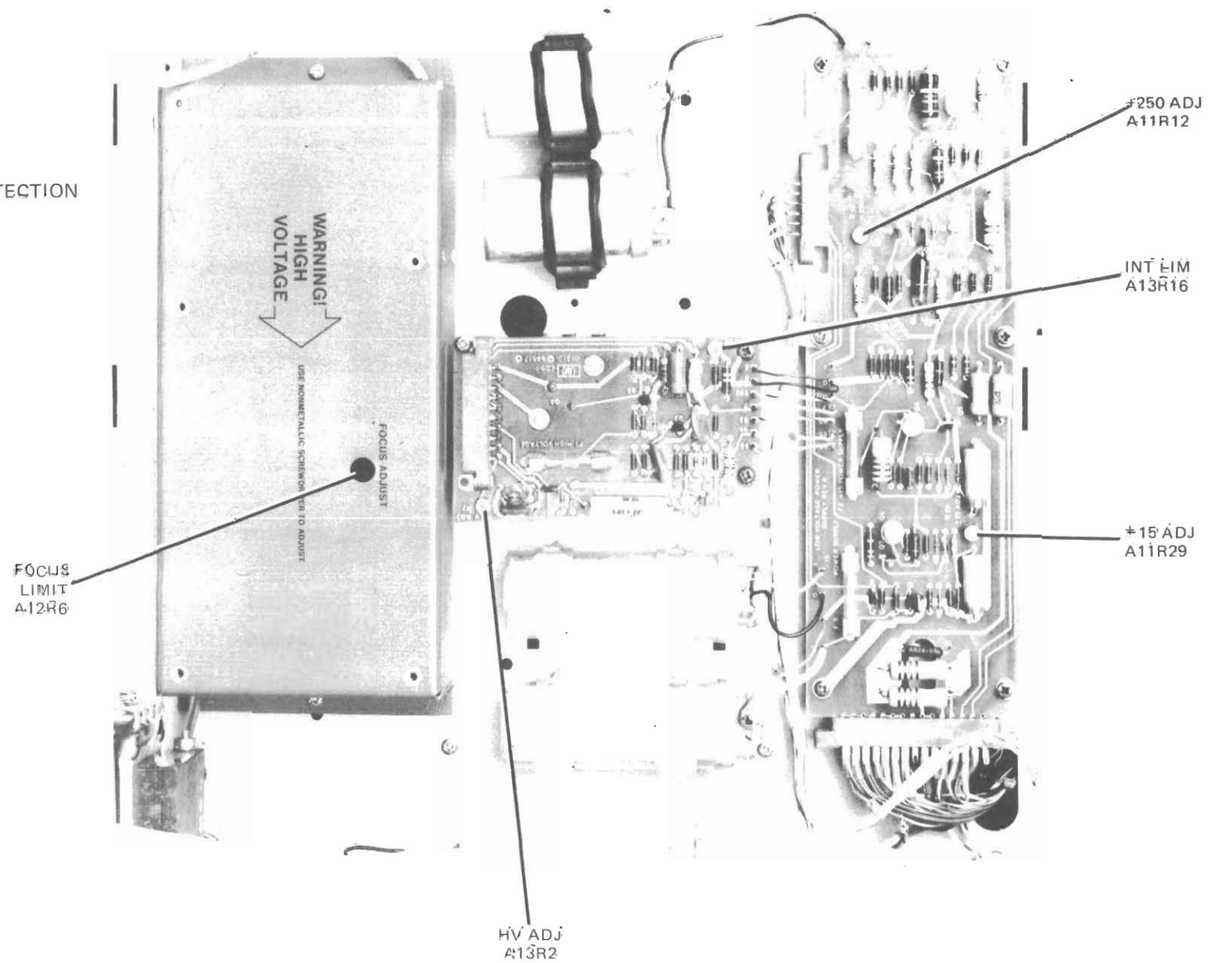


Figure 5-15. Equipment Setup for Phase Shift Adjustment

Table 5-2. Focus and Astigmatism Adjustments

Point	Adjust
3	A6R24 (FX2) A6R75 (AX2)
4	A6R10 (FY1) A6R61 (AY1)
5	A6R11 (FY2) A6R62 (AY2)





1317A-P-005-07-76

Figure 5-16.
Adjustments Locator

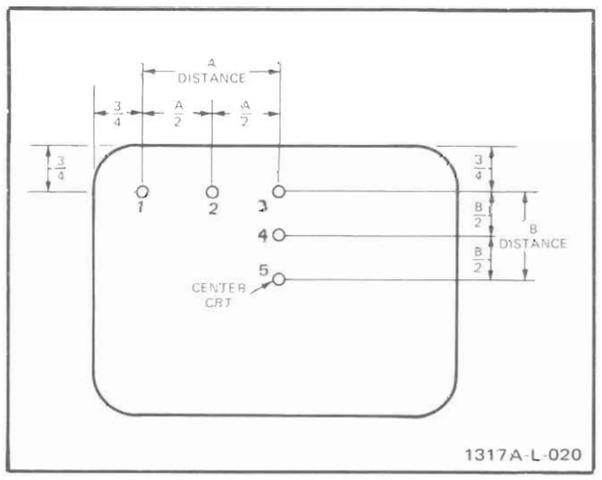


Figure 5-17. CRT Face Marking for Focus and Astigmatism Adjustments

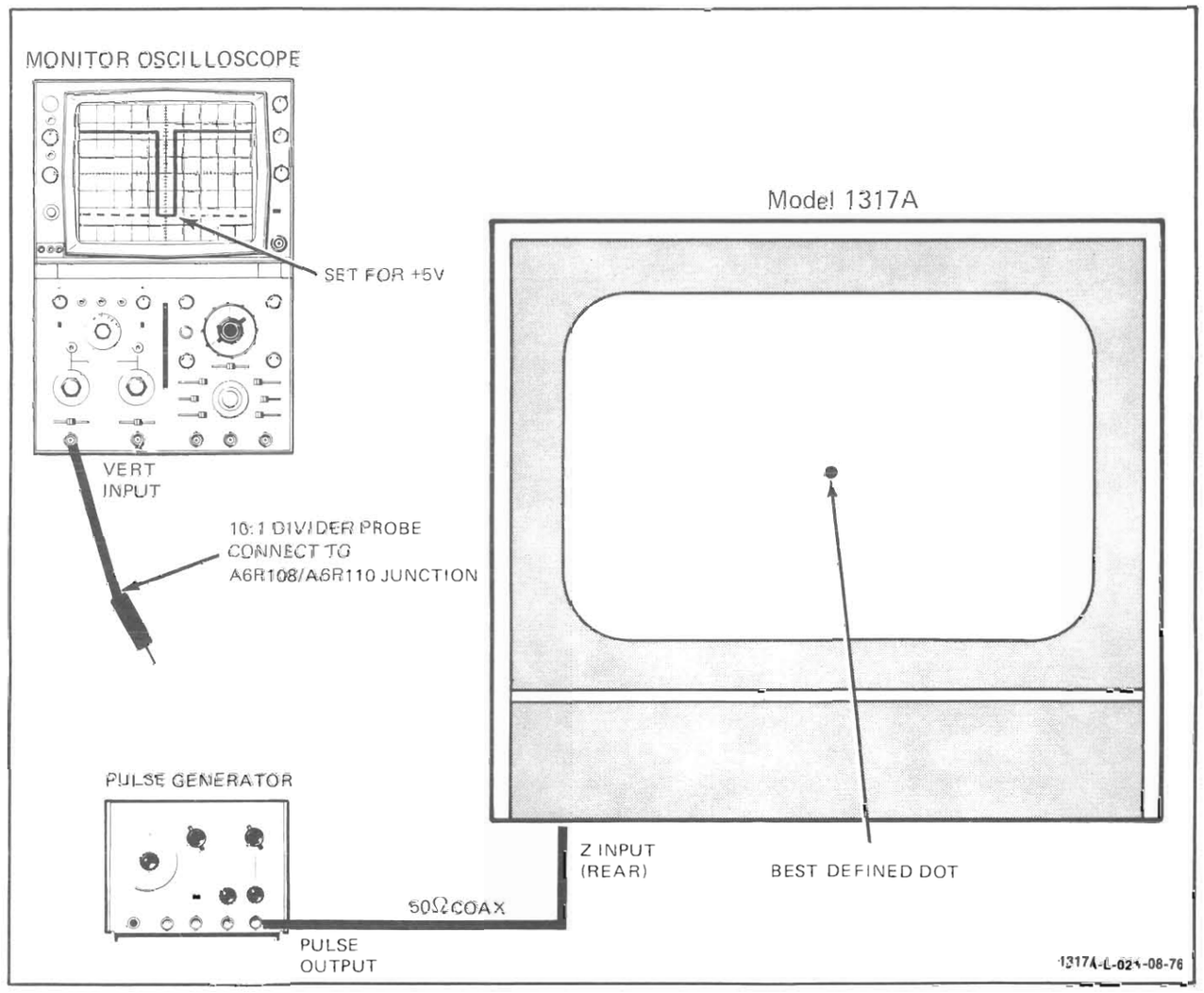


Figure 5-18. Equipment Setup for Focus Adjustments

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

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

6-3. ORDERING INFORMATION.

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

a. Instrument model and serial number.

b. HP part number of items(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		
BD	BOARD(S)	HZ	HERTZ			S-B	SLOW-BLOW
BH	BINDER HEAD					SCR	SILICON CONTROLLED RECTIFIER
BP	BANDPASS	IF	INTERMEDIATE FREQ.				
		IMPG	IMPREGNATED	OBD	ORDER BY DESCRIPTION	SE	SELENIUM
C	CENTI (10^{-2})	INCD	INCANDESCENT			SEC	SECOND(S)
CAR	CARBON	INCL	INCLUDE(S)	OH	OVAL HEAD	SECT	SECTION(S)
CCW	COUNTERCLOCKWISE	INS	INSULATION(ED)	OX	OXIDE	SI	SILICON
CER	CERAMIC	INT	INTERNAL			SIL	SILVER
CMO	CABINET MOUNT ONLY			P	PEAK	SL	SLIDE
COAX	COAXIAL	K	KILO (10^{3})	PC	PRINTED (ETCHED) CIRCUIT(S)	SP	SINGLE POLE
COEF	COEFFICIENT	KG	KILOGRAM			SPL	SPECIAL
COMP	COMPOSITION			PF	PICOFARADS	ST	SINGLE THROW
CONN	CONNECTOR(S)	LB	POUND(S)	PHL	PHILLIPS	STD	STANDARD
CRT	CATHODE-RAY TUBE	LH	LEFT HAND	PIV	PEAK INVERSE VOLTAGE(S)		
CW	CLOCKWISE	LIN	LINEAR TAPER			TA	TANTALUM
		LOG	LOGARITHMIC TAPER	PNP	POSITIVE-NEGATIVE-POSITIVE	TD	TIME DELAY
D	DECI (10^{-1})	LPF	LOW-PASS FILTER(S)			TFL	TEFLON
DEPC	DEPOSITED CARBON	LVR	LEVER	P/O	PART OF	TGL	TOGGLE
DP	DOUBLE POLE			PORC	PORCELAIN	THYR	THYRISTOR
DT	DOUBLE THROW	M	MILLI (10^{-3})	POS	POSITION(S)	TI	TITANIUM
		MEG	MEGA (10^{6})	POT	POTENTIOMETER(S)	TNLDIO	TUNNEL DIODE(S)
ELECT	ELECTROLYTIC	MET FILM	METAL FILM	P-P	PEAK-TO-PEAK	TOL	TOLERANCE
ENCAP	ENCAPSULATED	MET OX	METAL OXIDE	PRGM	PROGRAM	TRIM	TRIMMER
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)				
GL	GLASS			RMO	RACK MOUNT ONLY	W/O	WITHOUT
GRD	GROUNDED			RMS	ROOT MEAN SQUARE	WW	WIREWOUND

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	01317-66503		X INPUT BOARD	28480	01317-66503
A2	C1310-66507		X OUTPUT BOARD	28480	01310-66507
A3	01317-66503		Y INPUT BOARD	28480	01317-66503
A4	C1310-66507		Y OUTPUT BOARD	28480	01310-66507
A5	C1317-66502		Z-AXIS BOARD ASSY	28480	01317-66502
A6	C1317-66501		FOCUS/ASTIG BOARD ASSY	28480	01317-66501
A7	01317-66504		LEFT CONNECTOR BOARD	28480	01317-66504
A8	C1310-66505		RIGHT CONNECTOR BOARD	28480	01310-66505
A9	C1310-66511		CONTROL BOARD	28480	01310-66511
A10	01310-66513		TEST EXTENSION BOARD	28480	01310-66513
A11	C1310-66518		LOW VOLTAGE POWER SUPPLY BOARD	28480	01310-66518
A12	C1310-66526		HIGH VOLTAGE RECTIFIER BOARD	28480	01310-66526
A13	01310-66517		HIGH VOLTAGE REGULATOR BOARD	28480	01310-66517
A14	C1310-61103		BOARD ASSY:HIGH VOLTAGE OCTUPLER	28480	01310-61103
C1	0180-0030	2	CAPACITOR-FXD; 430UF+75-10% 200VDC AL	28480	0180-0030
C2	0180-0030 2		CAPACITOR-FXD; 120UF+75-10% 350VDC AL	28480	0180-0030 2
C3	0180-2313	1	CAPACITOR-FXD; 6000UF+75-10% 30VDC AL	28480	0180-2313
C4	0180-0213		CAPACITOR-FXD; 5000UF+75-10% 25VDC AL	28480	0180-0213
C5	C16C-2903	2	CAPACITOR-FXD .05UF+-20% 500WVDC	28480	0160-2903
C6	C16C-2903		CAPACITOR-FXD .05UF+-20% 500WVDC	28480	0160-2903
DS1	1450-0419	1	LIGHT, IND, NEON, WHT TL LENS	72765	599-237-WHITE
DS2	145C-0446	1	LIGHT, IND, INCANDESCENT, WHT TL LENS	72765	599-172-WHITE TL
E1	C34C-0114	2	INSULATOR, BSHG,FLG, .14 ID	26365	974-401
E2	C34C-0486	3	INSULATOR COVER, TO- 3, .33 THK	28480	0340-0486
E3	120C-0043	3	INSULATOR, XSTR, TO- 3, .02 THK	76530	322047
F1	211C-0020	1	FUSE; .8A 250V SLO-BLO (FOR 230V OPERATION)	71400	MDL 8/10
F1	211C-0059	1	FUSE; 1.5A 125V SLO-BLO (FOR 115V OPERATION)	75915	31301.5
H1	C38C-0019	1	SPACER; ROUND; .188 L	28480	0380-0019
H2	C510-C123	1	RETAINER, PUSH ON, .312 DIA, CAD PLT	78553	C17373-012-240
H3	1390-0231	1	FASTENER, PANEL, MAGNETIC CATCH,	94222	02-10-101-10
H4	C1500-40130	1	HOLDER:LAMP	28480	01500-40130
J1			NSR, PART OF W7(X INPUT)		
J2			NSR, PART OF W8(Y INPUT)		
J3	1250-0118	1	CONNECTOR-COAX; BNC; 50 OHM FEMALE	98949	31-2221-1022
J4	1251-2357	1	CONNECTOR, AC PWR, HP-9 MALE FLANGE	82389	EAC301
L1	01701-66001	1	COIL ASSY:TRACE ALIGN	28480	01701-66001
L2	5060-0435	1	COIL:ALIGNMENT Z AXIS	28480	5060-0435
MP1	0370-1103	8	KNOB, BASE, PTR, .5 IN, OBP, OBP DECAL	28480	0370-1103
MP2	1400-0026	1	CLAMP, ADJ, 2 DIA .5 W SST	28480	1400-0026
MP3	5040-0170	14	GUIDE:PLUG-IN PC BOARD	28480	5040-0170
MP4	5040-5891	2	HOLDER:RIGHT CONNECTOR BOARD	28480	5040-5891
MP5	5040-5892	2	HOLDER:LEFT CONNECTOR BOARD	28480	5040-5892
MP6	C1310-00601	4	SHIELD:AMPLIFIER	28480	01310-00601
MP7	C1310-01208	3	STRAP:TSTR COVER	28480	01310-01208
MP8	C1310-09101	1	SPRING:GROUNDING	28480	01310-09101
MP9	01310-21201	1	CLAMP:CRT	28480	01310-21201
MP10	C1310-40601	1	SHIELD:HV COVER	28480	01310-40601
MP11	01321-00601	1	SHIELD, FOCUS/ASTIG BOARD	28480	01321-00601
MP12	C1310-60603	2	SHIELD:CRT	28480	01310-60603
MP12	C1310-60603		SHIELD:CRT	28480	01310-60603
MP13	01317-00101	1	DECK MAIN	28480	01317-00101
MP14	C1317-00201	1	PANEL REAR	28480	01317-00201
MP15	C1317-00203	1	PANEL FRONT	28480	01317-00203
MP16	01317-01201	1	STRAP: GROUND	28480	01317-01201
MP17	01317-02201	1	BEZEL: OUTER RIM	28480	01317-02201
MP18	01321-04104	1	PLATE:INPUT RIGHT	28480	01321-04104
MP19	01321-04105	1	PLATE:INPUT LEFT	28480	01321-04105
MP20	01321-04701	1	SUPPORT:T	28480	01321-04701
MP21			NOT ASSIGNED		
MP22	C1317-04101	1	COVER: TOP	28480	01317-04101
MP23	C1317-04102	1	COVER: BOTTOM	28480	01317-04102
MP24	01321-04103	1	COVER:CRT	28480	01321-04103
MP25			NOT ASSIGNED		
MP26			NOT ASSIGNED		
MP27			NOT ASSIGNED		
MP28			NOT ASSIGNED		
MP29	01317-24705	1	SUPPORT: ANGLE RIGHT	28480	01317-24705
MP30	C1317-24706	1	SUPPORT: ANGLE LEFT	28480	01317-24706
MP31			NOT ASSIGNED		
MP32			NOT ASSIGNED		
MP33	4040-0574	1	BEZEL: CRT	28480	4040-0574
MP34			NOT ASSIGNED		
MP35	C1321-00602	1	SHIELD, Z-AXIS BOARD	28480	01321-00602
MP36	01317-60601	1	FRAME ASSY	28480	01317-60601

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
Q1	1854-0417	1	TRANSISTOR NPN SI PD=80W	28480	1854-0417
Q2	1854-0063		TRANSISTOR NPN 2N3055 SI PD=115W	28480	1854-0063
Q3	1854-0063		TRANSISTOR NPN 2N3055 SI PD=115W	28480	1854-0063
R1	0684-4731		R:FXD COMP 47K 10%	28480	0684-4731
S1	3101-0056	1	SWITCH; TGL; DPDT 10A/250VAC ON-NONE	27191	8926K316
S2	3101-1237	1	SWITCH; SL; DPDT NS; 3A 125VAC	82389	11A-1243
T1	9100-3437	1	TRANSFORMER	28480	9100-3437
V1	5083-4600	1	CRT:NON-IG P31	28480	5083-4600
W1	8120-1348	1	CABLE, UNSHLD 3-COND 18AWG	70903	KHS-7041
W2	00183-61625	1	CABLE:HORIZONTAL OUTPUT	28480	00183-61625
W3	00183-61625-1	1	CABLE:VERT. OUT	28480	00183-61625
W4	01317-61601	1	CABLE ASSY, MAIN	28480	01317-61601
W5	01321-61602	1	CABLE ASSY:CRT	28480	01321-61602
W6	01317-61606	1	CABLE ASSY, PRIMARY	28480	01317-61606
W7	01310-61606	2	CABLE ASSY:X-Y AXIS INPUT	28480	01310-61606
W8	01310-61606		CABLE ASSY:X-Y AXIS INPUT	28480	01310-61606
W9	01321-61608 8	1	CABLE ASSY, Z-INPUT	28480	01321-61608 8
XF1	1400-0084	1	FUSEHOLDER; EXTR POST; BAY CAP; 15A	28480	1400-0084
XQ1	1200-0041	3	SOCKET, ELEC, XSTR 2-CONT TO-3 PKG SLDR	00014	PTS-1
XQ2	1200-0041		SOCKET, ELEC, XSTR 2-CONT TO-3 PKG SLDR	00014	PTS-1
XQ3	1200-0041		SOCKET, ELEC, XSTR 2-CONT TO-3 PKG SLDR	00014	PTS-1
XV1	1200-0037	1	SOCKET, ELEC, TUBE 14-CONT CRT PKG	28480	1200-0037
A1	01317-66503	2	X INPUT BOARD	28480	01317-66503
A1C1	0160-3451	33	CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A1C2	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A1C3	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A1C4	0160-0174	5	CAPACITOR-FXD .47UF+80-20% 25WVDC	28480	0160-0174
A1C5	0160-3443		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3443
A1C6	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A1C7	0160-0168	28	CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C8	0160-2197	4	CAPACITOR-FXD 10PF+-5% 300WVDC	28480	0160-2197
A1C9	0160-2197		CAPACITOR-FXD 10PF+-5% 300WVDC	28480	0160-2197
A1C10	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C11	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C12	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C13	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C14	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C15	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C16	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A1C17	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C18	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C19	0160-0174		CAPACITOR-FXD .47UF+80-20% 25WVDC	28480	0160-0174
A1C20	0140-0196	2	CAPACITOR-FXD 150PF+-5% 300WVDC	72136	DM15F151J0300WV1CR
A1C21	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A1C22	0160-2254	2	CAPACITOR-FXD 7.5PF+-.25PF 500WVDC	28480	0160-2254
A1C23	0160-3443	23	CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A1C24	0160-3443		CAPACITOR-FXD .2UF+80-20% 50WVDC	28480	0160-3443
A1CR1	1901-0376	12	DIODE; GEN PRP; SI; 35V MAX VRM 50MA	28480	1901-0376
A1CR2	1901-0376		DIODE; GEN PRP; SI; 35V MAX VRM 50MA	28480	1901-0376
A1CR3	1901-0376		DIODE; GEN PRP; SI; 35V MAX VRM 50MA	28480	1901-0376
A1CR4	1901-0376		DIODE; GEN PRP; SI; 35V MAX VRM 50MA	28480	1901-0376
A1CR5	1901-0033	25	DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A1CR6	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A1CR7	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A1CR8	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A1CR9	1901-0040	71	DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A1CR10	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A1CR11	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A1CR12	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A1CR13	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A1CR14	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A1CR15	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A1CR16	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A1CR17	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A1CR18	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A1CR19	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A1CR20	1901-0513	1	DIODE: GEN PRP: SI100V MAX VRM 100MA	28480	1901-0513
A1CR21	1901-0513		N.S.R. PART OF CR20		
A1CR22	1901-0513	1	DIODE: GEN PRP: SI 100V MAX VRM 100MA	28480	1901-0513
A1CR23	1901-0513		N.S.R. PART OF CR22		
A1L1	9100-2276		COIL; MOLDED RF CHOKE 100UH 5%	28480	9100-2276
A1L2	9100-2276		COIL; MOLDED RF CHOKE 100UH 5%		9100-2276
A1Q1	1855-0202	4	TSTR:FET (MATCHED PAIR)	28480	1855-0202
A1Q2	1855-0202		TSTR:FET (MATCHED PAIR)	28480	1855-0202
A1Q3	1853-0036	42	TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q4	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q5	1854-0071	16	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q7	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q8	1853-0075	2	TRANSISTOR; BIPOL; SI; PNP DUAL	28480	1853-0075
A1Q9	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q10	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1Q11	1853-0276	6	TRANSISTOR PNP SI CHIP PD=360MW	28480	1853-0276
A1Q12	1853-0276		TRANSISTOR PNP SI CHIP PD=360MW	28480	1853-0276
A1Q13	1853-0276		TRANSISTOR PNP SI CHIP PD=360MW	28480	1853-0276
A1Q14	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q15	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q16	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1Q17	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A1R1	0698-5965	3	RESISTOR-FXD 50 OHM 1% .5W F TUBULAR	19701	MF7C1/2-T0-50R0-F
A1R2	0687-4701	4	RESISTOR-FXD 47 OHM 10% .5W CC TUBULAR	01121	EB4701
A1R3	0757-0340	3	RESISTOR-FXD 10K 1% .25W F TUBULAR	24546	C5-1/4-T0-1002-F
A1R4	0684-1041	4	RESISTOR-FXD 10K 10% .5W CC TUBULAR	01121	CB1041
A1R5	0684-1041		RESISTOR-FXD 10K 10% .5W CC TUBULAR	01121	CB1041
A1R6	0684-3901	42	RESISTOR-FXD 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A1R7	0684-3901		RESISTOR-FXD 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A1R8			NOT ASSIGNED		
A1R9			NOT ASSIGNED		
A1R10	0757-0280	25	RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A1R11	2100-2633	4	RESISTOR, VAR, TRMR, 1KOHM 10% C	19701	ET50X102
A1R12	2100-2633		RESISTOR, VAR, TRMR, 1KOHM 10% C	19701	ET50X102
A1R13	0698-3447	2	RESISTOR-FXD 422 OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-422R-F
A1R14	0757-0442	9	RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A1R15	0757-0273	4	RESISTOR-FXD 3.01K 1% .125W F TUBULAR	24546	C4-1/8-T0-3011-F
A1R16	0757-0409	6	RESISTOR-FXD 274 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-274R-F
A1R17			NOT ASSIGNED		
A1R18			NOT ASSIGNED		
A1R19	0757-0442		RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A1R20			NOT ASSIGNED		
A1R21			NOT ASSIGNED		
A1R22	0757-0442		RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A1R23	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A1R24	0757-0417	4	RESISTOR-FXD 562 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-562R-F
A1R25	0757-0417		RESISTOR-FXD 562 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-562R-F
A1R26	0757-0394	8	RESISTOR-FXD 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A1R27	0757-0401		RESISTOR-FXD 100 OHM 1% .125W F	28480	0757-0401
A1R28	0757-0442	2	RESISTOR-FXD 10K 1% .125W F TUBULAR	28480	0757-0442
A1R29	0757-0401		RESISTOR-FXD 100 OHM 1% .125W F	28480	0757-0401
A1R30	2100-2413	2	RESISTOR, VAR, TRMR, 200 OHM 10% C	19701	ET50X201
A1R31	0757-0394		RESISTOR-FXD 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A1R32	0698-3084	4	RESISTOR-FXD 2.15K 1% .125W F TUBULAR	16299	C4-1/8-T0-2151-F
A1R33	0757-0408	4	RESISTOR-FXD 243 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-243R-F
A1R34	0757-0273		RESISTOR-FXD 3.01K 1% .125W F TUBULAR	24546	C4-1/8-T0-3011-F
A1R35	0757-0408		RESISTOR-FXD 243 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-243R-F
A1R36	0757-0416	17	RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A1R37	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A1R38	0698-3132	2	RESISTOR-FXD 261 OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-2610-F
A1R39	0684-5621	8	RESISTOR-FXD 5.6K 10% .25W CC TUBULAR	01121	CB5621
A1R40	0684-1531	4	RESISTOR-FXD 15K 10% .25W CC TUBULAR	01121	CB1531
A1R41	0757-0442		RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A1R42	0757-0415	4	RESISTOR-FXD 475 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-475R-F
A1R43	0757-0415		RESISTOR-FXD 475 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-475R-F
A1R44	0698-0085	7	RESISTOR-FXD 2.61K 1% .125W F TUBULAR	16299	C4-1/8-T0-2611-F
A1R45	0757-0421	6	RESISTOR-FXD 825 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-825R-F
A1R46	0757-0421		RESISTOR-FXD 825 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-825R-F
A1R47	0684-2201	10	RESISTOR-FXD 22 OHM 10% .25W CC TUBULAR	01121	CB2201
A1R48	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A1R49	0757-0281	8	RESISTOR-FXD 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A1R50	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A1R51	0684-2201		RESISTOR-FXD 22 OHM 10% .25W CC TUBULAR	01121	CB2201
A1R52	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A1R53	0757-0281		RESISTOR-FXD 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A1R54	0684-2201		RESISTOR-FXD 22 OHM 10% .25W CC TUBULAR	01121	CB2201
A1R55	0684-2201		RESISTOR-FXD 22 OHM 10% .25W CC TUBULAR	01121	CB2201
A1R56	0684-2221	5	RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A1R57	0684-1021	7	RESISTOR-FXD 1K 10% .25W CC TUBULAR	01121	CB1021
A1R58	0684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A1R59	0684-1021		RESISTOR-FXD 1K 10% .25W CC TUBULAR	01121	CB1021
A1R60	0684-2201		RESISTOR-FXD 22 OHM 10% .25W CC TUBULAR	01121	CB2201
A1R61	0698-3150	3	RESISTOR-FXD 2.37K 1% .125W F TUBULAR	16299	C4-1/8-T0-2371-F
A1R62	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R63	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R64	2100-2632	2	RESISTOR, VAR, TRMR, 100 OHM 10% C	19701	ET50X101
A1R65	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R66	0684-5621		RESISTOR-FXD 5.6K 10% .25W CC TUBULAR	01121	CB5621
A1R67	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R68	0757-0281		RESISTOR-FXD 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1R69	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A1R70	0757-0281		RESISTOR-FXD 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A1R71	0684-5621		RESISTOR-FXD 5.6K 10% .25W CC TUBULAR	01121	CB5621
A1R72	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R73	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R74	0698-3153	6	RESISTOR-FXD 3.83K 1% .125W F TUBULAR	16299	C4-1/8-T0-3831-F
A1R75	0698-3153		RESISTOR-FXD 3.83K 1% .125W F TUBULAR	16299	C4-1/8-T0-3831-F
A1R76	0684-1841	2	RESISTOR-FXD 180K 10% .25W CC TUBULAR	01121	CB1841
A1R77	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R78	0684-1051	2	RESISTOR-FXD 1M 10% .25W CC TUBULAR	01121	CB1051
A1R79	0684-2231	2	RESISTOR-FXD 22K 10% .25W CC TUBULAR	01121	CB2231
A1R80	0684-1531		RESISTOR-FXD 15K 10% .25W CC TUBULAR	01121	CB1531
A1R81	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R82	0757-0284	4	RESISTOR-FXD 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A1R83	0757-0469	2	RESISTOR-FXD 150K 1% .125W F TUBULAR	24546	C4-1/8-T0-1503-F
A1R84	0757-0284		RESISTOR-FXD 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A1R85	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R86	0757-0467	4	RESISTOR-FXD 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-201-F
A1R87	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A1R88	0698-0084		RESISTOR-FXD 2.15K 1% .125W F TUBULAR	16299	C4-1/8-T0-2151-F
A1R89	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R90	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A1R91	0757-0441	3	RESISTOR-FXD 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F
A1S1	3101-0973	4	SWITCH; SL; DPDT NS; .5A 125VAC/DC	79727	GF126-0018
A1U1	1820-0352	2	IC;LIN;TRANSISTOR ARRAY	02735	CA3018
A1U2	1858-0040	2	IC;LIN;TRANSISTOR ARRAY	28480	1858-0040
A1XU1	1200-0441	2	SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	24995	583527-1
A2	01310-66507	2	X OUTPUT BOARD	28480	01310-66507
A2C1	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A2C2	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A2C3	0160-2150	4	CAPACITOR-FXD 33PF+-5% 300WVDC	28480	0160-2150
A2C4	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A2C5	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A2C6	0170-0063	4	CAPACITOR-FXD .02UF+-10% 400WVDC	84411	663UW20394
A2C7	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A2C8	0121-0407	4	CAPACITOR, VAR, TRMR, PSTN, .7/3PF	72982	536-016
A2C9	0170-0022	7	CAPACITOR-FXD .1UF+-20% 600WVDC	28480	0170-0022
A2C10			NOT ASSIGNED		
A2C11	0160-2150		CAPACITOR-FXD 33PF+-5% 300WVDC	28480	0160-2150
A2C12	0121-0407		CAPACITOR, VAR, TRMR, PSTN, .7/3PF	72982	536-016
A2C13	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A2C14	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A2C15	0170-0063		CAPACITOR-FXD .02UF+-10% 400WVDC	84411	663UW20394
A2C16	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A2C17	0121-0168	4	CAPACITOR, VAR, TRMR, PSTN, .2/1.5PF	28480	0121-0168
A2C18	0170-0022		CAPACITOR-FXD .1UF+-20% 600WVDC	28480	0170-0022
A2C19	0170-0022		CAPACITOR-FXD .1UF+-20% 600WVDC	28480	0170-0022
A2C20	0180-0374	8	CAPACITOR-FXD; 10UF+-10% 20VDC TA-SOLID	56289	150D106X9020B2
A2C21	0180-0374		CAPACITOR-FXD; 10UF+-10% 20VDC TA-SOLID	56289	150D106X9020B2
A2C22	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A2C23	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A2CR1	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A2CR2	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A2CR3	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A2CR4	1901-0033		DIODE; GEN PRP; SI; 180V MAX VRM 200MA	28480	1901-0033
A2CR5	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR6	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR7	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR8	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR9	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR10	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR11	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR12	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR13	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR14	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR15	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2CR16	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A2MP1	1200-0185	10	INSULATOR, XSTR, TO- 5, .075 THK	13103	7717-22 N RED
A2MP2	1205-0213	4	HEAT-DISSIPATOR, SGL, TO-5 PKG	28480	1205-0213
A2Q1	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q2	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q3			NOT ASSIGNED		
A2Q4	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q5	1854-0215	15	TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q6	1853-0038	8	TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0038

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
A2Q7	1853-0038		TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0038
A2Q8	1854-0271	4	TRANSISTOR NPN SI PD=1W FT=150MHZ	28480	1854-0271
A2Q9	1854-0523	4	TRANSISTOR NPN SI PD=1W FT=150MHZ	28480	1854-0523
A2Q10	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q11	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q12	1854-0271		TRANSISTOR NPN SI PD=1W FT=150MHZ	28480	1854-0271
A2Q13	1854-0523		TRANSISTOR NPN SI PD=1W FT=150MHZ	28480	1854-0523
A2Q14	1853-0038		TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0038
A2Q15	1853-0038		TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0038
A2R1	0684-4701	23	RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A2R2	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A2R3	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A2R4	0684-5601		RESISTOR-FXD 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A2R5	0698-3153		RESISTOR-FXD 3.83K 1% .125W F TUBULAR	16299	C4-1/8-T0-3831-F
A2R6	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A2R7	0698-0085		RESISTOR-FXD 2.61K 1% .125W F TUBULAR	16299	C4-1/8-T0-2611-F
A2R8	0757-0278	4	RESISTOR-FXD 1.78K 1% .125W F TUBULAR	24546	C4-1/8-T0-1781-F
A2R9	0698-3159	4	RESISTOR-FXD 26.1K 1% .125W F TUBULAR	16299	C4-1/8-T0-2612-F
A2R10	0684-1811	14	RESISTOR-FXD 180 OHM 10% .25W CC	01121	CB1811
A2R11	0684-2711	4	RESISTOR-FXD 270 OHM 10% .25W CC	01121	CB2711
A2R12	0698-0085		RESISTOR-FXD 2.61K 1% .125W F TUBULAR	16299	C4-1/8-T0-2611-F
A2R13	0757-0278		RESISTOR-FXD 1.78K 1% .125W F TUBULAR	24546	C4-1/8-T0-1781-F
A2R14	0698-3159		RESISTOR-FXD 26.1K 1% .125W F TUBULAR	16299	C4-1/8-T0-2612-F
A2R15	0684-2711		RESISTOR-FXD 270 OHM 10% .25W CC	01121	CB2711
A2R16	0684-1811		RESISTOR-FXD 180 OHM 10% .25W CC	01121	CB1811
A2R17	0684-1001	4	RESISTOR-FXD 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R18	0698-3655	4	RESISTOR-FXD 56K 5% 2W MO TUBULAR	16299	FP42-2-T00-5602-J
A2R19	0698-3155	4	RESISTOR-FXD 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A2R20	0757-0159	4	RESISTOR-FXD 1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-1R0-F
A2R21	0764-0021	8	RESISTOR-FXD 9.1K 5% 2W MO TUBULAR	24546	FP42-2-T00-9101-J
A2R22	0764-0021		RESISTOR-FXD 9.1K 5% 2W MO TUBULAR	24546	FP42-2-T00-9101-J
A2R23	0684-1021		RESISTOR-FXD 1K OHM 10% .25W CC	01121	CB1021
A2R24	2100-2692	2	RESISTOR, VAR, TRMR, 1MOHM 20% C	19701	ET50X105
A2R25	0757-0438	22	RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A2R26	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A2R27	0761-0076	4	RESISTOR-FXD 18K 5% 1W MO TUBULAR	24546	FP32-1-T00-1802-J
A2R28	0761-0074	4	RESISTOR-FXD 15K 5% 1W MO TUBULAR	24546	FP32-1-T00-1502-J
A2R29	0698-3646	8	RESISTOR-FXD 12K 5% 2W MO TUBULAR	16299	FP42-2-T00-1202-J
A2R30	0698-3646		RESISTOR-FXD 12K 5% 2W MO TUBULAR	16299	FP42-2-T00-1202-J
A2R31	0757-0480	2	RESISTOR-FXD 432K 1% .125W F TUBULAR	30983	MF4C1/8-T0-4323-F
A2R32	0698-3646		RESISTOR-FXD 12K 5% 2W MO TUBULAR	16299	FP42-2-T00-1202-J
A2R33	0684-1811		RESISTOR-FXD 180 OHM 10% .25W CC	01121	CB1811
A2R34	0698-3646		RESISTOR-FXD 12K 5% 2W MO TUBULAR	16299	FP42-2-T00-1202-J
A2R35	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A2R36	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A2R37	0684-1001		RESISTOR-FXD 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R38	0698-3655		RESISTOR-FXD 56K 5% 2W MO TUBULAR	16299	FP42-2-T00-5602-J
A2R39	0684-1811		RESISTOR-FXD 180 OHM 10% .25W CC	01121	CB1811
A2R40	0698-3155		RESISTOR-FXD 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A2R41	0757-0159		RESISTOR-FXD 1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-1R0-F
A2R42	0761-0074		RESISTOR-FXD 15K 5% 1W MO TUBULAR	24546	FP32-1-T00-1502-J
A2R43	0761-0076		RESISTOR-FXD 18K 5% 1W MO TUBULAR	24546	FP32-1-T00-1802-J
A2R44	0764-0021		RESISTOR-FXD 9.1K 5% 2W MO TUBULAR	24546	FP42-2-T00-9101-J
A2R45	0764-0021		RESISTOR-FXD 9.1K 5% 2W MO TUBULAR	24546	FP42-2-T00-9101-J
A2R46	0684-1021		RESISTOR-FXD 1K OHM 10% .25W CC	01121	CB1021
A2R47	0684-1811		RESISTOR-FXD 180 OHM 10% .25W CC	01121	CB1811
A3	01317-66503		Y INPUT BOARD SAME AS A1, USE PREFIX A3.	28480	01317-66503
A4	01310-66507		Y OUTPUT BOARD SAME AS A2, USE PREFIX A4.	28480	01310-66507
A5	01317-66502	1	Z-AXIS BOARD ASSY	28480	01317-66502
A5C5	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A5C6	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A5C7	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A5C8	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A5C9	0140-0203	2	CAPACITOR-FXD 30PF+-5% 500WVDC	72136	DM15E300J0500WV1CR
A5C10	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A5C11	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A5C12	0121-0474		CAPACITOR, VAR, TRMR, PSTN, .25/1.5PF	28480	0121-0474
A5C13	0160-3453	4	CAPACITOR-FXD .05UF+80-20% 100WVDC	28480	0160-3453
A5C14	0160-3453		CAPACITOR-FXD .05UF+80-20% 100WVDC	28480	0160-3453
A5C15	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A5C16	0160-3960	3	CAPACITOR-FXD .001UF+-20% 8000WVDC	84411	HEW337

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
A5C17	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A5C18	0180-0374		CAPACITOR-FXD: 10UF+-10% 20VDC TA-SOLID	56289	150D106X902082
A5C19	0180-0374		CAPACITOR-FXD; 10UF+-10% 20VDC TA-SOLID	56289	150D106X902082
A5C20	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A5C21	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A5C22	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A5C23	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A5C24	0160-3451		CAPACITOR-FXD .01UF+80-20% 100WVDC	28480	0160-3451
A5C25	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A5CR1	1901-0376		DIODE; GEN PRP; ; 35V MAX VRM 50MA	28480	1901-0376
A5CR2	1901-0376		DIODE; GEN PRP; ; 35V MAX VRM 50MA	28480	1901-0376
A5CR3	1901-0376		DIODE; GEN PRP; ; 35V MAX VRM 50MA	28480	1901-0376
A5CR4	1901-0376		DIODE; GEN PRP; ; 35V MAX VRM 50MA	28480	1901-0376
A5CR5	1901-0045	3	DIODE; PWR RECT; ; 100V MAX VRM 750MA	28480	1901-0045
A5CR6	1901-0045		DIODE; PWR RECT; ; 100V MAX VRM 750MA	28480	1901-0045
A5CR7	1901-0033		DIODE; GEN PRP; ; 180V MAX VRM 200MA	28480	1901-0033
A5CR8	1901-0040		DIODE; SWITCHING; ; 30V MAX VRM 50MA	28480	1901-0040
A5CR9	1901-0040		DIODE; SWITCHING; ; 30V MAX VRM 50MA	28480	1901-0040
A5CR10	1901-0050	2	DIODE; SWITCHING; ; 80V MAX VRM 200MA	28480	1901-0050
A5CR11	1901-0050		DIODE; SWITCHING; ; 80V MAX VRM 200MA	28480	1901-0050
A5CR12	1901-0040		DIODE; SWITCHING; ; 30V MAX VRM 50MA	28480	1901-0040
A5E1 THRU A5E9	0360-1514	9	TERMINAL, SLDR STUD	28480	0360-1514
A5E10 THRU A5E13	0360-1788	6	TERMINAL, SLDR STUD .045 SHK DIA	28480	0360-1788
A5E14 THRU A5E16	1200-0185	3	INSULATOR, XSTR, TO-5, .075 THK	13103	7717-22 N RED
A5E17	1205-0213		HEAT-DISSIPATOR, SGL, TO-5 PKG	28480	1205-0213
A5E18	1205-0226	1	HEAT-DISSIPATOR, SGL, TO-5 PKG	28480	1205-0226
A5E19	1251-0206	1	CONNECTOR; 1-CONT SKT .04 DIA;WHT TFE	98291	SKT-400
A5L1	9100-2276		COIL; FXD; MOLDED RF CHOKE; 100UH 5%	28480	9100-2276
A5L2	9100-2276		COIL; FXD: MOLDED RF CHOKE; 100UH 5%	24226	15/103
A5Q1	1855-0202	1	TRANSISTOR: FET SI	28480	1855-0202
A5Q2	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q3	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q4	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q5	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q6	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q7	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q8	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q9	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q10	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q11	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q12	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q13	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q16	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q17	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A5Q18	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q19	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A5Q20	1854-0234	4	TRANSISTOR NPN 2N3440 SI PD=1W	02735	2N3440
A5R1	0757-0340		RESISTOR-FXD 10K 1% .25W F TUBULAR	24546	C5-1/4-T0-1002-F
A5R2			NOT ASSIGNED		
A5R3	C698-5965		RESISTOR-FXD 50 OHM 1% .5W F TUBULAR	19701	MF7C1/2-T0-50R0-F
A5R8	0684-1041	3	RESISTOR-FXD 100K 10% .25W CC TUBULAR	01121	CB1041
A5R9	0684-1041		RESISTOR-FXD 100K 10% .25W CC TUBULAR	01121	CB1041
A5R10	0684-3901	5	RESISTOR-FXD 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A5R11	0684-3901		RESISTOR-FXD 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A5R12	0757-0288	2	RESISTOR-FXD 9.09K 1% .125W F TUBULAR	30983	MF4C1/8-T0-9091-F
A5R13	0757-0288		RESISTOR-FXD 9.09K 1% .125W F TUBULAR	30983	MF4C1/8-T0-9091-F
A5R14	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A5R15	C757-0439	11	RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A5R16	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A5R17	C757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A5R18	0757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A5R19	C757-0317	2	RESISTOR-FXD 1.33K 1% .125W F TUBULAR	24546	C4-1/8-T0-1331-F
A5R20	2100-2489	3	RESISTOR, VAR, TRMR, 5KOHM 10% C	19701	ET50X502
A5R21	C698-3154	2	RESISTOR-FXD 4.22K 1% .125W F TUBULAR	16299	C4-1/8-T0-4221-F
A5R22	0757-0441		RESISTOR-FXD 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F
A5R23	0757-0407		RESISTOR-FXD 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-201-F
A5R24	0757-0407		RESISTOR-FXD 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-201-F
A5R25	C698-3445	2	RESISTOR-FXD 348 OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-348R-F
A5R26	C698-3445		RESISTOR-FXD 348 OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-348R-F
A5R27	C757-0430	1	RESISTOR-FXD 2.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-2211-F
A5R28	0757-0274	3	RESISTOR-FXD 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A5R29	0757-0411	1	RESISTOR-FXD 332 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-332R-F
A5R30	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A5R31	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A5R32	C757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5R33	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A5R34	0757-0401	3	RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A5R35	C757-0274		RESISTOR-FXD 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A5R36	0757-0274		RESISTOR-FXD 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A5R37	2100-2489		RESISTOR, VAR, TRMR, 5KOHM 10% C	19701	ET50X502
A5R38	0687-4711	5	RESISTOR-FXD 470 OHM 10% .5W CC TUBULAR	01121	EB4711
A5R39	C757-0817	2	RESISTOR-FXD 750 OHM 1% .5W F TUBULAR	30983	MF7C1/2-T0-751-F
A5R40	0757-0817		RESISTOR-FXD 750 OHM 1% .5W F TUBULAR	30983	MF7C1/2-T0-751-F
A5R41	0687-4711		RESISTOR-FXD 470 OHM 10% .5W CC TUBULAR	01121	EB4711
A5R42	0757-0843	1	RESISTOR-FXD 15K 1% .5W F TUBULAR	30983	MF7C1/2-T0-1502-F
A5R43	C764-0012	1	RESISTOR-FXD 6.8K 5% 2W MO TUBULAR	24546	FP42-2-T00-6801-J
A5R44	0757-0747	2	RESISTOR-FXD 5.11K 1% .25W F TUBULAR	24546	C5-1/4-T0-5111-F
A5R45	C683-2705	2	RESISTOR-FXD 27 OHM 5% .25W CC TUBULAR	01121	CB2705
A5R46	0683-2705		RESISTOR-FXD 27 OHM 5% .25W CC TUBULAR	01121	CB2705
A5R47	C760-0016	2	RESISTOR-FXD 2.7K 2% 1W MO TUBULAR	FR003	C32
A5R48	C760-0016		RESISTOR-FXD 2.7K 2% 1W MO TUBULAR	FR003	C32
A5R49			NOT ASSIGNED		
A5R50	0687-6801	1	RESISTOR-FXD 68 OHM 10% .5W CC TUBULAR	01121	EB6801
A5R51	0687-4721	1	RESISTOR-FXD 4.7K 10% .5W CC TUBULAR	01121	EB4721
A5R52	0757-0465	1	RESISTOR-FXD 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A5R53	0687-1051	2	RESISTOR-FXD 1M 10% .5W CC TUBULAR	01121	EB1051
A5R54	0684-1031	2	RESISTOR-FXD 10K 10% .25W CC TUBULAR	01121	CB1031
A5R55	C684-1221	2	RESISTOR-FXD 1.2K 10% .25W CC TUBULAR	01121	CB1221
A5R56	0684-2211	1	RESISTOR-FXD 220 OHM 10% .25W CC	01121	CB2211
A5R57	0684-2221		RESISTOR-FXD 2.2K 10% .25W CC TUBULAR	01121	CB2221
A5R58	0684-6831	1	RESISTOR-FXD 68K 10% .25W CC TUBULAR	01121	CB6831
A5R59	0684-1041		RESISTOR-FXD 100K 10% .25W CC TUBULAR	01121	CB1041
A5R60	0684-2241	2	RESISTOR-FXD 220K 10% .25W CC TUBULAR	01121	CB2241
A5R61	0684-1541	1	RESISTOR-FXD 150K 10% .25W CC TUBULAR	01121	CB1541
A5R62	0684-2241		RESISTOR-FXD 220K 10% .25W CC TUBULAR	01121	CB2241
A5R63	C684-1021		RESISTOR-FXD 1K 10% .25W CC TUBULAR	01121	CB1021
A5R64	0687-4711		RESISTOR-FXD 470 OHM 10% .5W CC TUBULAR	01121	EB4711
A5R65	2100-3274	1	RESISTOR, VAR, TRMR, 10KOHM 10% C	28480	2100-3274
A5R66	C698-3154		RESISTOR-FXD 4.22K 1% .125W F TUBULAR	16299	C4-1/8-T0-4221-F
A5R67	0684-1221		RESISTOR-FXD 1.2K 10% .25W CC TUBULAR	01121	CB1221
A5R68	0757-0445	1	RESISTOR-FXD 13K 1% .125W F TUBULAR	24546	C4-1/8-T0-1302-F
A5S1	3101-0973		SWITCH; SL; DPDT NS; .5A 125VAC/DC	79727	GF126-0018
A5V1	2140-0008	8	LAMP, GLOW, BULB T-2, 59V	71744	A1A (NE-2)
A5V2	2140-0008		LAMP, GLOW, BULB T-2, 59V	71744	A1A (NE-2)
A5V3	2140-0008		LAMP, GLOW, BULB T-2, 59V	71744	A1A (NE-2)
A5V4	2140-0008		LAMP, GLOW, BULB T-2, 59V	71744	A1A (NE-2)
A5V5	2140-0008		LAMP, GLOW, BULB T-2, 59V	71744	A1A (NE-2)
A5V6	2140-0008		LAMP, GLOW, BULB T-2, 59V	71744	A1A (NE-2)
A5V7	2140-0008		LAMP, GLOW, BULB T-2, 59V	71744	A1A (NE-2)
A5VR1	1902-0041	4	DIODE; ZENER; 5.11V VZ; .4W MAX PD	04713	SZ 10939-98
A5VR2	1902-0041		DIODE; ZENER; 5.11V VZ; .4W MAX PD	04713	SZ 10939-98
A5VR3	1902-3149	1	DIODE; ZENER; 9.09V VZ; .4W MAX PD	04713	SZ 10939-170
A5VR4	1902-0184	1	DIODE; ZENER; 16.2V VZ; .4W MAX PD	28480	1902-0184
A5VR5	1902-3393	2	DIODE; ZENER; 75V VZ; .4W MAX PD	04713	SZ 10939-434
A5VR6	1902-3139	1	DIODE; ZENER; 8.25V VZ; .4W MAX PD	04713	SZ 10939-158
A6	01317-66501	1	FOCUS/ASTIG BOARD ASSY	28480	01317-66501
A6C1	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A6C2	0140-0203		CAPACITOR-FXD 30PF+-5% 500WVDC	72136	DM15E300J0500WV1CR
A6C3	C160-3670	3	CAPACITOR-FXD .1UF+-20% 200WVDC	28480	0160-3670
A6C4	0121-0474		CAPACITOR, VAR, TRMR, PSTN, .25/1.5PF	28480	0121-0474
A6C5	0170-0022		CAPACITOR-FXD .1UF+-20% 600WVDC	28480	0170-0022
A6C6	016C-3670		CAPACITOR-FXD .1UF+-20% 200WVDC	28480	0160-3670
A6C7	016C-3007	1	CAPACITOR-FXD .0047UF+-20% 4000WVDC	28480	0160-3007
A6C8	018C-0374		CAPACITOR-FXD; 10UF+-10% 20VDC TA-SOLID	56289	150D106X9020B2
A6C9	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A6C10	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A6C11	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A6C12	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A6C13	C180-0374		CAPACITOR-FXD; 10UF+-10% 20VDC TA-SOLID	56289	150D106X9020B2
A6C14	016C-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A6C15	016C-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A6C16	016C-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A6C17	C160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A6C18	016C-2207	1	CAPACITOR-FXD 300PF+-5% 300WVDC	28480	0160-2207
A6C19	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A6C20	C160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A6C21	016C-3670		CAPACITOR-FXD .1UF+-20% 200WVDC	28480	0160-3670
A6C22	0140-0178	1	CAPACITOR-FXD 560PF+-2% 300WVDC	72136	DM15F561G0300WV1CR

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
A6CR1	1901-0040		DIODE; SWITCHING; ; 30V MAX VRM 50MA	28480	1901-0040
A6CR2	1901-0040		DIODE; SWITCHING; ; 30V MAX VRM 50MA	28480	1901-0040
A6CR3	1901-0040		DIODE; SWITCHING; ; 30V MAX VRM 50MA	28480	1901-0040
A6CR4	1901-0040		DIODE; SWITCHING; ; 30V MAX VRM 50MA	28480	1901-0040
A6CR5	1901-0040		DIODE; SWITCHING; ; 30V MAX VRM 50MA	28480	1901-0040
A6CR6	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR7	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR8	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR9	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR10	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR11	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR12	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR13	1901-0026	12	DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A6CR14	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A6CR15	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A6CR16	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A6CR17	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR18	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR19	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR20	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR21	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR22	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR23	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR24	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR25	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR26	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR27	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6CR28	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A6E1 THRU A6E5	1200-0185	5	INSULATOR, XSTR, TO-5, .075 THK	13103	7717-22 N RED
A6E6	1205-0213		HEAT-DISSIPATOR, SGL, TO-5 PKG	28480	1205-0213
A6E7	01300-21102	1	HEAT SINK:CLAMP	28480	01300-21102
A6E8	5040-0401	1	SUPPORT:CAPACITOR	28480	5040-0401
A6E9	01300-21103	1	HEAT SINK:BASE	28480	01300-21103
A6L1	9100-2276		COIL; FXD; MOLDED RF CHOKE; 100UH 5%	28480	9100-2276
A6L2	9100-2276		COIL; FXD; MOLDED RF CHOKE; 100UH 5%	28480	9100-2276
A6Q1	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q2	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q3	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q4	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q5	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A6Q6	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q7	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A6Q8	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q9	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q10	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q11	1854-0092	1	TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A6Q12			NOT ASSIGNED		
A6Q13	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q14	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q15	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q16	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q17	1854-0404	2	TRANSISTOR NPN SI PD=360MW FT=200MHZ	28480	1854-0404
A6Q18	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q19	1854-0404		TRANSISTOR NPN SI PD=360MW FT=200MHZ	28480	1854-0404
A6Q20	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q21	1854-0234		TRANSISTOR NPN 2N3440 SI PD=1W	02735	2N3440
A6Q22	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A6Q23	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A6Q24	1853-0232		TRANSISTOR PNP SI CHIP PD=1W	28480	1853-0232
A6Q25	1854-0419		TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0419
A6R1	C684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R2	C757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A6R3	C757-0317		RESISTOR-FXD 1.33K 1% .125W F TUBULAR	24546	C4-1/8-T0-1331-F
A6R4	C757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A6R5	C684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R6	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R7	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R8	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R9	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R10	2100-3352	8	RESISTOR, VAR, TRMR, 1KOHM 10% C	73138	72XR102
A6R11	2100-3352		RESISTOR, VAR, TRMR, 1KOHM 10% C	73138	72XR102
A6R12	C757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R13	C757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R14	C684-4731	4	RESISTOR-FXD 47K 10% .25W CC TUBULAR	01121	CB4731
A6R15	C684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R16	C757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A6R17	0757-0424	1	RESISTOR-FXD 1.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1101-F
A6R18	0757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A6R19	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R20	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R21	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R22	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R23	2100-3352		RESISTOR, VAR, TRMR, 1KOHM 10% C	73138	72XR102
A6R24	2100-3352		RESISTOR, VAR, TRMR, 1KOHM 10% C	73138	72XR102
A6R25	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R26	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R27	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R28	0684-4731		RESISTOR-FXD 47K 10% .25W CC TUBULAR	01121	CB4731
A6R29	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R30	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R31	0757-0414	2	RESISTOR-FXD 432 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-432R-F
A6R32	0757-0414		RESISTOR-FXD 432 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-432R-F
A6R33	0757-0409		RESISTOR-FXD 274 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-274R-F
A6R34	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A6R35	0757-0409		RESISTOR-FXD 274 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-274R-F
A6R36	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A6R37	0757-0728	1	RESISTOR-FXD 619 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-619R-F
A6R38	0757-0907	2	RESISTOR-FXD 200 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-201-G
A6R39	0757-0907		RESISTOR-FXD 200 OHM 2% .125W F TUBULAR	24546	C4-1/8-T0-201-G
A6R40	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A6R41	C698-0085		RESISTOR-FXD 2.61K 1% .125W F TUBULAR	16299	C4-1/8-T0-2611-F
A6R42	0757-0346	1	RESISTOR-FXD 10 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-10R0-F
A6R43	2100-2574	1	RESISTOR, VAR, TRMR, 500 OHM 10% C	19701	ET50X501
A6R44	2100-3274	2	RESISTOR, VAR, TRMR, 10KOHM 10% C	28480	2100-3274
A6R45	0757-0437	1	RESISTOR-FXD 4.75K 1% .125W F TUBULAR	24546	C4-1/8-T0-4751-F
A6R46	0757-0283	2	RESISTOR-FXD 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A6R47	2100-2489		RESISTOR, VAR, TRMR, 5KOHM 10% C	19701	ET50X502
A6R48	0687-4701		RESISTOR-FXD 47 OHM 10% .5W CC TUBULAR	01121	EB4701
A6R49	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R50	0687-4711		RESISTOR-FXD 470 OHM 10% .5W CC TUBULAR	01121	EB4711
A6R51	C684-3901		RESISTOR-FXD 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A6R52	0687-4711		RESISTOR-FXD 470 OHM 10% .5W CC TUBULAR	01121	EB4711
A6R53			NOT ASSIGNED		
A6R54	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R55	C757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A6R56	0757-0421		RESISTOR-FXD 825 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-825R-F
A6R57	0757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A6R58	C684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R59	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R60	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R61	2100-3352		RESISTOR, VAR, TRMR, 1KOHM 10% C	73138	72XR102
A6R62	2100-3352		RESISTOR, VAR, TRMR, 1KOHM 10% C	73138	72XR102
A6R63	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R64	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R65	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R66	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R67	0684-4731		RESISTOR-FXD 47K 10% .25W CC TUBULAR	01121	CB4731
A6R68	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R69	0757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A6R70	0757-0421		RESISTOR-FXD 825 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-825R-F
A6R71	0757-0439		RESISTOR-FXD 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A6R72	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R73	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R74	2100-3352		RESISTOR, VAR, TRMR, 1KOHM 10% C	73138	72XR102
A6R75	2100-3352		RESISTOR, VAR, TRMR, 1KOHM 10% C	73138	72XR102
A6R76	C757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R77	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R78	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R79	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R80	C757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R81	0684-4731		RESISTOR-FXD 47K 10% .25W CC TUBULAR	01121	CB4731
A6R82	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R83	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R84	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A6R85	0757-0402	1	RESISTOR-FXD 110 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-111-F
A6R86	0757-0294	1	RESISTOR-FXD 17.8 OHM 1% .125W F	30983	MF4C1/8-T0-17R8-F
A6R87	0757-0416		RESISTOR-FXD 511 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-511R-F
A6R88	C757-0409		RESISTOR-FXD 274 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-274R-F
A6R89	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A6R90	2100-3274		RESISTOR, VAR, TRMR, 10KOHM 10% C	28480	2100-3274

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
A6R91	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A6R92	0757-0339	1	RESISTOR-FXD 3.01K 1% .25W F TUBULAR	24546	C5-1/4-T0-3011-F
A6R93	0757-0409		RESISTOR-FXD 274 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-274R-F
A6R94	0757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A6R95	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R96	C811-0007	1	RESISTOR-FXD 10K 1% 5W PW TUBULAR	14841	5SX
A6R97	0684-4701		RESISTOR-FXD 47 OHM 10% .25W CC TUBULAR	01121	CB4701
A6R98	C687-4701		RESISTOR-FXD 47 OHM 10% .5W CC TUBULAR	01121	EB4701
A6R99			NOT ASSIGNED		
A6R100	0757-0736	2	RESISTOR-FXD 1.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-1501-F
A6R101	0757-0764	1	RESISTOR-FXD 33.2K 1% .25W F TUBULAR	24546	C5-1/4-T0-3322-F
A6R102	0764-0005	1	RESISTOR-FXD 10K 5% 2W MO TUBULAR	24546	EP42-2-T00-1002-J
A6R103	0757-0736		RESISTOR-FXD 1.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-1501-F
A6R104	0757-0290	1	RESISTOR-FXD 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A6R105	0684-3901		RESISTOR-FXD 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A6R106	0684-3901		RESISTOR-FXD 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A6R107	0757-0427	1	RESISTOR-FXD 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A6R108	0687-2231	1	RESISTOR-FXD 22K 10% .5W CC TUBULAR	01121	EB2231
A6R109	0687-1051		RESISTOR-FXD 1M 10% .5W CC TUBULAR	01121	EB1051
A6VR1	1902-0574	2	DIODE; ZENER; 64.9V VZ; 1W MAX PD	04713	SZ 11213-374
A6VR2	1902-0574		DIODE; ZENER; 64.9V VZ; 1W MAX PD	04713	SZ 11213-374
A6VR3	1902-0041		DIODE; ZENER; 5.11V VZ; .4W MAX PD	04713	SZ 10939-98
A6VR4	1902-0041		DIODE; ZENER; 5.11V VZ; .4W MAX PD	04713	SZ 10939-98
A7	01317-66504	1	LEFT CONNECTOR BOARD	28480	01317-66504
A7XA1	1251-0213	7	CONNECTOR, PC EDGE, 15-CONT, DIP SOLDER	26742	91-6915-1700-00
A7XA2	1251-0213		CONNECTOR, PC EDGE, 15-CONT, DIP SOLDER	26742	91-6915-1700-00
A7XA6	1251-0213		CONNECTOR, PC EDGE, 15-CONT, DIP SOLDER	26742	91-6915-1700-00
A7XA10	1251-0213		CONNECTOR, PC EDGE, 15-CONT, DIP SOLDER	26742	91-6915-1700-00
A8	01310-66505	1	RIGHT CONNECTOR BOARD	28480	01310-66505
A8S1	3101-0973		SWITCH; SL; DPDT NS; .5A 125VAC/DC	79727	GF126-0018
A8XA3	1251-0213		CONNECTOR, PC EDGE, 15-CONT, DIP SOLDER	26742	91-6915-1700-00
A8XA4	1251-0213		CONNECTOR, PC EDGE, 15-CONT, DIP SOLDER	26742	91-6915-1700-00
A8XA5	1251-0213		CONNECTOR, PC EDGE, 15-CONT, DIP SOLDER	26742	91-6915-1700-00
A9	01310-66511	1	CONTROL BOARD	28480	01310-66511
A9R1	2100-3137	1	RESISTOR; VAR; CONT; 1K 20% MC	28480	2100-3137
A9R2	2100-3135	8	RESISTOR; VAR; CONT; 5K 20% MC	28480	2100-3135
A9R3	2100-3135		RESISTOR; VAR; CONT; 5K 20% MC	28480	2100-3135
A9R4	2100-3135		RESISTOR; VAR; CONT; 5K 20% MC	28480	2100-3135
A9R5	2100-3135		RESISTOR; VAR; CONT; 5K 20% MC	28480	2100-3135
A9R6	2100-3135		RESISTOR; VAR; CONT; 5K 20% MC	28480	2100-3135
A9R7	2100-3135		RESISTOR; VAR; CONT; 5K 20% MC	28480	2100-3135
A9R8	2100-3135		RESISTOR; VAR; CONT; 5K 20% MC	28480	2100-3135
A9R9	2100-3135		RESISTOR; VAR; CONT; 5K 20% MC	28480	2100-3135
A9R10	C687-5611	1	RESISTOR-FXD 560 OHM 10% .5W CC TUBULAR	01121	EB5611
A10	01310-66513	1	TEST EXTENSION BOARD	28480	01310-66513
A11	01310-66518	1	LOW VOLTAGE POWER SUPPLY BOARD	28480	01310-66518
A11C1	C160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A11C2	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A11C3	0180-0058	2	CAPACITOR-FXD; 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A11C4	0160-3443		CAPACITOR-FXD .1UF+80-20% 50WVDC	28480	0160-3443
A11C5	0180-0058		CAPACITOR-FXD; 50UF+75-10% 25VDC AL	56289	30D506G025CC2
A11C6	C160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A11C7	0160-0168		CAPACITOR-FXD .1UF+-10% 200WVDC	56289	292P10492
A11CR1	1901-0030	4	DIODE; PWR RECT; SI; 800V MAX VRM 600MA	04713	SR1358-11
A11CR2	1901-0030		DIODE; PWR RECT; SI; 800V MAX VRM 600MA	04713	SR1358-11
A11CR3	1901-0030		DIODE; PWR RECT; SI; 800V MAX VRM 600MA	04713	SR1358-11
A11CR4	1901-0030		DIODE; PWR RECT; SI; 800V MAX VRM 600MA	04713	SR1358-11
A11CR5	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A11CR6	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A11CR7	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A11CR8	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A11CR9	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A11CR10	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A11CR11	1901-0026		DIODE; PWR RECT; SI; 200V MAX VRM 750MA	04713	SR1358-8
A11CR12	1901-0026		DIODE; PWR RECT; SI ; 200V MAX VRM 750MA	04713	SR1358-8
A11CR13	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A11CR14	1901-0040		DIODE: SWITCHING SI: 30V MAX VRM 50MA	28480	1901-0040
A11CR15	1901-0028	10	DIODE; PWR RECT; SI ; 400V MAX VRM 750MA	04713	SR1358-9
A11CR16	1901-0040		DIODE: SWITCHING SI: 30V MAX VRM 50MA	28480	1901-0040
A11CR17	1901-0040		DIODE: SWITCHING SI: 30V MAX VRM 50MA	28480	1901-0040
A11CR18	1901-0040		DIODE: SWITCHING SI: 30V MAX VRM 50MA	28480	1901-0040
A11CR19	1901-0040		DIODE: SWITCHING SI: 30V MAX VRM 50MA	28480	1901-0040
A11CR20	1901-0040		DIODE: SWITCHING SI: 30V MAX VRM 50MA	28480	1901-0040
A11CR21	1901-0040		DIODE: SWITCHING SI: 30V MAX VRM 50MA	28480	1901-0040
A11F1	2110-0067	1	FUSE; .3A 250V	71400	AGC 3/10
A11F2	2110-0001	2	FUSE; 1A 250V	71400	AGC-1
A11F3	2110-0001		FUSE; 1A 250V	71400	AGC-1
A11MP1	2110-0269	9	FUSEHOLDER; CLIP TYPE	28480	2110-0269
A11Q1	1854-0234		TRANSISTOR NPN 2N3440 SI PD=1W	02735	2N3440

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11Q2	1854-0358	2	TRANSISTOR NPN SI PD=310MW FT=60MHZ	28480	1854-0358
A11Q3	1854-0358		TRANSISTOR NPN SI PD=310MW FT=60MHZ	28480	1854-0358
A11Q4	1854-0234		TRANSISTOR NPN 2N3440 SI PD=1W	02735	2N3440
A11Q5	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11Q6	1854-0022	1	TRANSISTOR NPN SI PD=700MW FT=50MHZ	07263	S17843
A11Q7	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A11R1	0764-0027	1	RESISTOR-FXD 75K 5% 2W MO TUBULAR	24546	FP42-2-T00-7502-J
A11R2	C698-3691	1	RESISTOR-FXD 24 OHM 5% 1W MO TUBULAR	16299	FP32-1-T00-24R0-J
A11R3	C764-0001	1	RESISTOR-FXD 6.2K 5% 2W MO TUBULAR	24546	FP42-2-T00-6201-J
A11R4	0757-0388	3	RESISTOR-FXD 30.1 OHM 1% .125W F	24546	C4-1/8-T0-30R1-F
A11R5	C757-0128	1	RESISTOR-FXD 200K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2003-F
A11R6	0757-0399	1	RESISTOR-FXD 82.5 OHM 1% .125W F	24546	C4-1/8-T0-82R5-F
A11R7	C757-0433	1	RESISTOR-FXD 3.32K 1% .125W F TUBULAR	24546	C4-1/8-T0-3321-F
A11R8	0757-0855	3	RESISTOR-FXD 68.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-6812-F
A11R9	0757-C855		RESISTOR-FXD 68.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-6812-F
A11R10	0757-0341	1	RESISTOR-FXD 30.1K 1% .25W F TUBULAR	24546	C5-1/4-T0-3012-F
A11R11	C757-0848	1	RESISTOR-FXD 30.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-3012-F
A11R12	2100-2216	1	RESISTOR, VAR, TRMR, 5KOHM 10% C	28480	2100-2216
A11R13	C757-0855		RESISTOR-FXD 68.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-6812-F
A11R14	0757-0850	1	RESISTOR-FXD 39.2K 1% .5W F TUBULAR	30983	MF7C1/2-T0-3922-F
A11R15	C687-3321	2	RESISTOR-FXD 3.3K 10% .5W CC TUBULAR	01121	EB3321
A11R16	C698-3622	1	RESISTOR-FXD 120 OHM 5% 2W MO TUBULAR	24546	FP42-2-T00-120R-J
A11R17	0757-0446	2	RESISTOR-FXD 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F
A11R18	C757-0388		RESISTOR-FXD 30.1 OHM 1% .125W F	24546	C4-1/8-T0-30R1-F
A11R19	C757-0352	2	RESISTOR-FXD 150K 1% .5W F TUBULAR	30983	MF7C1/2-T0-1503-F
A11R20	0757-0344	1	RESISTOR-FXD 1M 1% .25W F TUBULAR	24546	C5-1/4-T0-1004-F
A11R21	0757-0434	1	RESISTOR-FXD 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A11R22	C698-3152	1	RESISTOR-FXD 3.48K 1% .125W F TUBULAR	16299	C4-1/8-T0-3481-F
A11R23	C687-3321		RESISTOR-FXD 3.3K 10% .5W CC TUBULAR	01121	EB3321
A11R24	0757-0440	2	RESISTOR-FXD 7.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-7501-F
A11R25	C757-0388		RESISTOR-FXD 30.1 OHM 1% .125W F	24546	C4-1/8-T0-30R1-F
A11R26	0757-C737	1	RESISTOR-FXD 1.62K 1% .25W F TUBULAR	24546	C5-1/4-T0-1621-F
A11R27	0757-0458	3	RESISTOR-FXD 51.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-5112-F
A11R28	C698-3150		RESISTOR-FXD 2.37K 1% .125W F TUBULAR	16299	C4-1/8-T0-2371-F
A11R29	2100-2061	1	RESISTOR, VAR, TRMR, 200 OHM 10% C	28480	2100-2061
A11R30	0757-1094	1	RESISTOR-FXD 1.47K 1% .125W F TUBULAR	24546	C4-1/8-T0-1471-F
A11R31	C767-0009	2	RESISTOR-FXD 12K 5% 3W MO TUBULAR	24546	FP32-3-250-1202-J
A11R32	0767-0009		RESISTOR-FXD 12K 5% 3W MO TUBULAR	24546	FP32-3-250-1202-J
A11R33	0684-3321	2	RESISTOR-FXD 3.3K 10% .25W CC TUBULAR	01121	CB3321
A11R34	0684-3321		RESISTOR-FXD 3.3K 10% .25W CC TUBULAR	01121	CB3321
A11R35	0811-2729	1	RESISTOR-FXD 5K 3% 3W PW TUBULAR	00213	1200S
A11V1	1940-0013	1	TUBE, ELCTRN, Z82R7, DIODE, V RGLTR	74276	Z82R7
A11VR1	1902-0175	2	DIODE; ZENER; 100V VZ; 1W MAX PD	04713	SZ-11213-428
A11VR2	1902-0049	1	DIODE; ZENER; 6.19V VZ; .4W MAX PD	28480	1902-0049
A11VR3	1902-0065	1	DIODE; ZENER; 46.4V VZ; .4W MAX PD	04713	SZ 10939-373
A11VR4	1902-3393		DIODE; ZENER; 75V VZ; .4W MAX PD	04713	SZ 10939-434
A11VR5	1902-0033	1	DIODE; ZENER; 6.2V VZ; .25W MAX PD	03877	1N823
A11VR6	1902-3256		DIODE ZENER 23.7VZ	28480	1902-3256
A12	01310-66526	1	HIGH VOLTAGE RECTIFIER BOARD	28480	01310-66526
A12C1	C180-0094	1	CAPACITOR-FXD; 100UF+75-10% 25VDC AL	56289	30D107G025DD2
A12C2	0160-0678	3	CAPACITOR-FXD .01UF+-20% 6000WVDC	84411	HEW-337
A12C3	C160-0678		CAPACITOR-FXD .01UF+-20% 6000WVDC	84411	HEW-337
A12C4	016C-3960		CAPACITOR-FXD .001UF+-20% 8000WVDC	84411	HEW337
A12C5	016C-3960		CAPACITOR-FXD .001UF+-20% 8000WVDC	84411	HEW337
A12C6	016C-0678		CAPACITOR-FXD .01UF+-20% 6000WVDC	84411	HEW-337
A12C7	016C-2264	2	CAPACITOR-FXD 20PF+-5% 500WVDC	28480	0160-2264
A12C8	0160-0543	2	CAPACITOR-FXD .0047UF+-20% 4000WVDC	84411	HEW-337
A12C9	0160-0543		CAPACITOR-FXD .0047UF+-20% 4000WVDC	84411	HEW-337
A12C10	C160-2264		CAPACITOR-FXD 20PF+-5% 500WVDC	28480	0160-2264
A12C11	0160-3448	1	CAPACITOR-FXD .001UF+-10% 1000WVDC	28480	0160-3448
A12C12	C180-0289	2	CAPACITOR-FXD; 1UF+75-10% 150VDC AL	56289	30D105G150BA2
A12CR1	1901-0652	1	DIODE:SILICON 12KV PIV 10MA	28480	1901-0652
A12CR2	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A12CR3	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A12CR4	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A12CR5	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A12CR6	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A12CR7	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A12CR8	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A12CR9	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A12R1	0757-C747		RESISTOR-FXD 5.11K 1% .25W F TUBULAR	24546	C5-1/4-T0-5111-F
A12R2	C698-7182	1	RESISTOR-FXD 30M 1% 2W F TUBULAR	03888	PME80-2-T0-3005-F
A12R3	0684-1021		RESISTOR-FXD 1K 10% .25W CC TUBULAR	01121	CB1021
A12R4	C687-1061	2	RESISTOR-FXD 10M 10% .5W CC TUBULAR	01121	EB1061
A12R5	0687-3941	2	RESISTOR-FXD 390K 10% .5W CC TUBULAR	01121	EB3941
A12R6	2100-3148	1	RESISTOR, VAR, TRMR, 2MOHM 20% MG	28480	2100-3148

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
A12R7	C836-0006	1	RESISTOR-FXD 20M 10% 1W CF TUBULAR	77764	BAKW
A12R8	0684-1031		RESISTOR-FXD 10K 10% .25W CC TUBULAR	01121	CB1031
A12R9	C687-1061		RESISTOR-FXD 10M 10% .5W CC TUBULAR	01121	EB1061
A12R10	C687-3941		RESISTOR-FXD 390K 10% .5W CC TUBULAR	01121	EB3941
A12R11	0684-1021		RESISTOR-FXD 1K 10% .25W CC TUBULAR	01121	CB1021
A12R12	0683-1555	1	RESISTOR-FXD 1.5M 5% .25W CC TUBULAR	01121	CB1555
A12RT1	C837-0105	2	THERMISTOR, 200K OHM 10%	28480	0837-0105
A12RT2	C837-0105		THERMISTOR, 200K OHM 10%	28480	0837-0105
A12T1	01310-61104	1	TRANSFORMER ASSY:HIGH VOLTAGE	28480	01310-61104
A12VR1	1902-0668	5	DIODE; ZENER; 200V VZ; 1W MAX PD	04713	SZ 11213-449
A12VR2	1902-0668		DIODE; ZENER; 200V VZ; 1W MAX PD	04713	SZ 11213-449
A12VR3	1902-0668		DIODE; ZENER; 200V VZ; 1W MAX PD	04713	SZ 11213-449
A12VR4	1902-0668		DIODE; ZENER; 200V VZ; 1W MAX PD	04713	SZ 11213-449
A12VR5	1902-0668		DIODE; ZENER; 200V VZ; 1W MAX PD	04713	SZ 11213-449
A12VR6	1902-0175		DIODE; ZENER; 100V VZ; 1W MAX PD	04713	SZ-11213-428
A12VR7	1902-3381	2	DIODE; ZENER; 68.1V VZ; .4W MAX PD	04713	SZ 10939-422
A12VR8	1902-3381		DIODE; ZENER; 68.1V VZ; .4W MAX PD	04713	SZ 10939-422
A13	01310-66517	1	HIGH VOLTAGE REGULATOR BOARD	28480	01310-66517
A13C1	0160-0174		CAPACITOR-FXD .47UF+80-20% 25WVDC	28480	0160-0174
A13C2	C16C-3453		CAPACITOR-FXD .05UF+80-20% 100WVDC	28480	0160-3453
A13C3	C16C-0380	1	CAPACITOR-FXD .22UF+-10% 200WVDC	84411	HEW238T
A13C4	0160-3453		CAPACITOR-FXD .05UF+80-20% 100WVDC	28480	0160-3453
A13C5	C16C-0166	1	CAPACITOR-FXD .068UF+-10% 200WVDC	56289	292P68392
A13C6			NOT ASSIGNED		
A13C7	0180-0269		CAPACITOR-FXD; 1UF+75-10% 150VDC AL	56289	30D105G150BA2
A13CR1	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A13CR2	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A13CR3	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A13CR4	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A13CR5	1901-0040		DIODE; SWITCHING; SI; 30V MAX VRM 50MA	28480	1901-0040
A13CR6	1901-0045		DIODE; PWR RECT; SI; 100V MAX VRM 750MA	28480	1901-0045
A13CR7	1901-0028		DIODE; PWR RECT; SI; 400V MAX VRM 750MA	04713	SR1358-9
A13F1	2110-0007	1	FUSE; 1A 250V SLO-BLO	71400	MDL-1
A13J1	1251-2965	1	CONNECTOR, PC EDGE, 10-CONT, RTANG DP	26742	92-6010-5800-00
A13L1	9140-0138	1	COIL; FXD; MOLDED RF CHOKE; 180UH 5%	24226	15/183
A13MP1	1205-0242	1	HEAT-DISSIPATOR, SGL, TO-3 PKG	28480	1205-0242
A13Q1	1854-0023	1	TRANSISTOR NPN SI PD=360MW FT=15MHZ	28480	1854-0023
A13Q2	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A13Q3	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A13Q4	1854-0063	3	TRANSISTOR NPN 2N3055 SI PD=115W	28480	1854-0063
A13Q5	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A13R1	0757-0156	1	RESISTOR-FXD 1.5M 1% .5W F TUBULAR	30983	MF7C1/2-T0-1504-F
A13R2	2100-2650	1	RESISTOR, VAR, TRMR, 200KOHM 10% C	28480	2100-2650
A13R3	C757-0280		RESISTOR-FXD 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A13R4	0757-0442		RESISTOR-FXD 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A13R5	C757-0446		RESISTOR-FXD 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F
A13R6	0757-0440		RESISTOR-FXD 7.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-7501-F
A13R7	0757-0178	1	RESISTOR-FXD 100 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-101-F
A13R8	0757-0458		RESISTOR-FXD 51.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-5112-F
A13R9	C687-2711	1	RESISTOR-FXD 270 OHM 10% .5W CC TUBULAR	01121	EB2711
A13R10	0757-0438		RESISTOR-FXD 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A13R11	0757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A13R12	C757-0458		RESISTOR-FXD 51.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-5112-F
A13R13	C757-0401		RESISTOR-FXD 100 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-101-F
A13R14	0757-0352		RESISTOR-FXD 150K 1% .5W F TUBULAR	30983	MF7C1/2-T0-1503-F
A13R15	0757-0283		RESISTOR-FXD 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A13R16	2100-2031	1	RESISTOR, VAR, TRMR, 50KOHM 10% C	28480	2100-2031
A13V1	2140-0008		LAMP, GLOW, BULB T-2, 59V	71744	A1A (NE-2)
A13VR1	1902-3357	1	DIODE; ZENER; 56.2V VZ; .4W MAX PD	04713	SZ 10939-398
A13XF1	2110-0269		FUSEHOLDER; CLIP TYPE	28480	2110-0269
A14	01310-61103	1	BOARD ASSY:HIGH VOLTAGE OCTUPLER	28480	01310-61103

Table 6-3. Manufacturers' Code

MRF NO.	MANUFACTURE NAME	ADDRESS	ZIP CODE
	NO M/F DESCRIPTION FOR THIS MFG NUMBER		
FR003	SOVCOR ELECTRONIQUE	LE VESINET FRANCE	
00014	NO M/F DESCRIPTION FOR THIS MFG NUMBER		
00213	SAGE ELECTRONICS CORP	ROCHESTER NY	14610
01121	ALLEN BRADLEY CO	MILWAUKEE WI	53212
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE NJ	08876
03877	TRANSITRON ELECTRONIC CORP	WAKEFIELD MA	01880
03888	PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94040
13103	THERMALLOY CO	DALLAS TX	75247
14941	WARD LEONARD HAGERSTOWN DIV	HAGERSTOWN MD	21740
16299	CORNING GL WK ELEC CMPNT DIV	RALEIGH NC	27604
19701	MEPCO/ELECTRA CORP (ME RES)	MINERAL WELLS TX	76067
24226	GOWANDA ELECTRONICS CORP	GOWANDA NY	14070
24546	CORNING GLASS WORKS (C STYLE RES)	BRADFORD PA	16701
24655	ENVIRONMENTAL CNTNR SYS(CRATE-RITE)	PALO ALTO CA	94304
26365	GRIES REPRODUCER CORP	NEW ROCHELLE NY	10802
26742	METHODE ELECTRONICS INC	CHICAGO IL	60656
27191	CUTLER-HAMMER INC POWER DISTR CONT	MILWAUKEE WI	53216
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
30983	MEPCO/ELECTRA CORP (VAR RES)	SAN DIEGO CA	92121
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	63017
71744	CHICAGO MINIATURE LAMP WORKS	CHICAGO IL	60640
72136	ELECTRO MOTIVE MFG CO INC	WILLIMANTIC CT	06226
72765	DRAKE MFG CO	HARWOOD HEIGHTS IL	60656
72982	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE PA	16512
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
74276	SIGNALITE INC	NEPTUNE NJ	07753
75915	LITTELFUSE INC	DES PLAINES IL	60016
76530	TRW ELEK CMPNT CINCH-MONADNOCK DIV	CITY OF INDUSTRY CA	91747
77764	RESISTANCE PRODUCTS CO	HARRISBURG PA	17104
78553	TINNERMAN PRODUCTS INC	CLEVELAND OH	44129
79727	C-W INDUSTRIES	WARMINSTER PA	18974
82209	NO M/F DESCRIPTION FOR THIS MFG NUMBER		
84411	TRW CAPACITOR DIV	OGALLALA NE	69153
90849	AMPHENOL SALES DIV OF BUNKER-RAMO	HAZELWOOD MO	63042
94222	SOUTHCO INC	LESTER PA	19113
98291	SEALECTRO CORP	MAMARONECK NY	10544

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. Description of special options and standard options are also in this section.

7-3. MANUAL CHANGES.

7-4. This manual applies directly to instruments having the same serial prefix shown on the manual title page. If the serial prefix of the 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 that are listed for that serial prefix. When making changes listed in table 7-1, make the change with the highest number first. Example: if backdating changes 1, 2, and 3 are required for your serial prefix, do change 3 first, then change 2, and finally change 1. If the serial prefix of the instrument is not listed either in the title page or in table 7-1, refer to the enclosed replacement pages in the front of this manual.

Table 7-1. Manual Changes

Serial Prefix	Make Changes
1406A	3, 2, 1
1510A	3, 2
1542A	3

7-5. STANDARD OPTIONS.

7-6. 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. Table 7-2 lists the Model 1317A standard options.

7-7. INSTRUMENT IMPROVEMENT MODIFICATIONS.

7-8. The following modifications may be easily installed by the customer to adapt the Model 1317A for a wide variety of applications. Single-ended or differential X- and Y-axis amplifiers and attenuators for X-, Y-, and Z-axis amplifiers are briefly described in the following paragraphs. Refer to HP Application Note 166 (included with the instrument) for a full discussion and installation instructions before making any modifications. Figures 7-2 through 7-5 are for use with Application Note 166.

NOTE

Modifications are not the same as changes required to make this manual apply directly to the instrument as it left the factory.

7-9. SINGLE-ENDED OR DIFFERENTIAL X-AXIS AND Y-AXIS AMPLIFIERS. The 1317A is configured with X-axis and Y-axis amplifiers operating differentially. However, these amplifiers may be modified to any configuration from single-ended (with shield grounded), to fully differential with balanced impedance and voltage sensitivity, or anything in between.

7-10. X-AXIS, Y-AXIS AND Z-AXIS ATTENUATORS. The 1317A provides full-scale X-axis and Y-axis deflection when a 1 V peak-to-peak signal is applied to either input. A front-panel GAIN control for each axis reduces sensitivity to 1.75 V peak-to-peak for full screen deflection. Attenuators may be added to provide full-scale deflection for any required voltage >1 V on either axis. Regardless of signal input attenuation, range of the GAIN control is constant at a ratio of 1.75:1. The Z-axis attenuator may be modified to accommodate Z-axis input voltages greater than 2.5 V, or to allow an increased range of the Z-axis Balance adjustment (referenced to the input signal level). Internal Z-axis Gain adjustment range remains constant at a ratio of 2.5:1 regardless of input signal attenuation.

CHANGE 1

Table 6-2,

Add: DS1: HP Part No. 1450-0419; LIGHT, IND, NEON, WHT TL LENS; Mfr Code 72765; Mfr Part No. 599-237-WHITE.

MP13: Change HP Part No. and Mfr Part No. to 01317-00101.

MP14: Change HP Part No. and Mfr Part No. to 01317-00204.

MP18: Change HP Part No. and Mfr Part No. to 01321-04104.

Add: MP18 OPTION 050 through MP18 OPTION 054: HP Part No. 01317-04107; Qty 1; PLATE: INPUT RIGHT; Mfr Code 28480; Mfr Part No. 01317-04107.

MP36 OPTION 055: Change to HP Part No. 1490-0922; Qty 2; RACK SLIDES; Mfr Code 28480; Mfr Part No. 1490-0922.

Table 7-2. Standard Options

Option	Description
005	Form fitting neutral density (smoke gray) contrast filter with antiglare coating to improve trace contrast for easier viewing in bright lighting.
006	Form fitting blue contrast filter with antiglare coating.
008	Designed to meet UL listing requirements for medical and dental equipment. Includes a special input power cord (HP Part No. 8120-1992) and the special contrast filter which is Option 005.
050	TTL blanking input. High state (+2.5 V to +5 V) blanks any analog Z-input. Low level (0.0 V to 0.8 V) returns blanking to analog Z-axis input.
051	Differential inputs to X, Y, and Z amplifiers. Inputs for each axis are through separate BNC connectors (shield grounded).
052	Four bit binary Z-axis input provides 16 levels of gray (TTL compatible). Settling time ≤300 ns. See schematic 7 for optional components. With pins 4, 5, 6, and 7 of J5 open, display is fully unblanked. With pins 4, 5, 6, and 7 of J5 shorted to ground, display brightness is minimum. Adjust Option 052 circuitry as follows: a. Disconnect all inputs to J5. b. Apply fully-unblanking voltage to J3 and position beam off screen to avoid burning CRT screen. c. Monitor dc voltage at A5TP1. d. Adjust A5R20 for +60 V at A5TP1. e. Short pins 4, 5, 6, and 7 of J5 to ground. f. Adjust A5R71 for +12 V at A5TP1. To make signal connections to J5, the following three components are recommended: Mating Connector, HP Part No. 1251-0063, Mfr Code 71785, Mfr Part No. DBM-25P. Hood for Mating Connector, HP Part No. 1251-0392, Mfr Code 71785, Mfr Part No. DB-51212-1. Retainer, Mating Connector, HP Part No. 1251-1042, Mfr Code 71468, Mfr Part No. DB-51221-1.
053	Light output varies linearly (±20%) with linear change in Z-axis drive (Gamma correction).
054	TTL blanking input. Low state (0.0 V to +0.8 V) blanks any analog input. High stage (+25 V to +5 V) returns blanking to analog Z-axis input.
055	Fixed slides for use in EIA standard 19 inch rack.
604	P4 phosphor, aluminized, open graticule CRT in lieu of P31.
607	P7 phosphor, aluminized, open graticule CRT in lieu of P31. Includes amber contrast filter with antiglare coating.
639	P39 phosphor aluminized, open graticule CRT in lieu of P31. HP Part No. 5083-4572.
905	2-1/2-foot power cord for use in rack-mount installations (HP Part No. 8120-1625). Conforms to standard CEE 22-V1.

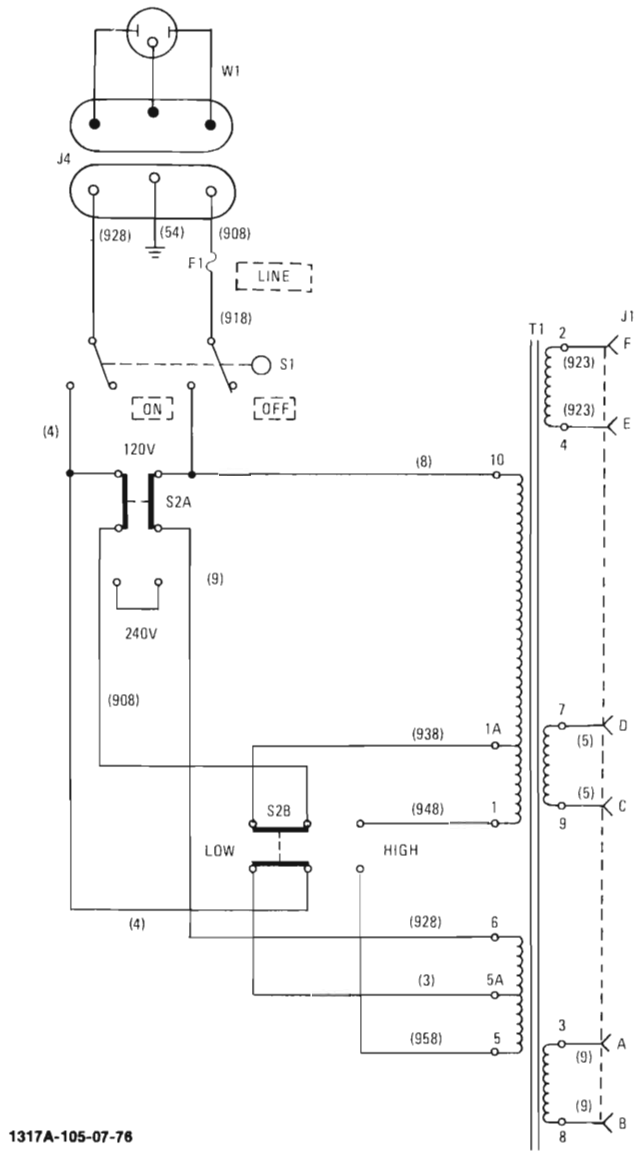
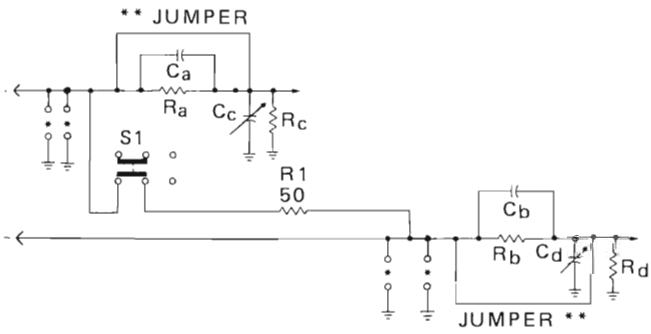


Figure 7-1. Revised Input Power Circuit



* Resistor mounting pads to permit changing input Z when added attenuator components are used.

** REMOVE JUMPER(S) WHEN ADDING ATTENUATION

1310A/11A-002

Figure 7-2. Amplifier Input Circuits

CHANGE 1 (Cont'd)

Delete: MP41.

Add: R1: HP Part No. 0684-4731; R:FXD COMP 47K 10% Mfr Code 28480; Mfr Part No. 0684-4731.

Schematic 10,

Replace the power input portion of this schematic with figure 7-1.

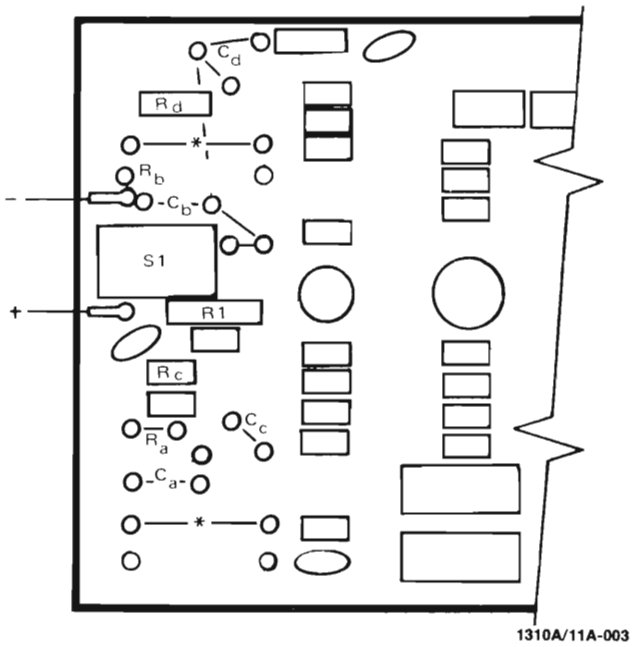


Figure 7-3. Attenuator Components Locator

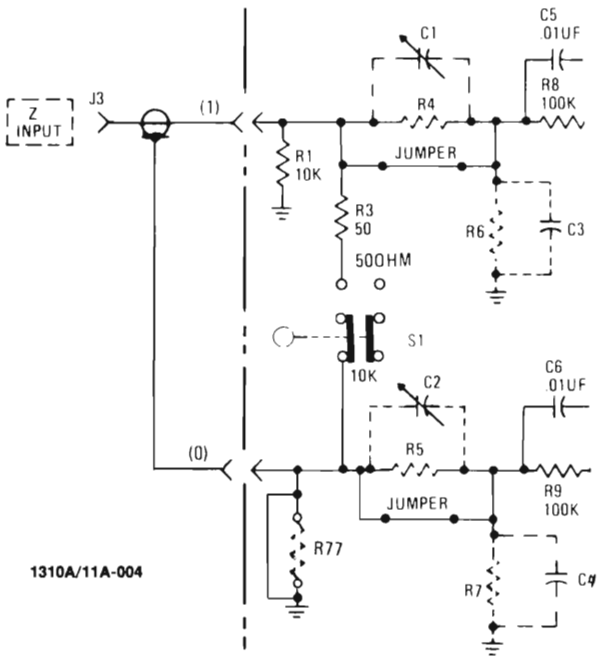


Figure 7-4. Z-axis Amplifier

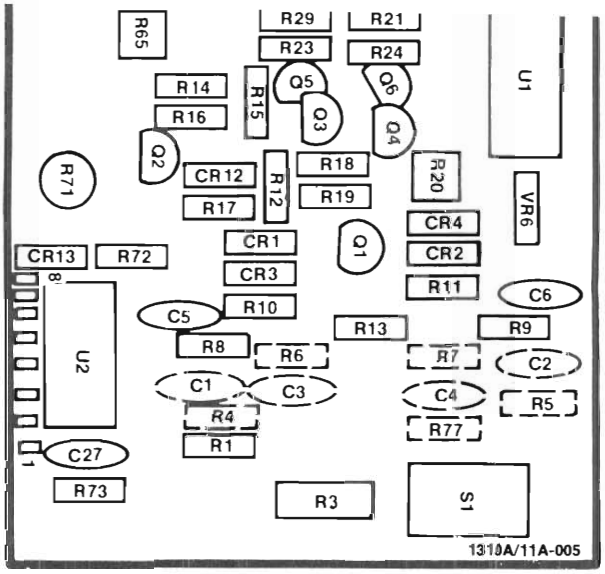


Figure 7-5. Z-axis Component Locator

CHANGE 2

Table 6-2,

MP23: Change HP Part No. and Mfr Part No. to 01317-04111.

MP26: Change to HP Part No. 01317-24702; Qty 2; SUPPORT: SIDE HORIZ; Mfr Code 28480, Mfr Part No. 01317-24702.

MP45: Change HP Part No. and Mfr Part No. to 01317-24707.

CHANGE 3

Table 6-2,

Add: MP21, HP Part No. 01317-20201, Qty 1, SUB PANEL: FRONT, Mfr Code 28480, Mfr Part No. 01317-20201.

Add: MP25, HP Part No. 01317-24701, Qty 1, SUPPORT: FRONT HORIZ TOP, Mfr Code 28480, Mfr Part No. 01317-24701.

Add: MP26, HP Part No. 01317-24702, Qty 2, SUPPORT: SIDE HORIZ, Mfr Code 28480, Mfr Part No. 01317-24702.

Add: MP27, HP Part No. 01317-24703, Qty 1, SUPPORT: FRONT VERT LEFT, Mfr Code 28480, Mfr Part No. 01317-24703.

Add: MP28, HP Part No. 01317-24704, Qty 1, SUPPORT: FRONT VERT RIGHT, Mfr Code 28480, Mfr Part No. 01317-24704.

Add: MP34, HP Part No. 01317-60301, Qty 1, DOOR ASSY, Mfr Code 28480, Mfr Part No. 01317-60301.

Delete: MP36.

SECTION VIII

SCHEMATICS AND TROUBLESHOOTING

8-1. INTRODUCTION.

8-2. This section contains schematics, repair and relacement information, component locator illustrations, and troubleshooting information. Table 8-1 defines symbols used on the schematics.

8-3. SCHEMATICS.

8-4. Schematics are printed on foldout 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. Non MIL-standard symbols and conventions used in the schematics are defined in table 8-1.

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 the schematics. At each circuit breaking point, a number in a circle is shown, followed by another number in bold type. The circled number indicates the signal or circuit and the bold number indicates the associated schematic that contains the source or destination of the signal. To find the source or destination of the signal, turn to the indicated schematic and find the circled number in question.

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

8-7. All components within the inclosed areas of the schematic (refer to the first illustration on table 8-1) are physically located on etched circuit board Components not physically located on etched circuit boards are shown in the uninclosed 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 a number. This letter-number combination is the basic reference designation. Components which are part of an assembly have, in addition to the basic designation, a prefix designation indicating the assembly of which the component is a part. For instance 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.

8-12. COMPONENT LOCATIONS.

8-13. Locations of components on assemblies and subassemblies are illustrated adjacent to the schematics. Since the schematics are drawn to shown function, portions of a particular assembly may appear on several different schematics. The component-location illustration is printed next to the schematic that shows most of the circuitry on the assembly. In some cases, a particular component-location illustration may appear adjacent to more than one schematic.

8-14. The locations of all adjustments are shown in Section V.

8-15. PREVENTIVE MAINTENANCE.

8-16. Preventive maintenance consists of periodic performance checks, calibration, mechanical inspection, cleaning, and other services designed to prevent breakdown and failure. Performance checks and calibration are covered in Section V of this manual. The other preventive maintenance services are covered in the following paragraphs.

8-17. MECHANICAL INSPECTION.

8-18. Periodically inspect the instrument for damaged components, excess grease, dirt, and corrosion. Look for loose and misaligned assemblies. Ensure that all screws and fasteners are tight and serviceable.

8-19. CLEANING.

8-20. Painted, glass, and plastic surfaces can be cleaned with a spray-type, window cleaner or with a mild soap and water solution. Excess grease can be removed with a degreaser such as M-180 FREON TF DEGREASER produced my Miller-Stevenson Company. Use alcohol to clean plastic CRT Filters.

8-21. Corroded spots are best removed with soap and water. Stubborn residue can be removed with a fine abrasive. When using abrasives be careful that fine particles do not fall into the instrument. The cleaned spots can be protected from further corrosion by an application of a silicone resin such as GE DRIFILM 88.

8-22. ETCHED CIRCUIT BOARDS.

8-23. The following paragraphs provide servicing procedures for etched circuit boards.

8-24. BOARD CONNECTIONS.

8-25. Single-pin connectors on circuit boards are identified by the color code of the connecting wire. Connector pins on plugs and jacks are identified by a numeral or a letter. The letters G, I, O, and Q are not used. Table 8-1 shows the type of board connections used in the instrument.

8-26. SWITCH MAINTENANCE.

8-27. The slide switches used on the etched circuit boards have been designed for long, trouble-free service. Should one of these switches become defective, replacement rather than repair is recommended.

8-28. HEAT SINKS.

8-29. The heat sinks used on the instrument are all of the friction type. They can be removed by carefully pulling them off. When reinstalling, support the bottom of the transistor while pushing the heat sink on. Transistor damage may result if the transistor leads are bent.

8-30. SERVICING ETCHED CIRCUIT BOARDS.

8-31. The etched circuit boards in the instrument have plated-through component holes. This permits components to be removed by unsoldering 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 lift the part from the board. HP Service Note M-20E contains additional information on repair of etched circuit boards.

8-32. SEMICONDUCTOR REPLACEMENT.

8-33. Figure 8-1 is included to help identify the leads of common sizes and shapes of semiconductor devices. When removing a semiconductor, use long-nosed pliers as a heat sink between the device and the soldering iron. When installing a semiconductor, ensure sufficient lead length to dissipate the soldering heat by using the same length of exposed lead as used for the original part.

3-34. TROUBLESHOOTING.

8-35. The most important prerequisite for successful troubleshooting is understanding how the instrument is designed to operate and correct use of front-panel controls. Suspected malfunctions may be caused by improper control settings or circuit connections. Before doing the test and/or troubleshooting procedures, read Section III (Operation) for an explanation of controls and connectors and general operating considerations, and Section IV (Principles of Operation) for an explanation of circuit theory.

8-36. If trouble is suspected, visually inspect the instrument. Look for loose or burned components that might suggest a source of trouble. Check to see that all circuit board connections are making good contact. If no obvious trouble is found, check the power supply voltages in the unit. Prior to any extensive troubleshooting, check the external power sources also.

8-37. TROUBLESHOOTING THE LOW VOLTAGE POWER SUPPLY.

8-38. If the supply is completely inoperative, inspect the line fuse located on the rear of the instrument. If the line fuse is open, the power lamps will not be lighted. Check input voltage source for proper voltage.

8-39. The voltage from each secondary winding of input transformer T1 is rectified by a full-wave bridge rectifier and filtered by a capacitor (the +250V supply is filtered by two capacitors). In the event of diode failure, the supply voltage will vary considerably from the design value and filtering will be severely affected. Loss of a filter capacitor will affect the voltage and result in excess ripple at the series regulator input.

8-40. Fuses and adjustments for the dc voltages are located on the low voltage power supply board, A11. The fuses are connected in series with the regulator transistors. In case a fuse is open, check the series regulator and driver transistors.

8-41. No Output Voltage. No output voltage may be the result of an open fuse, open series regulator transistor, or loss of the +250V reference voltage. When all supplies are inoperative, check the +250V power supply first. Output from this supply is required for the +15V supply. Output from the +15V supply is required for the —15V supply.

8-42. Voltage Too High. Too high a voltage may be caused by a shorted series regulator transistor, shorted driver transistor, +250V reference voltage out of regulation, or a defective sensor amplifier. If the ±15V supplies are low, check the output of the +250V supply.

8-43. Voltage Too Low. Adjust the +250V supply (A11R12) while measuring the output of the supply. If proper adjustment cannot be made, check the resistor divider network, A11R11, A11R12, and A11R13 for proper values. Check for low input line voltage.

8-44. TROUBLESHOOTING THE HIGH VOLTAGE POWER SUPPLY.

WARNING

Contact with the high voltage power supply voltage can result in injury or death.

8-45. Malfunction of the high voltage power supply will usually result in loss of beam spot or unstable intensity. Troubleshooting may be accomplished by resistance checks of the high voltage oscillator, high voltage transformer, and regulator circuits. In the event of complete failure, check fuse A13F1. If fuse is all right, check —15V supply. Failure of the —15V supply will turn off high voltage oscillator A13Q4. In the event of octupler failure, replace the assembly.

8-46. TROUBLESHOOTING X-, Y-, Z-AXIS AMPLIFIERS.

8-47. The X-axis and Y-axis amplifiers are identical. When trouble develops in either the X-axis circuit or Y-axis circuit (not both), the quickest way to isolate the problem to a board assembly is by substitution. Interchange board assembly A1 with board assembly A3. If trouble still exists, interchange board assembly A2 with board assembly, A4. This procedure should isolate the problem to a particular board assembly.

8-48. Trouble in the X-axis and Y-axis amplifier circuits will usually result in an unbalanced condition. The spot will usually shift from the center of the CRT and, in some instances, may leave the viewing area completely. Troubleshooting the differential stages may be done by clamping the stages within a differential amplifier together. The following steps describe this method.

CAUTION

When clamping the bases of the differential amplifier stages together do not allow the jumper wire to contact the chassis or other components. Damage to the equipment may result.

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

b. Turn instrument off while making connection.

c. For example, connect jumper between bases of A1Q11 and A1Q12 (see schematic 2). Connection between bases may be made at base side of A1R77 and base side of A1R81.

d. With jumper in place, turn instrument on. If beam spot returns to center of CRT, A1Q11 and A1Q12, along with output amplifier assembly, A2, are functioning properly. The trouble is back toward input circuit.

e. By selecting differential stages, either toward input or toward output, faulty stage can be isolated. Using voltage and resistance measurements, faulty component should be easily identified.

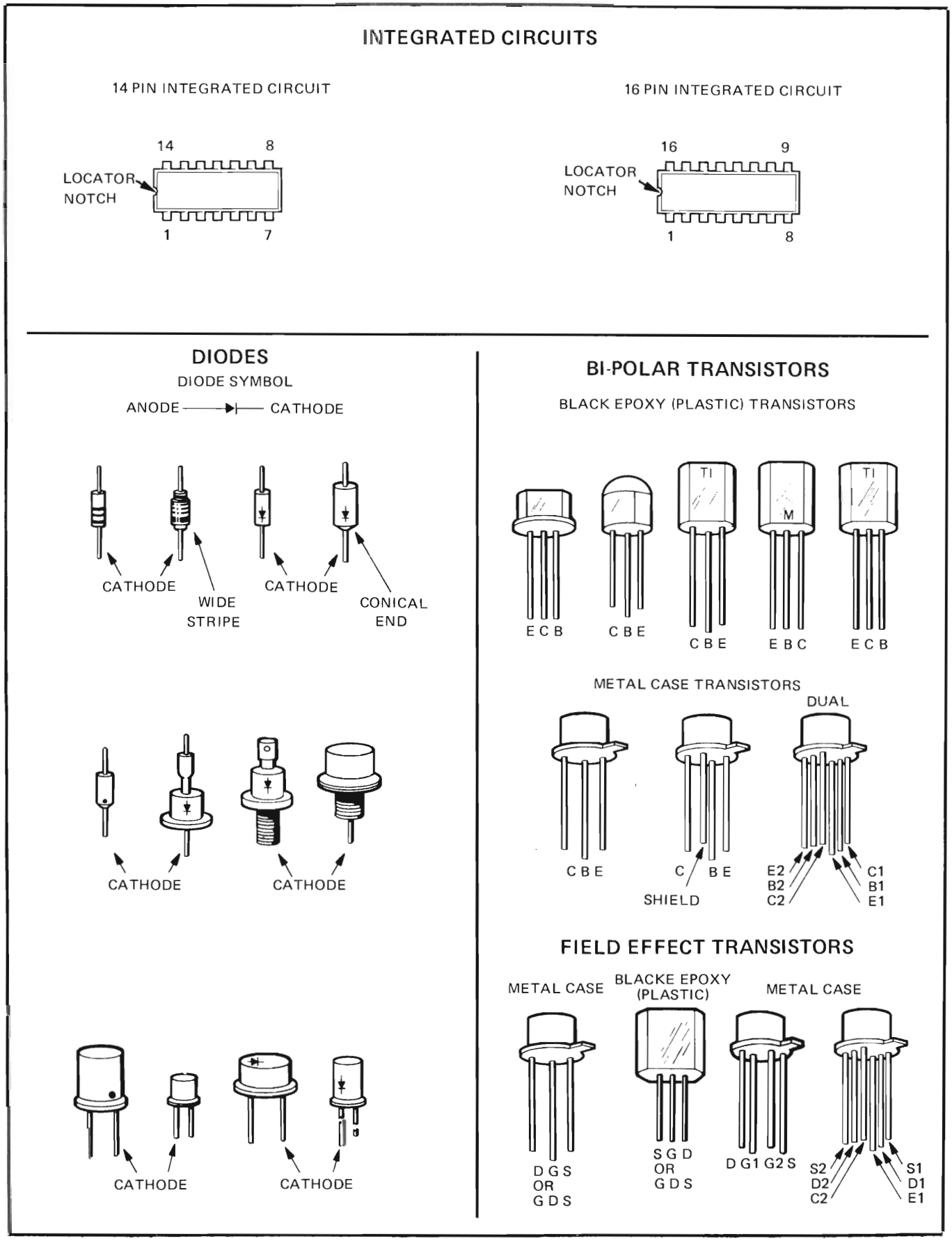


Figure 8-1. Semiconductor Terminal Identification

Table 8-1. Schematic Notes

Refer to MIL-STD-15-1A and MIL-STD-806 for schematic symbols not listed in this table.

- ETCHED CIRCUIT BOARD
- FRONT-PANEL MARKING
- REAR-PANEL MARKING
- FRONT-PANEL CONTROL
- SCREWDRIVER ADJUSTMENT
- P/O — PART OF
- NC — NO CONNECTION
- CW — CLOCKWISE END OF VARIABLE RESISTOR
- MAIN SIGNAL PATH
- PRIMARY FEEDBACK PATH
- SECONDARY FEEDBACK PATH
- TP1 — MAJOR ELECTRICAL TEST POINT TP (WITH NUMBER)
- 1 — MINOR WAVEFORM TEST POINT (WITH NUMBER)
- SINGLE-PIN CONNECTOR ON BOARD
- A — PIN OF A PLUG-IN BOARD (WITH LETTER OR NUMBER)
- COAXIAL CABLE CONNECTED TO SNAP-ON JACK
- COAXIAL CABLE CONNECTED DIRECTLY TO BOARD

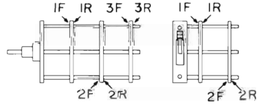
- FIELD-EFFECT TRANSISTOR (P-TYPE BASE)
- FIELD-EFFECT TRANSISTOR (N-TYPE BASE)
- BREAKDOWN DIODE (VOLTAGE REGULATOR)
- TUNNEL DIODE
- STEP-RECOVERY DIODE
- CIRCUITS OR COMPONENTS DRAWN WITH DASHED LINES (PHANTOM) SHOW FUNCTION ONLY AND ARE NOT INTENDED TO BE COMPLETE. THE CIRCUIT OR COMPONENT IS SHOWN IN DETAIL ON ANOTHER SCHEMATIC.

(925) WIRE COLORS ARE GIVEN BY NUMBERS IN PARENTHESIS 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 - GRAY
4 - YELLOW 9 - WHITE

SWITCH WAFERS ARE IDENTIFIED AS FOLLOWS:



* OPTIMUM VALUE SELECTED AT FACTORY; TYPICAL VALUE SHOWN; PART MAY HAVE BEEN OMITTED.

UNLESS OTHERWISE INDICATED:
RESISTANCE IN OHMS
CAPACITANCE IN PICOFARADS
INDUCTANCE IN MICROHENRIES

6 SIGNAL REFERENCE

2 SCHEMATIC REFERENCE

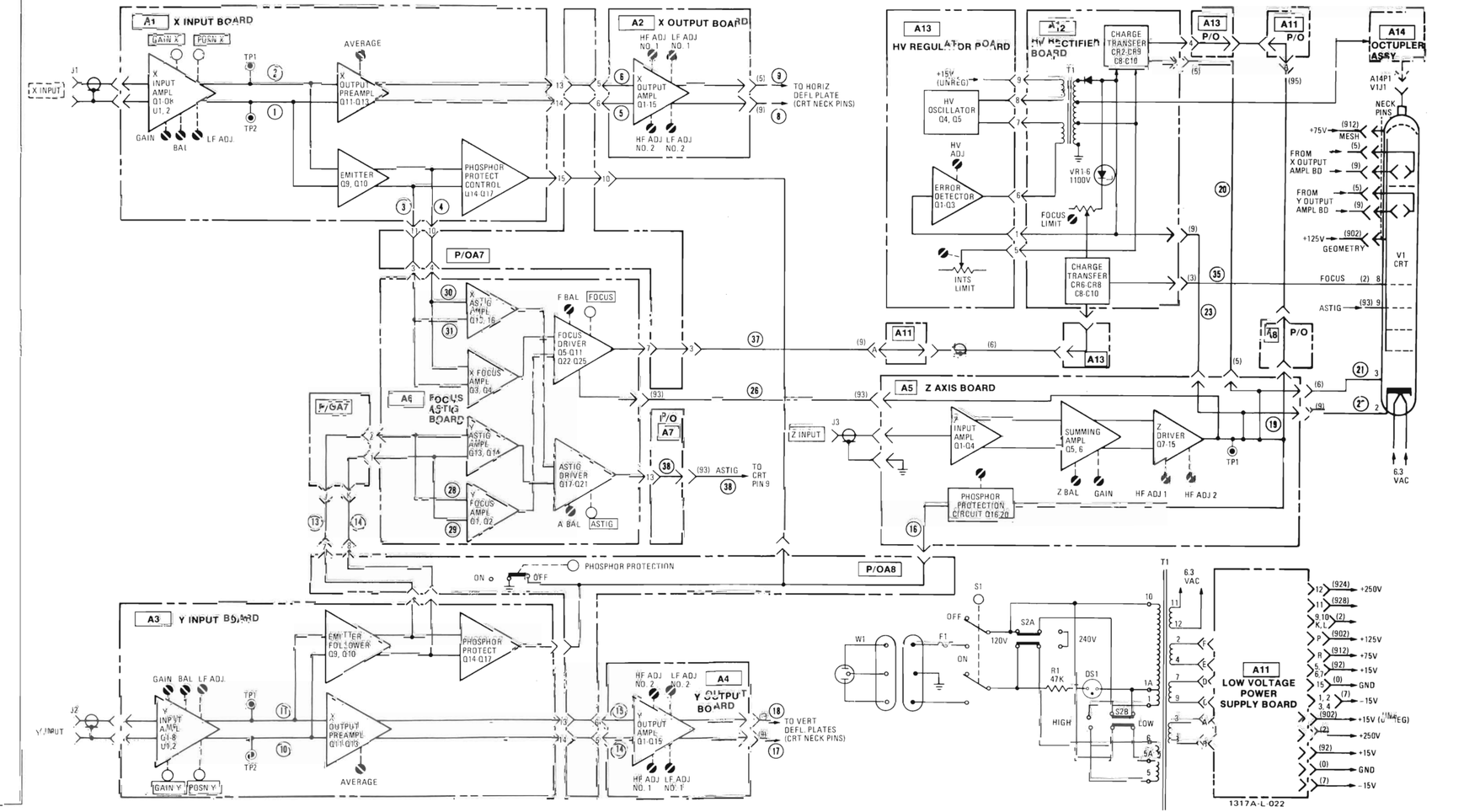
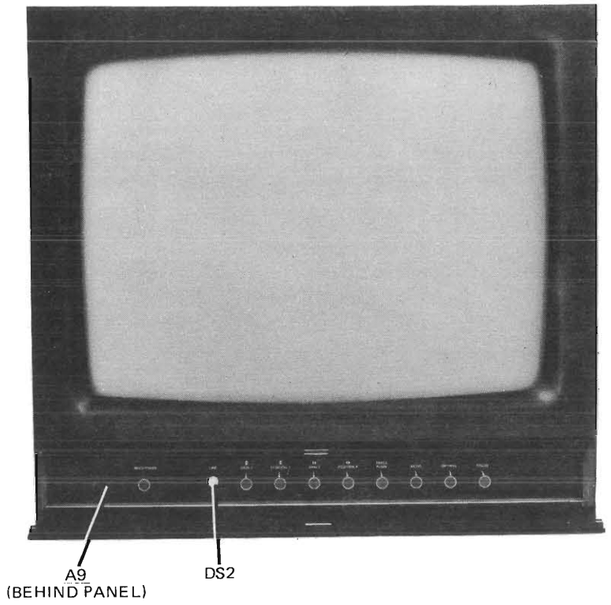
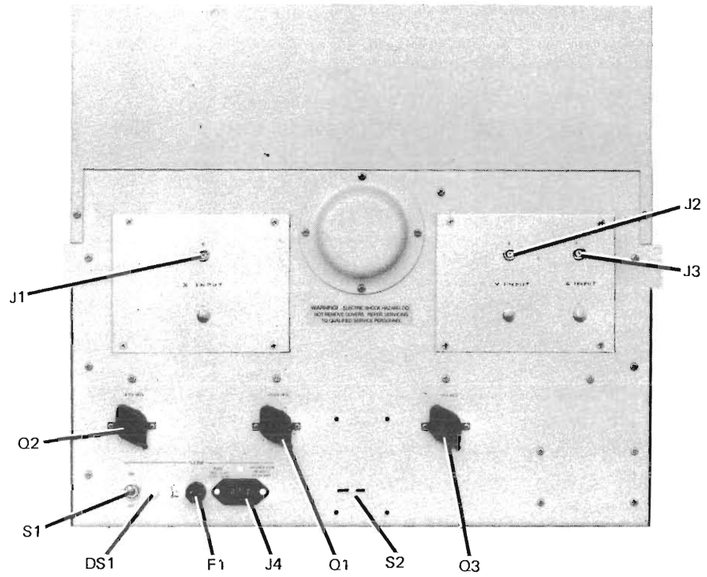
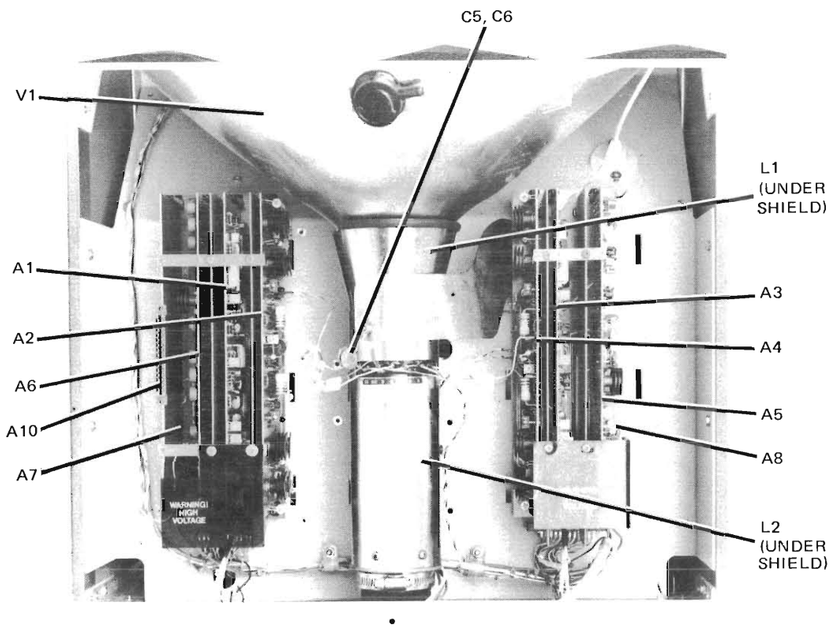
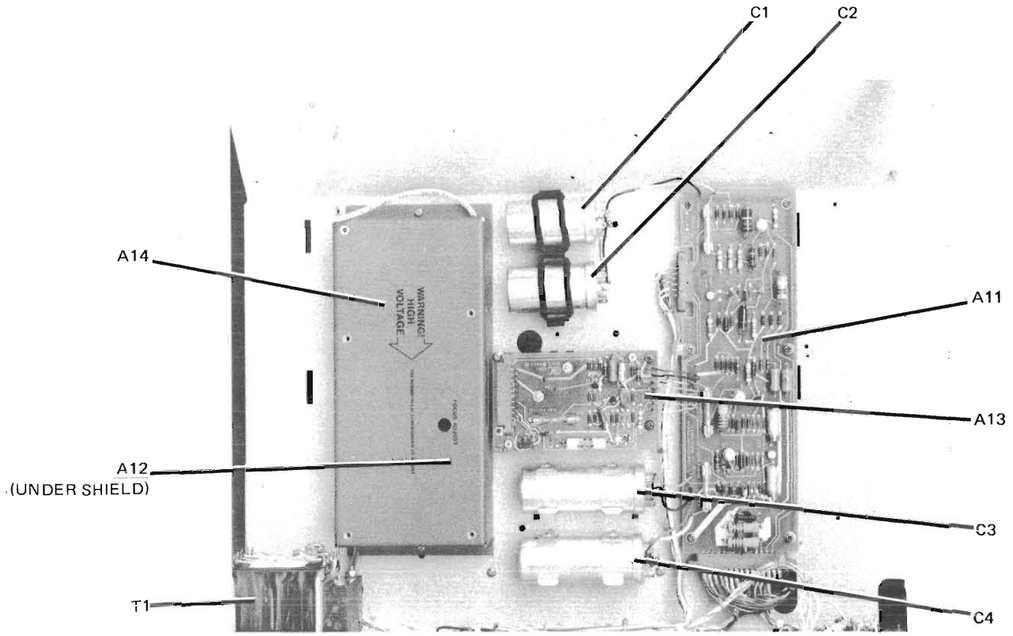


Figure 8-2.
Troubleshooting Block Diagram









1317A-P-006

Figure 8-3. Assembly and Chassis Parts Locator

Table 8-2. X-axis Input Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

   INTENSITY .....+7.0V at Test Point A5TP1

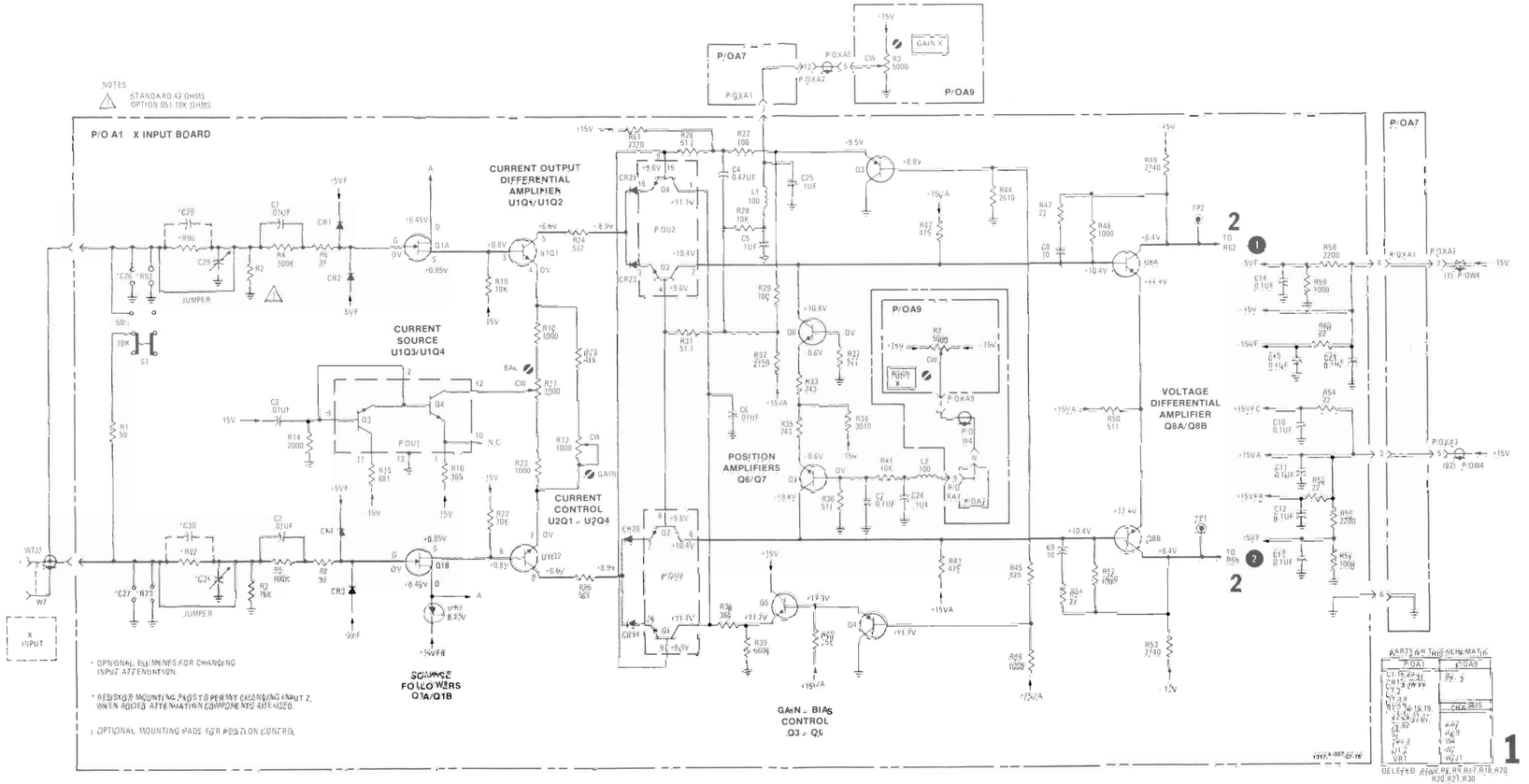
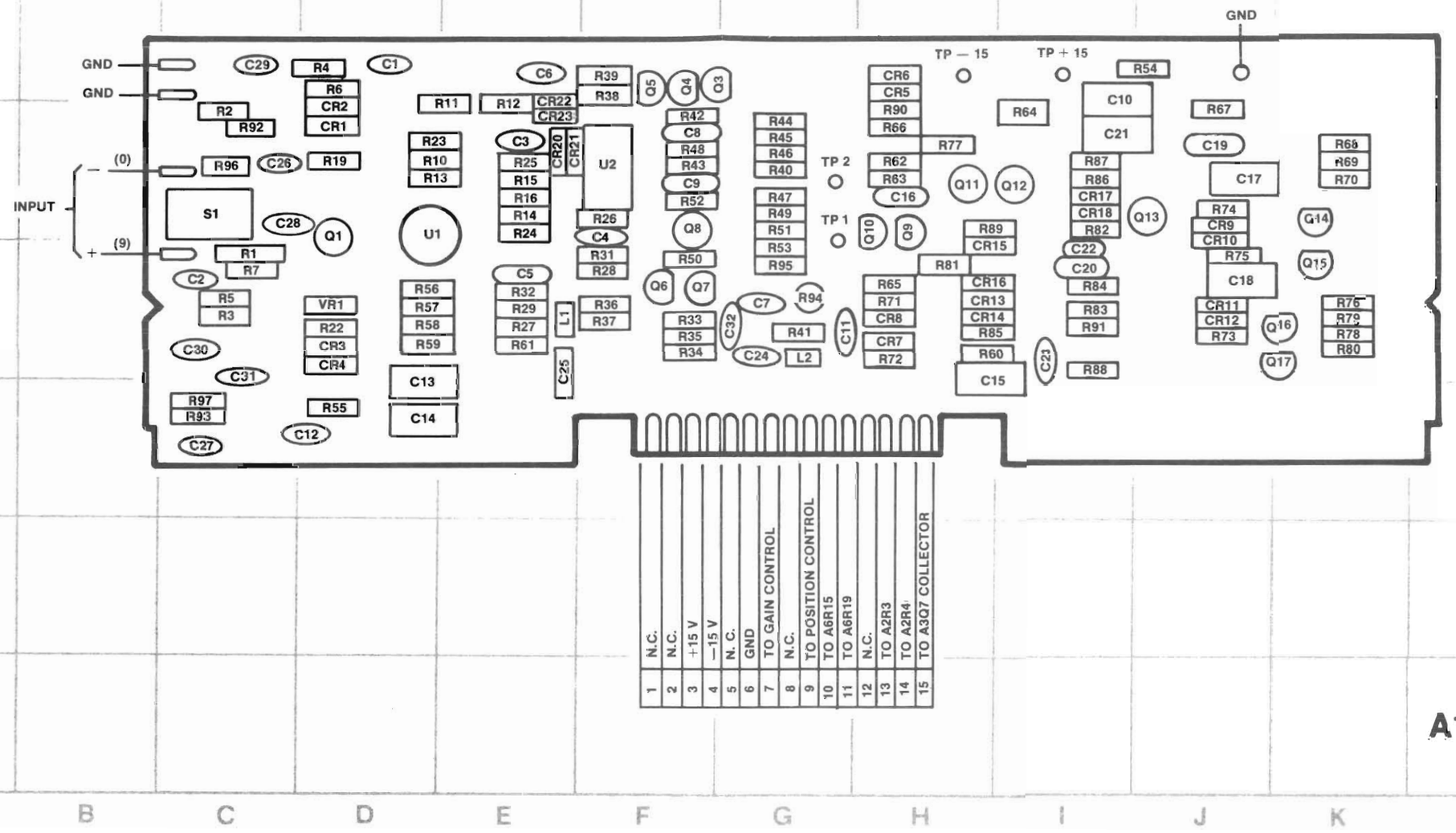


Figure 8-4.
X-axis Input Amplifier Schematic 1



1	N.C.
2	N.C.
3	+15 V
4	—15 V
5	N. C.
6	GND
7	TO GAIN CONTROL
8	N.C.
9	TO POSITION CONTROL
10	TO A6R15
11	TO A6R19
12	N.C.
13	TO A2R3
14	TO A2R4
15	TO A3Q7 COLLECTOR

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	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	D-1	C17	J-2	CR1	D-2	CR17	I-2	Q10	H-2	R11	E-2	R31	F-3	R47	G-2	R63	H-2	R79	K-3	R95	G-3
C2	D-3	C18	J-3	CR2	D-2	CR18	I-2	Q11	H-2	R12	E-2	R32	E-3	R48	F-2	R64	I-2	R80	K-3	R96	C-2
C3	E-2	C19	J-2	CR3	D-3	CR20	E-2	Q12	I-2	R13	D-2	R33	F-3	R49	G-2	R65	H-3	R81	H-3	R97	C-4
C4	F-2	C20	I-3	CR4	D-3	CR21	E-2	Q13	J-2	R14	E-2	R34	F-3	R50	F-3	R66	H-2	R82	J-2	S1	C-2
C5	E-3	C21	I-2	CR5	H-1	CR22	E-2	Q14	K-2	R15	E-2	R35	F-3	R51	G-2	R67	J-2	R83	I-3	TP1	G-2
C6	E-1	C22	I-3	CR6	H-1	CR23	E-2	Q15	K-3	R16	E-2	R36	F-3	R52	F-2	R68	K-2	R84	I-3	TP2	G-2
C7	G-3	C23	I-3	CR7	H-3	L1	E-3	Q16	K-3	R19	D-2	R37	F-3	R53	G-3	R69	K-2	R85	H-3	TP—15	H-1
C8	F-2	C24	G-3	CR8	H-3	L2	G-4	Q17	K-3	R22	D-3	R38	F-1	R54	J-1	R70	K-2	R86	I-2	TP+15	I-1
C9	F-2	C25	E-4	CR9	J-2	Q1	D-2	R1	C-3	R23	D-2	R39	F-1	R55	D-4	R71	H-3	R87	I-2	U1	D-2
C10	I-2	C26	C-2	CR10	J-2	Q3	F-1	R2	C-2	R24	E-2	R40	G-2	R56	D-3	R72	H-3	R88	I-3	U2	F-2
C11	G-3	C27	C-4	CR11	J-3	Q4	F-1	R3	C-3	R25	E-2	R41	G-3	R57	D-3	R73	J-3	R89	H-2	VR1	D-3
C12	D-4	C28	C-2	CR12	J-3	Q5	F-1	R4	D-1	R26	F-2	R42	F-2	R58	D-3	R74	J-2	R90	H-2		
C13	D-4	C29	C-1	CR13	H-3	Q6	F-3	R5	C-3	R27	E-3	R43	F-2	R59	D-3	R75	J-3	R91	I-3		
C14	D-4	C30	C-3	CR14	H-3	Q7	F-3	R6	D-1	R28	F-3	R44	G-2	R60	H-3	R76	K-3	R92	C-2		
C15	H-3	C31	C-3	CR15	H-2	Q8	F-2	R7	C-3	R29	E-3	R45	G-2	R61	E-3	R77	H-2	R93	C-4		
C16	H-2	C32	G-3	CR15	H-3	Q9	H-2	R10	D-2			R46	G-2	R62	H-2	R78	K-3	R94	G-3		

Figure 8-5. A1 Component Locator

Table 8-3. X-axis Preamplifier Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

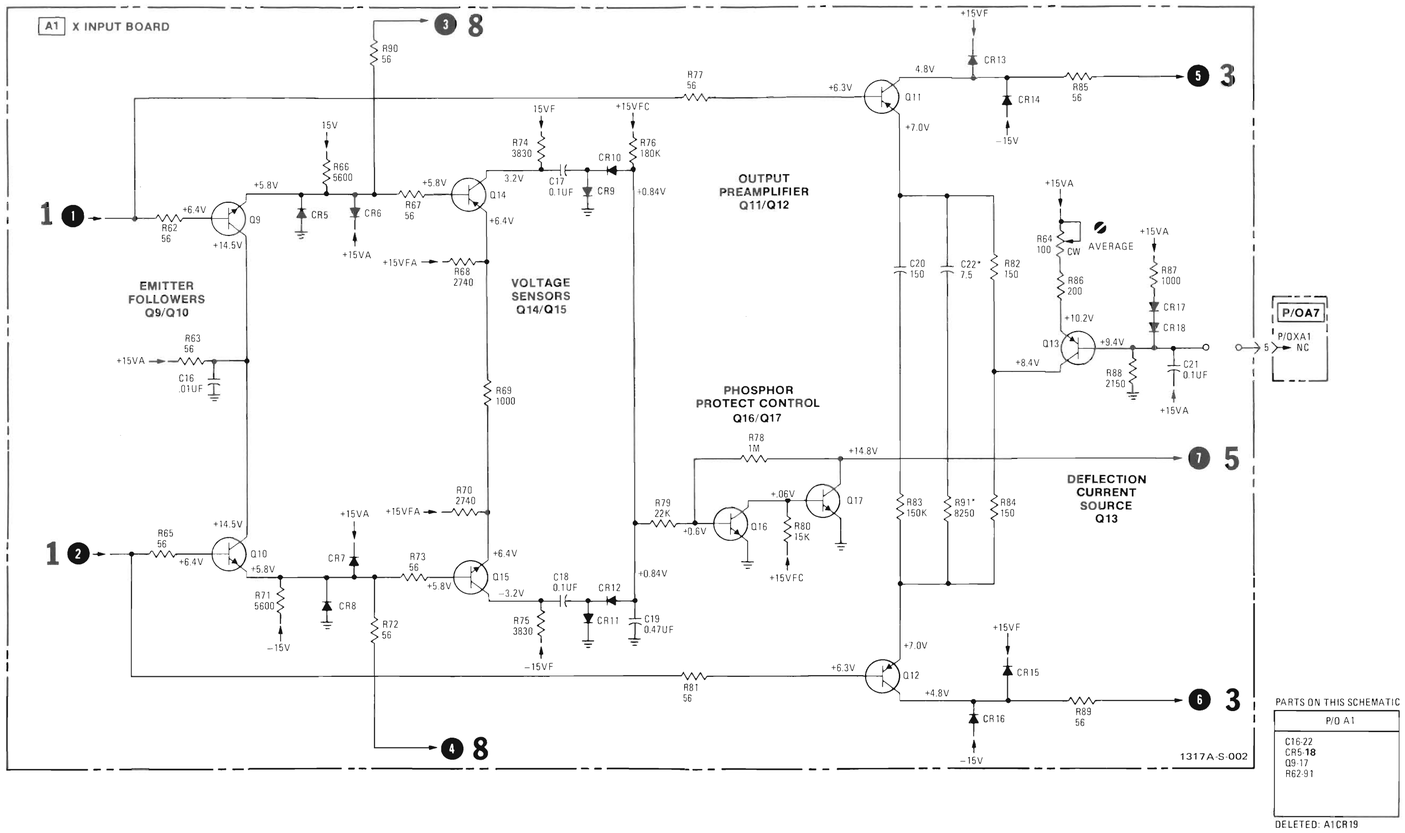
   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

   INTENSITY .....+7.0V at Test Point A5TP1

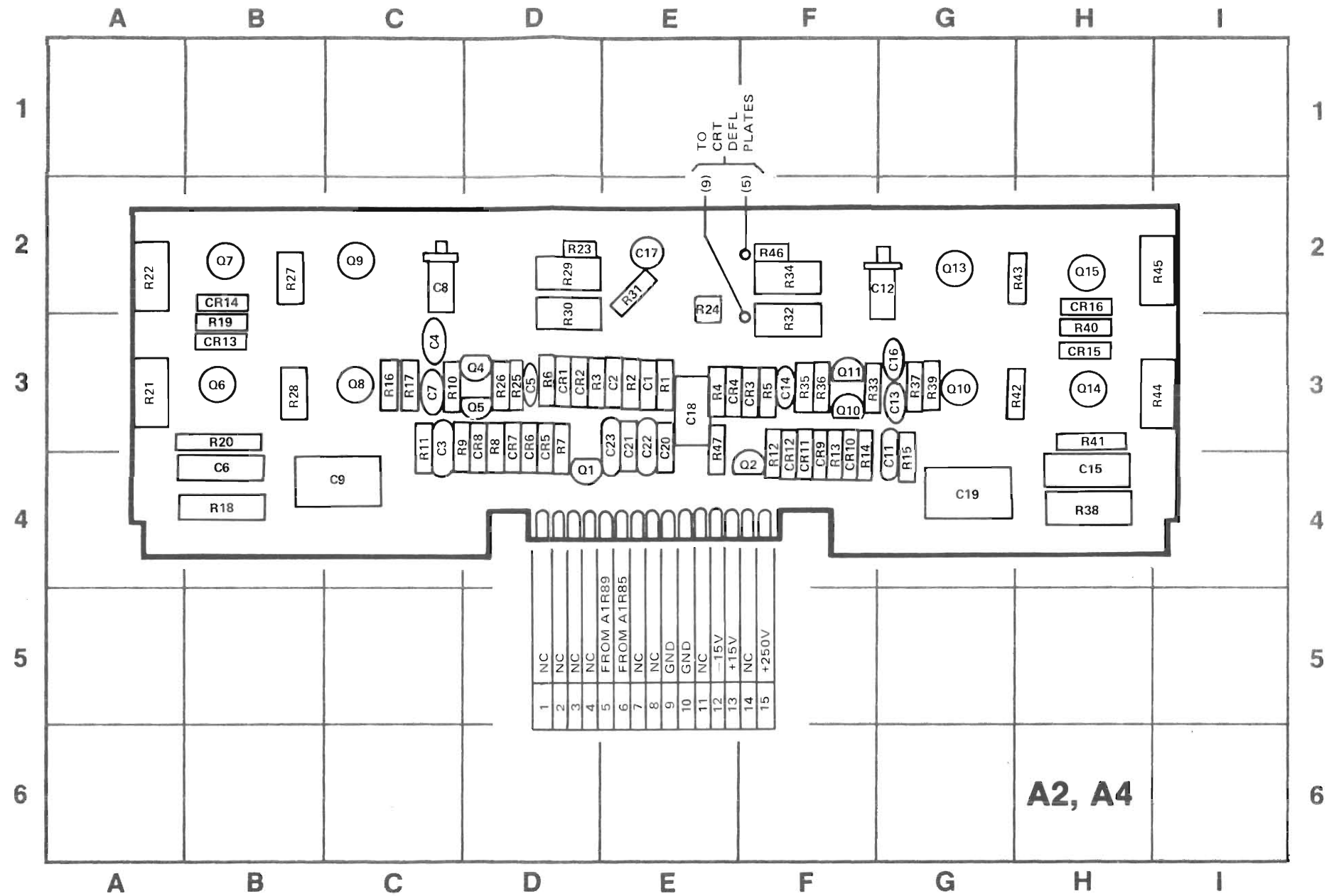


PARTS ON THIS SCHEMATIC

P/O A1
C16-22 CR5-18 Q9-17 R62-91

DELETED: A1CR19

Figure 8-6.
X-axis Amplifier



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	E-3	C21	E-3	Q2	F-4	R8	D-3	R28	B-3
C2	E-3	C22	E-3	Q4	D-3	R9	D-3	R29	D-2
C3	C-3	C23	E-3	Q5	D-3	R10	C-3	R30	D-2
C4	C-3	CR1	D-3	Q6	B-3	R11	C-3	R31	E-2
C5	D-3	CR2	D-3	Q7	B-2	R12	F-4	R32	F-3
C6	B-4	CR3	F-3	Q8	C-3	R13	F-4	R33	F-3
C7	C-3	CR4	E-3	Q9	C-2	R14	F-4	R34	F-2
C8	C-2	CR5	D-3	Q10	F-3	R15	G-4	R35	F-3
C9	B-4	CR6	D-3	Q11	F-3	R16	C-3	R36	F-3
C11	G-4	CR7	D-3	Q12	G-3	R17	C-3	R37	G-3
C12	G-2	CR8	D-3	Q13	G-2	R18	B-4	R38	H-4
C13	G-3	CR9	F-4	Q14	H-3	R19	B-3	R39	G-3
C14	F-3	CR10	F-4	Q15	H-2	R20	B-3	R40	H-3
C15	H-4	CR11	F-4	R1	E-3	R21	A-3	R41	H-3
C16	G-3	CR12	F-4	R2	E-3	R22	A-2	R42	H-3
C17	E-2	CR13	B-3	R3	D-3	R23	D-2	R43	H-2
C18	E-3	CR14	B-2	R4	E-3	R24	E-2	R44	I-3
C19	G-4	CR15	H-3	R5	F-3	R25	D-3	R45	I-2
C20	E-3	CR16	H-2	R6	D-3	R26	D-3	R46	F-2
		Q1	D-4	R7	D-3	R27	B-2	R47	E-3

1317A-L-024

Figure 8-7. A2 Component Locator

Table 8-4. X-axis Output Amplifier Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

   INTENSITY .....+7.0V at Test Point A5TP1

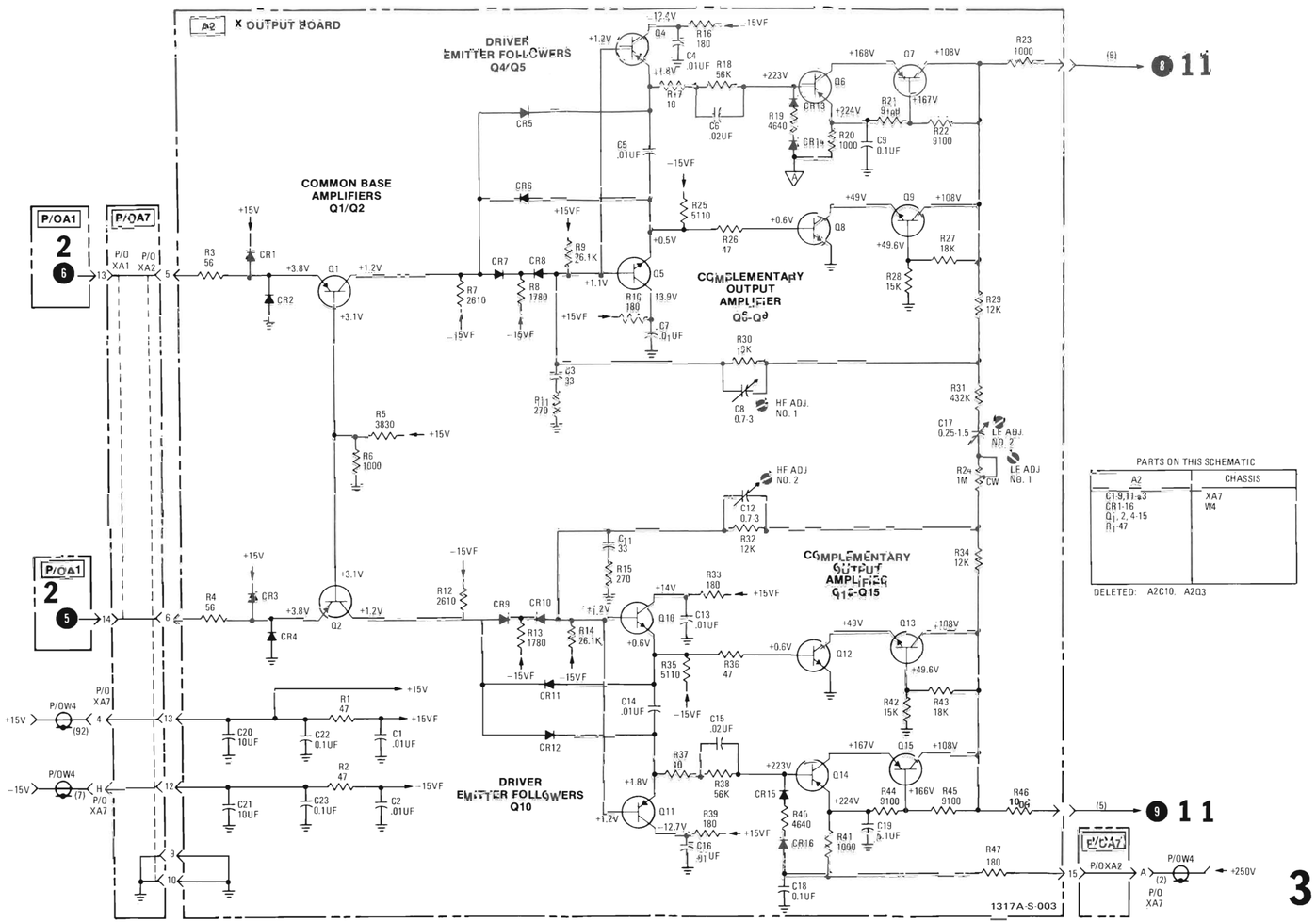


Figure 8-8.
X-axis Output Amplifier

Table 8-5. Y-axis Input Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

   INTENSITY .....+7.0V at Test Point A5TP1

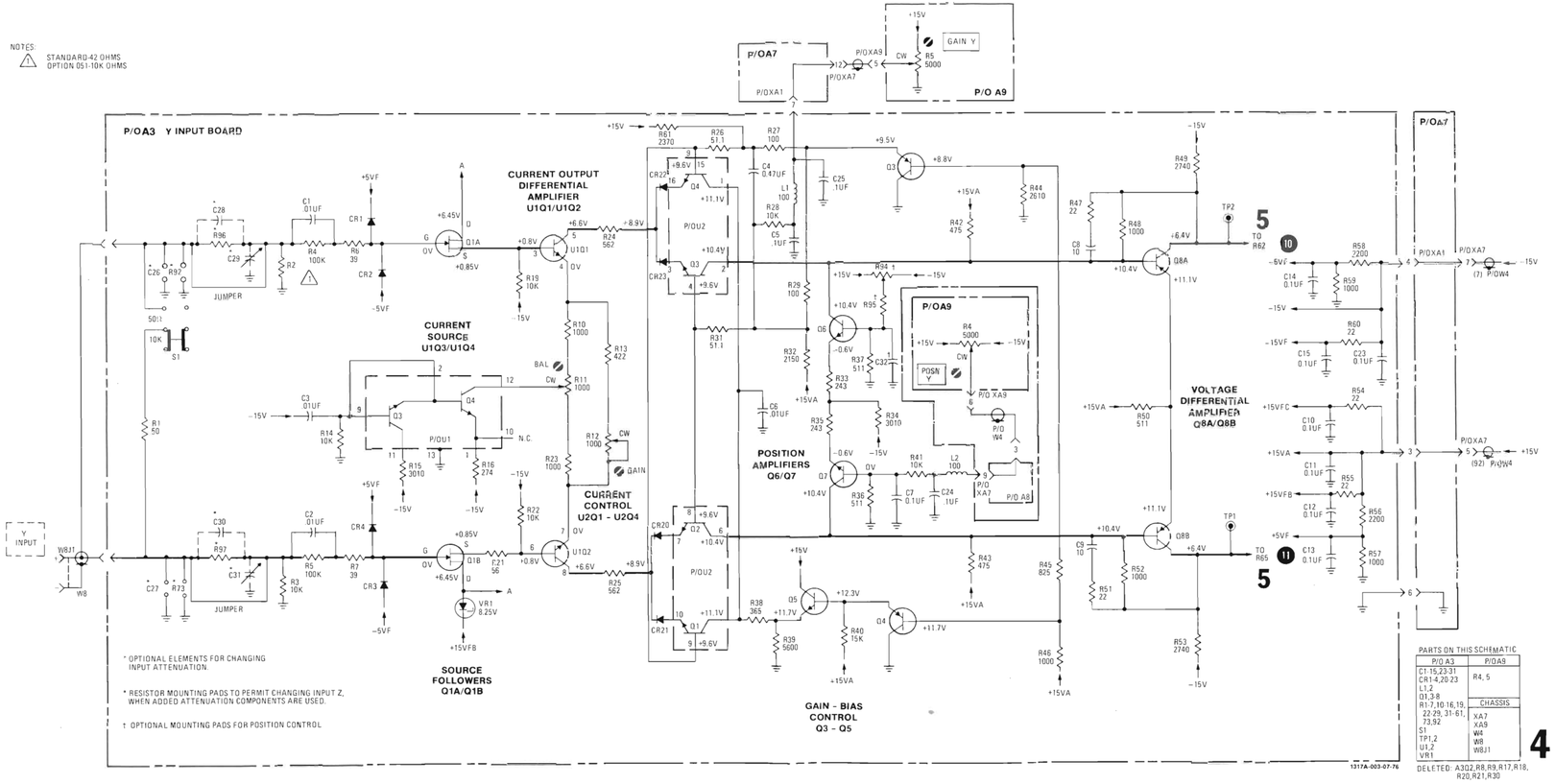
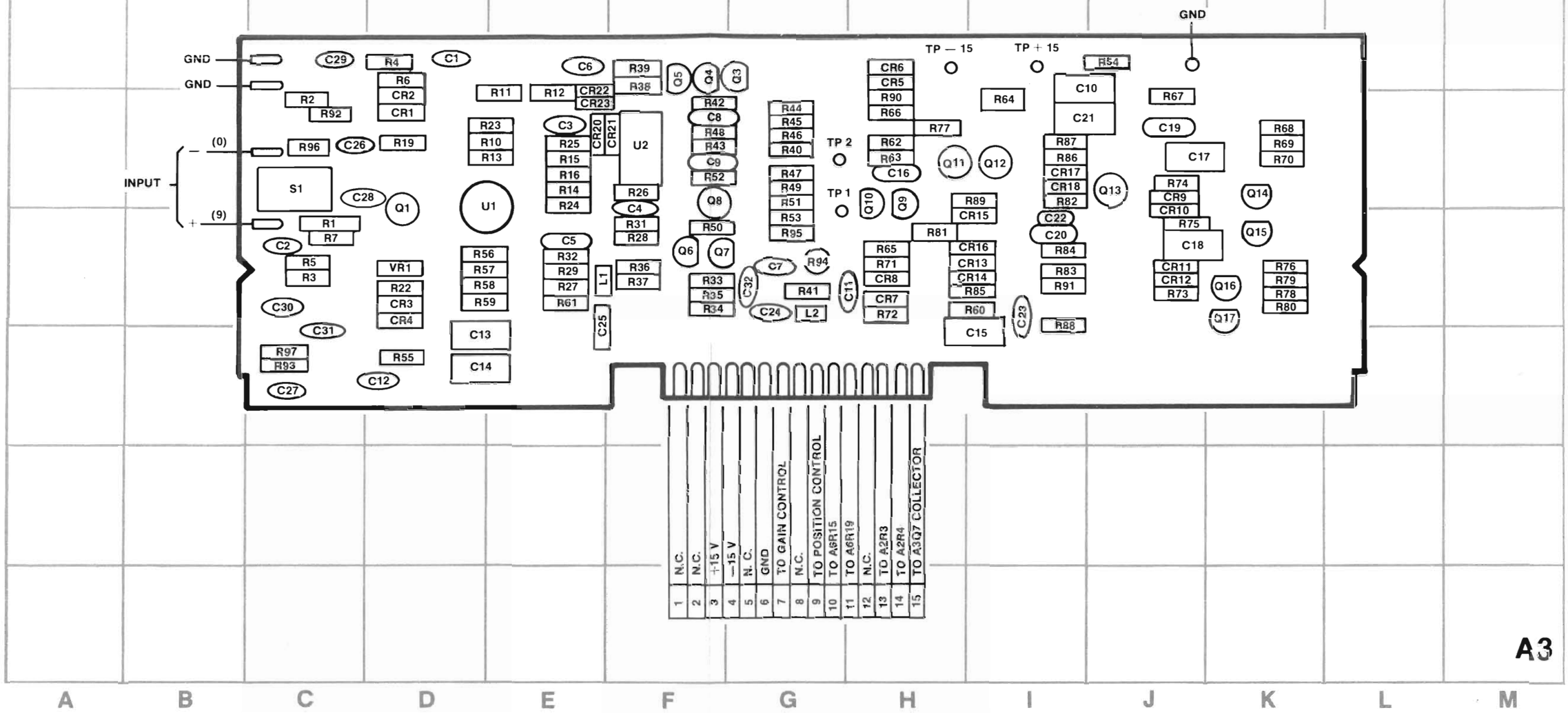


Figure 8-9.
Y-axis Input Amplifier Schematic 4



1317A-006-07-76

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	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	D-1	C17	J-2	CR1	D-2	CR17	I-2	Q10	H-2	R11	E-2	R31	F-3	R47	G-2	R63	H-2	R79	K-3	R95	G-3
C2	C-3	C18	J-3	CR2	D-2	CR18	I-2	Q11	H-2	R12	E-2	R32	E-3	R48	F-2	R64	I-2	R80	K-3	R96	C-2
C3	E-2	C19	J-2	CR3	D-3	CR20	E-2	Q12	I-2	R13	D-2	R33	F-3	R49	G-2	R65	H-3	R81	H-3	R97	C-4
C4	F-2	C20	I-3	CR4	D-3	CR21	E-2	Q13	J-2	R14	E-2	R34	F-3	R50	F-3	R66	H-2	R82	I-2	S1	C-2
C5	E-3	C21	I-2	CR5	H-1	CR22	E-2	Q14	K-2	R15	E-2	R35	F-3	R51	G-2	R67	J-2	R83	I-3	TP1	G-2
C6	E-1	C22	I-3	CR6	H-1	CR23	E-2	Q15	K-3	R16	E-2	R36	F-3	R52	F-2	R68	K-2	R84	I-3	TP2	G-2
C7	G-3	C23	I-3	CR7	H-3	L1	E-3	Q16	K-3	R19	D-2	R37	F-3	R53	G-3	R69	K-2	R85	H-3	TP—15	H-1
C8	F-2	C24	G-3	CR8	H-3	L2	G-4	Q17	K-3	R22	D-3	R38	F-1	R54	J-1	R70	K-2	R86	I-2	TP+15	I-1
C9	F-2	C25	E-4	CR9	J-2	Q1	D-2	R1	C-3	R23	D-2	R39	F-1	R55	D-4	R71	H-3	R87	I-2	U1	D-2
C10	I-2	C26	C-2	CR10	J-2	Q3	F-1	R2	C-2	R24	E-2	R40	G-2	R56	D-3	R72	H-3	R88	I-3	U2	F-2
C11	G-3	C27	C-4	CR11	J-3	Q4	F-1	R3	C-3	R25	E-2	R41	G-3	R57	D-3	R73	J-3	R89	H-2	VR1	D-3
C12	D-4	C28	C-2	CR12	J-3	Q5	F-1	R4	D-1	R26	F-2	R42	F-2	R58	D-3	R74	J-2	R90	H-2		
C13	D-4	C29	C-1	CR13	H-3	Q6	F-3	R5	C-3	R27	E-3	R43	F-2	R59	D-3	R75	J-3	R91	I-3		
C14	D-4	C30	C-3	CR14	H-3	Q7	F-3	R6	D-1	R28	F-3	R44	G-2	R60	H-3	R76	K-3	R92	C-2		
C15	H-3	C31	C-3	CR15	H-2	Q8	F-2	R7	C-3	R29	E-3	R45	G-2	R61	E-3	R77	H-2	R93	C-4		
C16	H-2	C32	G-3	CR16	H-3	Q9	H-2	R10	D-2			R46	G-2	R62	H-2	R78	K-3	R94	G-3		

Figure 8-10. A3 Component Locator

Table 8-6. Y-axis Preamplifier Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

   INTENSITY .....+7.0V at Test Point A5TP1

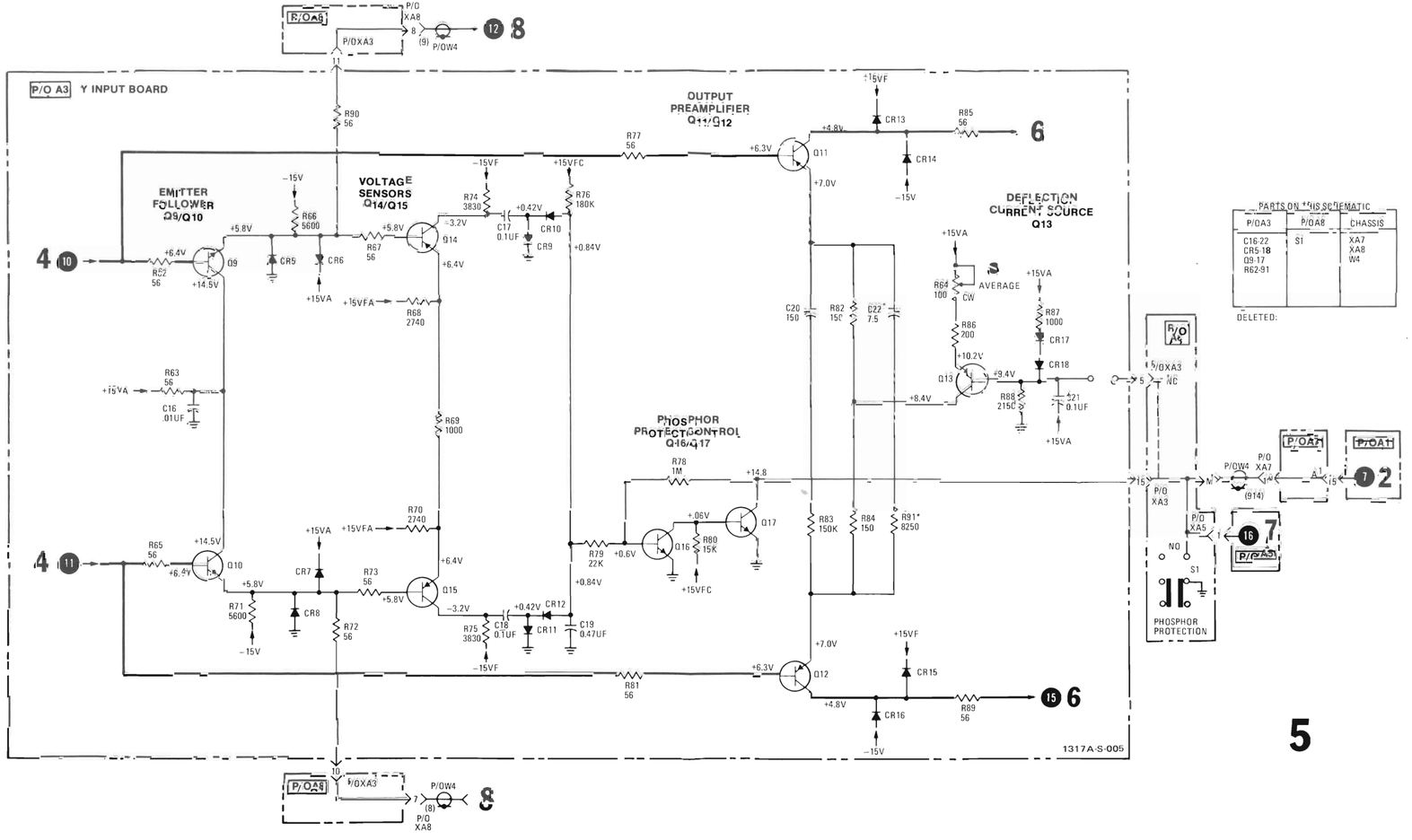
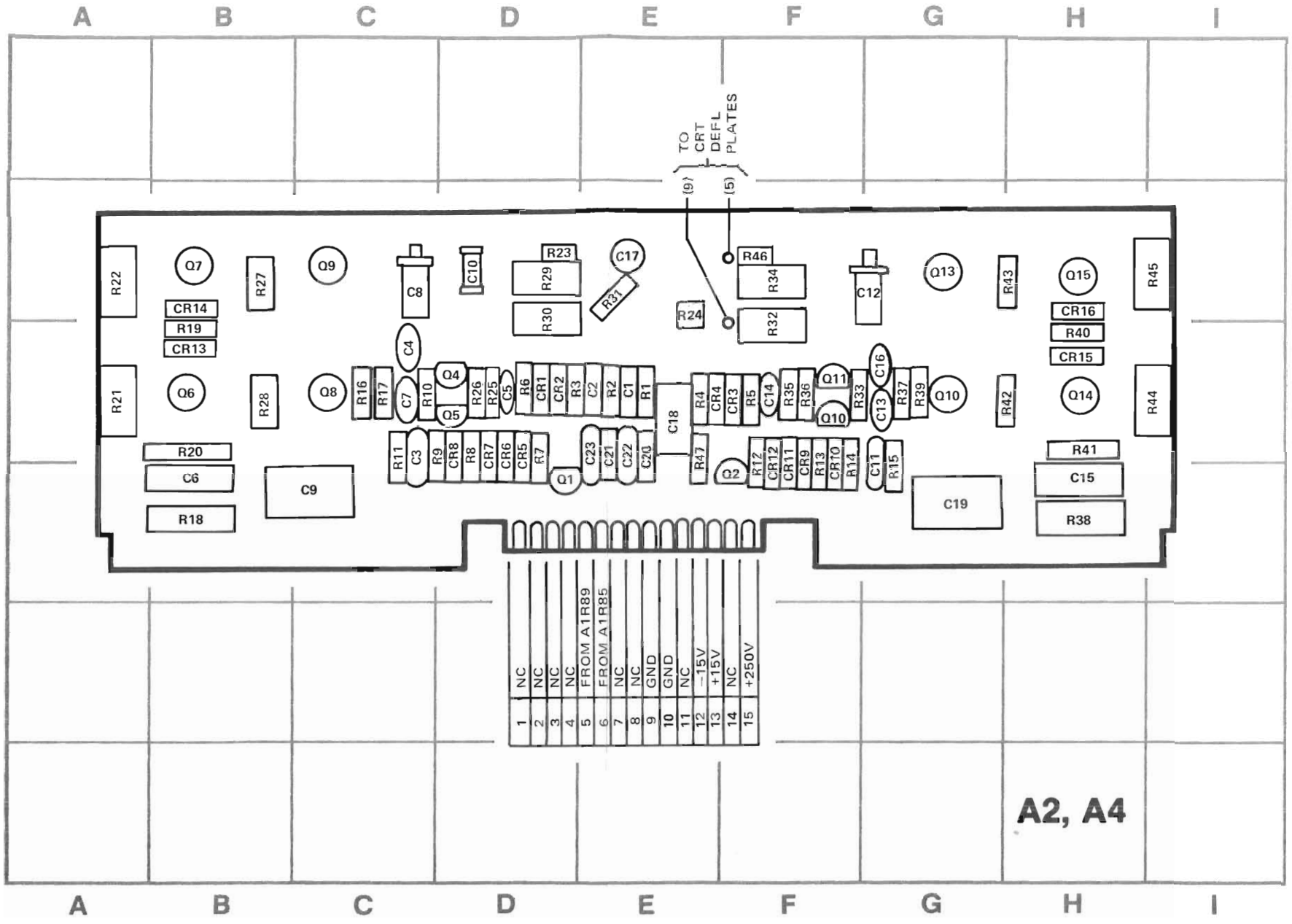


Figure 8-11. Y-axis Amplifier



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	E-3	C21	E-3	Q2	F-4	R8	D-3	R28	B-3
C2	E-3	C22	E-3	Q4	D-3	R9	D-3	R29	D-2
C3	C-3	C23	E-3	Q5	D-3	R10	C-3	R30	D-2
C4	C-3	CR1	D-3	Q6	B-3	R11	C-3	R31	E-2
C5	D-3	CR2	D-3	Q7	B-2	R12	F-4	R32	F-3
C6	B-4	CR3	F-3	Q8	C-3	R13	F-4	R33	F-3
C7	C-3	CR4	E-3	Q9	C-2	R14	F-4	R34	F-2
C8	C-2	CR5	D-3	Q10	F-3	R15	G-4	R35	F-3
C9	B-4	CR6	D-3	Q11	F-3	R16	C-3	R36	F-3
C10	D-2	CR7	D-3	Q12	G-3	R17	C-3	R37	G-3
C11	G-4	CR8	D-3	Q13	G-2	R18	B-4	R38	H-4
C12	G-2	CR9	F-4	Q14	H-3	R19	B-3	R39	G-3
C13	G-3	CR10	F-4	Q15	H-2	R20	B-3	R40	H-3
C14	F-3	CR11	F-4	R1	E-3	R21	A-3	R41	H-3
C15	H-4	CR12	F-4	R2	E-3	R22	A-2	R42	H-3
C16	G-3	CR13	B-3	R3	D-3	R23	D-2	R43	H-2
C17	E-2	CR14	B-2	R4	E-3	R24	E-2	R44	I-3
C18	E-3	CR15	H-3	R5	F-3	R25	D-3	R46	I-2
C19	G-4	CR16	H-2	R6	D-3	R26	D-3	R46	F-2
C20	E-3	Q1	D-4	R7	D-3	R27	B-2	R47	E-3

1317A-L-026

Figure 8-12. A4 Component Locator

Table 8-7. Y-axis Output Amplifier Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

   INTENSITY .....+7.0V at Test Point A5TP1

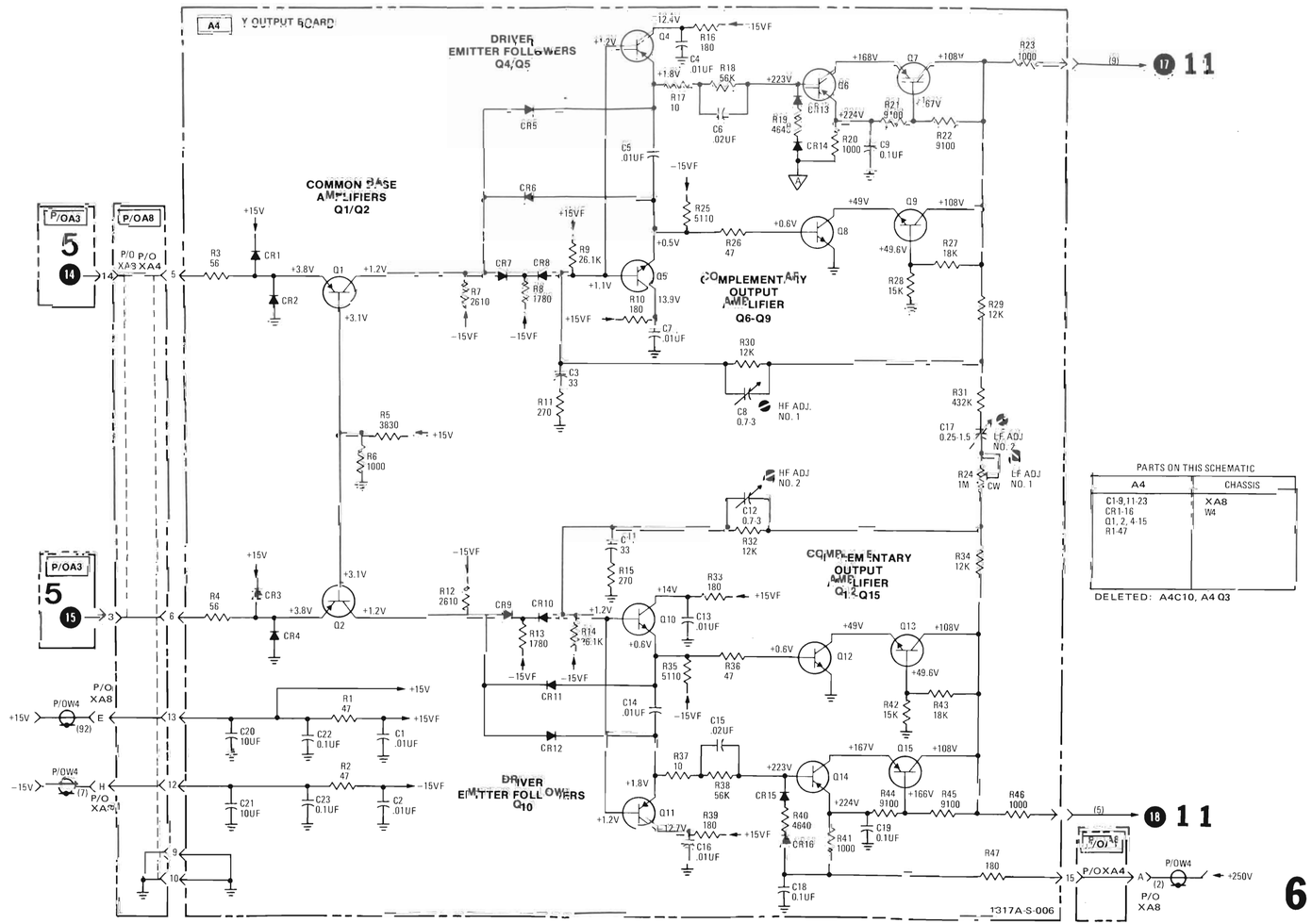
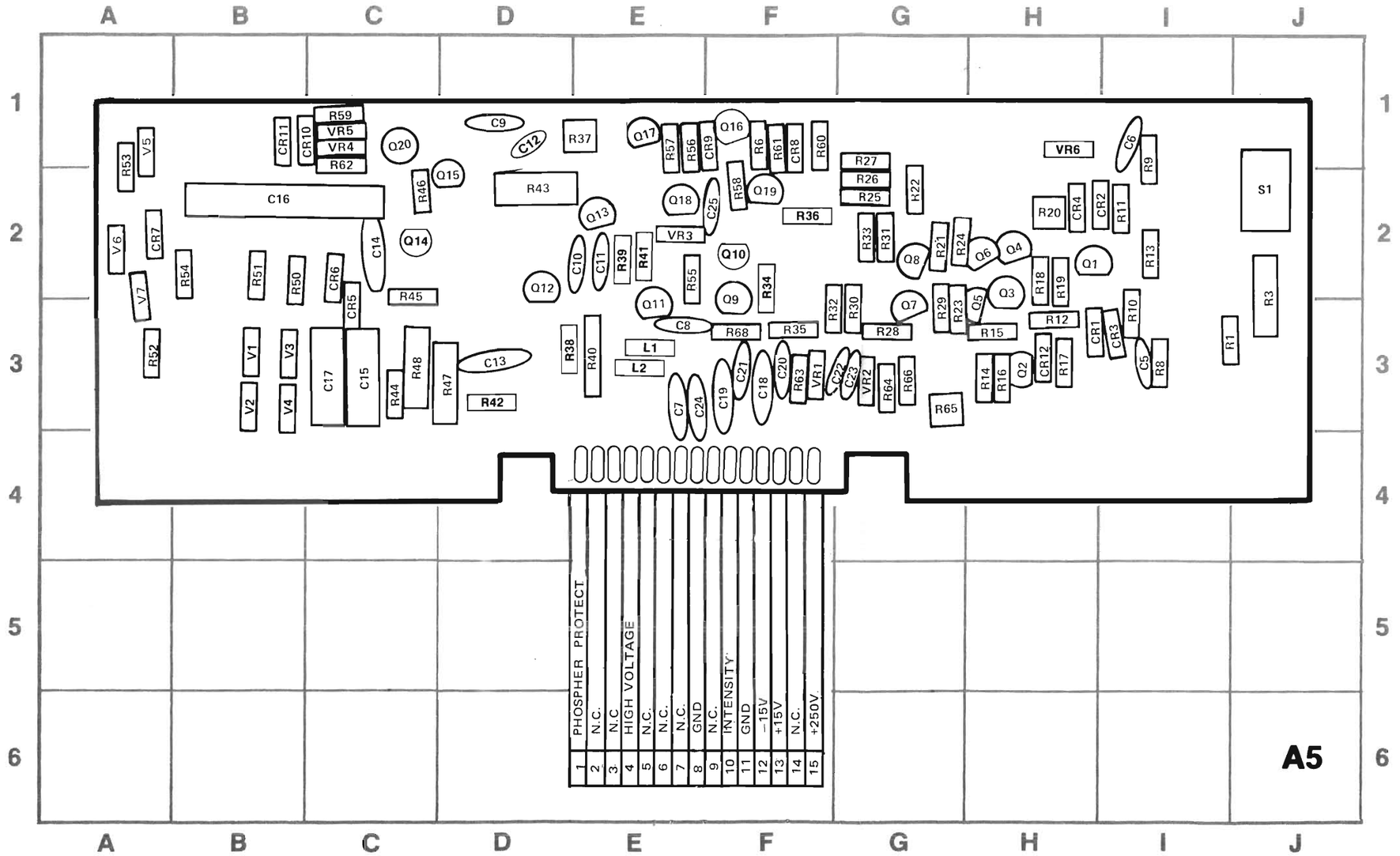


Figure 8-13.
Y-axis Output Amplifier



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C5	I-3	Q9	F-2	R38	E-3
C6	I-1	Q10	F-2	R39	E-2
C7	E-3	Q11	E-3	R40	E-3
C8	E-3	Q12	D-2	R41	E-1
C9	D-1	Q13	E-2	R42	D-3
C10	E-2	Q14	D-2	R43	D-2
C11	D-1	Q15	D-2	R44	C-3
C12	D-1	Q16	F-1	R45	C-2
C13	D-3	Q17	E-1	R46	C-2
C14	C-2	Q18	E-2	R47	D-3
C15	C-3	Q19	F-2	R48	C-3
C16	B-2	Q20	C-1	R50	B-2
C17	C-3	R1	I-3	R51	B-2
C18	F-3	R3	J-2	R52	A-3
C19	F-3	R8	I-3	R53	A-1
C20	F-3	R9	I-1	R54	B-2
C21	F-3	R10	I-3	R55	E-2
C22	G-3	R11	I-2	R56	E-1
C23	G-3	R12	H-3	R57	E-1
C24	F-3	R13	I-2	R58	F-2
C25	F-2	R14	H-3	R59	C-1
CR1	H-3	R15	H-3	R60	F-1
CR2	I-2	R16	H-3	R61	F-1
CR3	E-3	R17	H-3	R62	C-1
CR4	H-2	R18	H-2	R63	F-3
CR5	C-3	R19	H-2	R64	G-3
CR6	C-2	R20	H-2	R65	G-3
CR7	A-2	R21	G-2	R66	G-3
CR8	F-1	R22	G-2	R67	F-1
CR9	F-1	R23	G-3	R68	F-3
CR10	B-1	R24	G-2	S1	J-2
CR11	B-1	R25	G-2	V1	B-3
CR12	H-3	R26	G-2	V2	B-3
J2	S-1	R27	G-1	V3	B-3
L1	E-3	R28	G-3	V4	B-3
L2	E-3	R29	G-3	V5	A-1
Q1	H-2	R30	G-3	V6	A-2
Q2	H-3	R31	G-2	V7	A-2
Q3	H-2	R32	F-3	VR1	F-3
Q4	H-2	R33	G-2	VR2	G-3
Q5	H-3	R34	F-2	VR3	E-2
Q6	H-2	R35	F-3	VR4	C-1
Q7	G-3	R36	F-2	VR5	C-1
Q8	G-2	R37	E-1	VR6	H-1

1317A-L-027

Figure 8-14. A5 Component Locator

Table 8-8. Z-axis Amplifier Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

   INTENSITY .....+7.0V at Test Point A5TP1

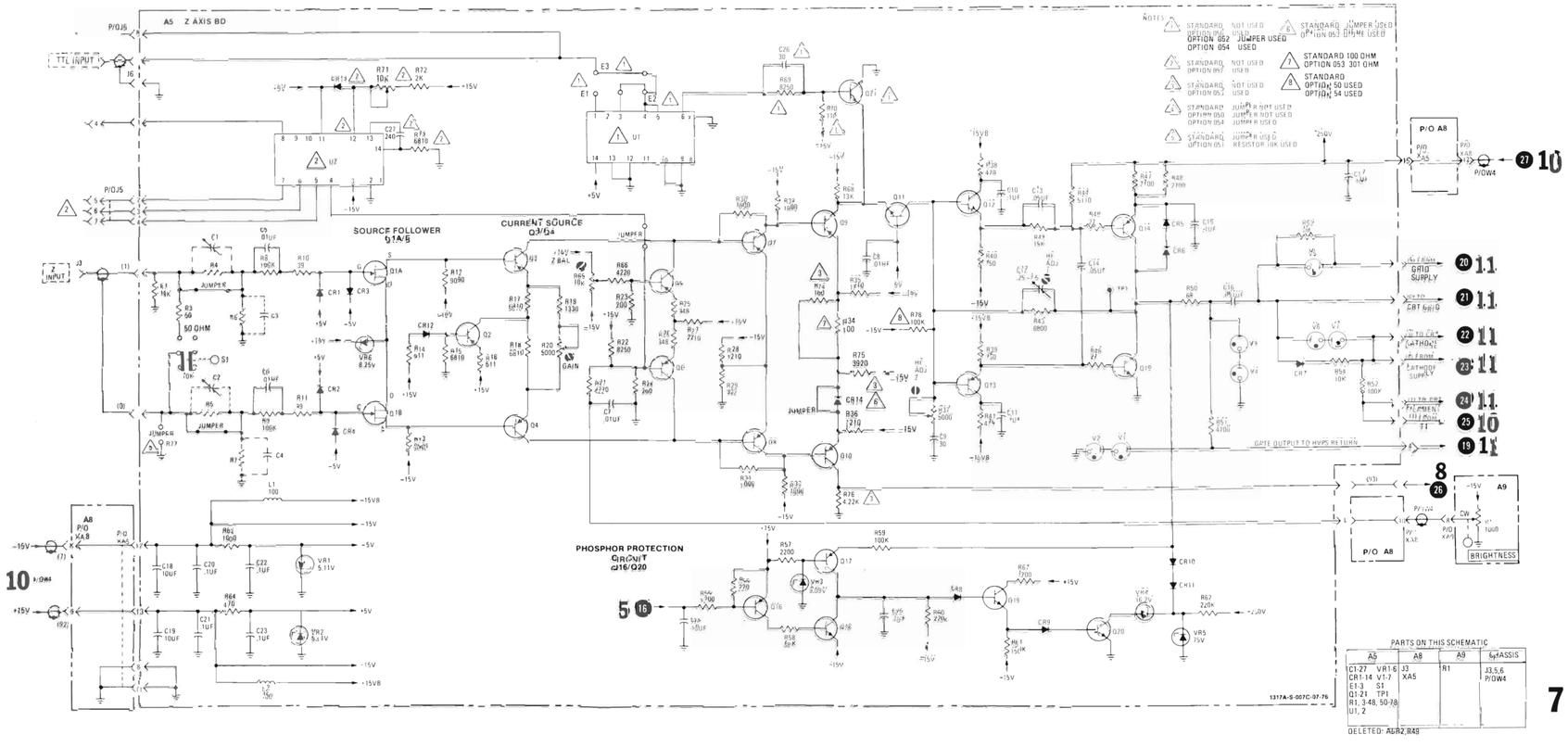
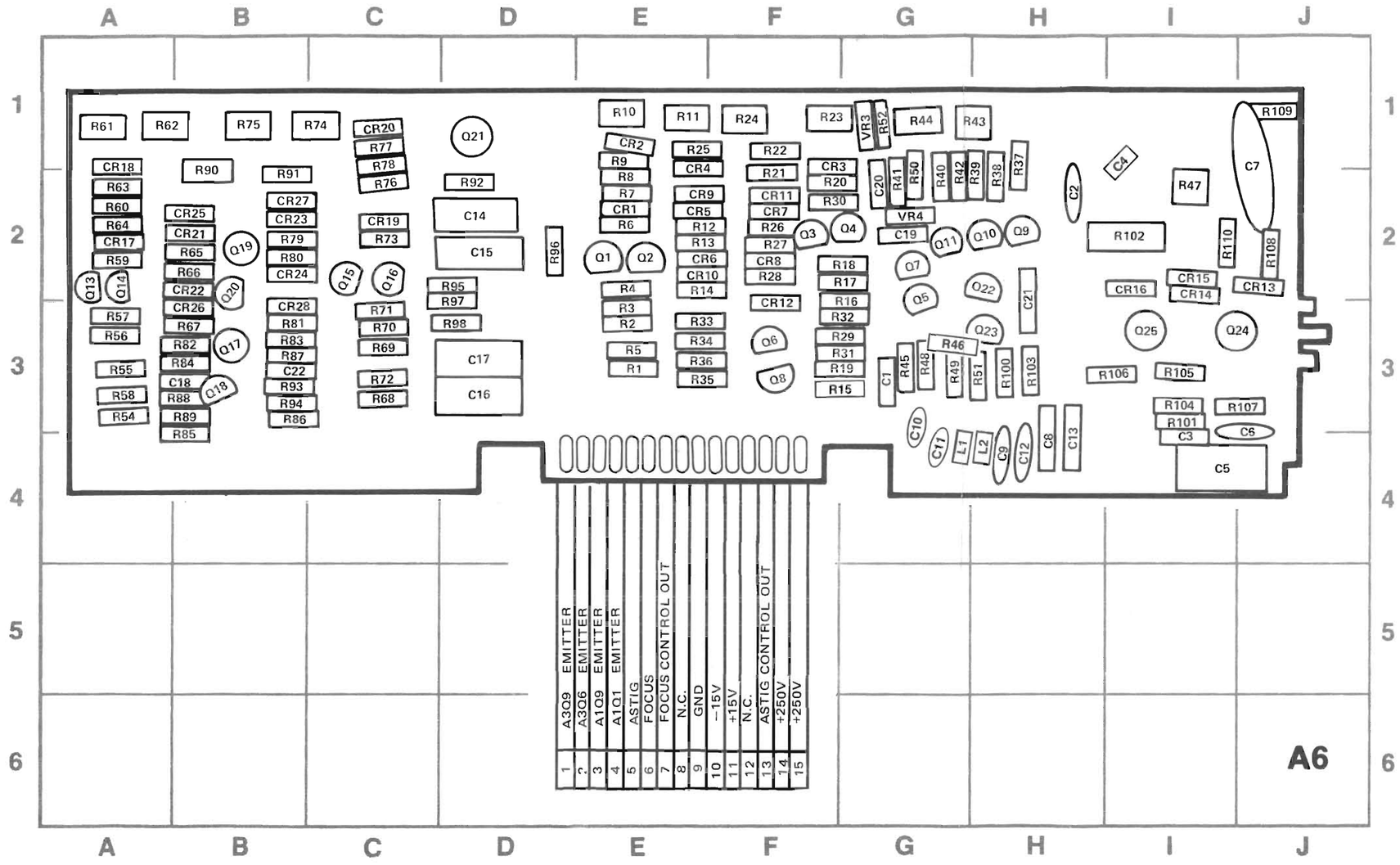


Figure 8-15.
Z-axis Amplifier
8-19



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	G-3	CR26	B-3	R18	G-2	R66	B-2
C2	H-2	CR27	B-2	R19	G-3	R67	B-3
C3	I-4	CR28	B-3	R20	C-1	R68	C-3
C4	I-2	L1	G-4	R21	F-2	R69	C-3
C5	I-4	L2	H-4	R22	F-1	R70	C-3
C6	J-4	Q1	E-2	R23	F-1	R71	C-3
C7	J-1	Q2	E-2	R24	F-1	R72	C-3
C8	H-4	Q3	F-2	R25	E-1	R73	C-2
C9	H-4	Q4	G-2	R26	F-2	R74	B-1
C10	G-4	Q5	G-2	R27	F-2	R75	B-1
C11	G-4	Q6	F-3	R28	F-2	R76	C-2
C12	H-4	Q7	G-2	R29	G-3	R77	C-1
C13	H-4	Q8	F-3	R30	F-2	R78	C-2
C14	D-2	Q9	H-2	R31	G-3	R79	B-2
C15	D-2	Q10	H-2	R32	G-3	R80	B-2
C16	D-3	Q11	G-2	R33	E-3	R81	B-3
C17	D-3	Q13	A-2	R34	E-3	R82	B-3
C18	B-3	Q14	A-2	R35	E-3	R83	B-3
C19	G-2	Q15	C-2	R36	E-3	R84	B-3
C20	G-2	Q16	C-2	R37	H-2	R85	B-3
C21	H-3	Q17	B-3	R38	H-2	R86	B-3
C22	B-3	Q18	B-3	R39	H-2	R87	B-3
CR1	E-2	Q19	B-2	R40	G-2	R88	B-3
CR2	E-1	Q20	B-2	R41	G-2	R89	B-3
CR3	E-2	Q21	D-1	R42	G-2	R90	B-2
CR4	E-2	Q22	H-2	R43	G-1	R91	B-2
CR5	E-2	Q23	H-3	R44	G-1	R92	D-2
CR6	E-2	Q24	I-3	R45	G-3	R93	B-3
CR7	F-2	Q25	I-3	R46	G-3	R94	B-3
CR8	F-2	R1	E-3	R47	I-2	R95	D-2
CR9	E-2	R2	E-3	R48	G-3	R96	D-2
CR10	E-2	R3	E-3	R49	G-3	R97	D-3
CR11	F-2	R4	E-2	R50	G-2	R98	D-3
CR12	F-3	R5	E-3	R51	H-3	R100	I-3
CR13	J-2	R6	E-2	R52	G-1	R101	I-2
CR14	I-2	R7	E-2	R54	A-3	R102	H-3
CR15	I-2	R8	E-2	R55	A-3	R103	I-3
CR16	I-2	R9	E-1	R56	A-3	R104	I-3
CR17	A-2	R10	E-1	R57	A-3	R105	I-3
CR18	A-2	R11	E-1	R58	A-3	R106	J-3
CR19	C-2	R12	E-2	R59	A-2	R107	J-2
CR20	C-1	R13	E-2	R60	A-2	R108	J-2
CR21	B-2	R14	E-2	R61	A-1	R109	J-1
CR22	B-2	R15	G-3	R62	A-1	R110	J-2
CR23	B-2	R16	G-3	R63	A-2	VR3	G-1
CR24	B-2	R17	G-2	R64	A-2	VR4	G-2
CR25	B-2	R18	G-2	R65	B-2		

Figure 8-16. A6 Component Locator

1317A-L-028-07-76

Table 8-9. Dynamic Focus Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

   INTENSITY .....+7.0V at Test Point A5TP1

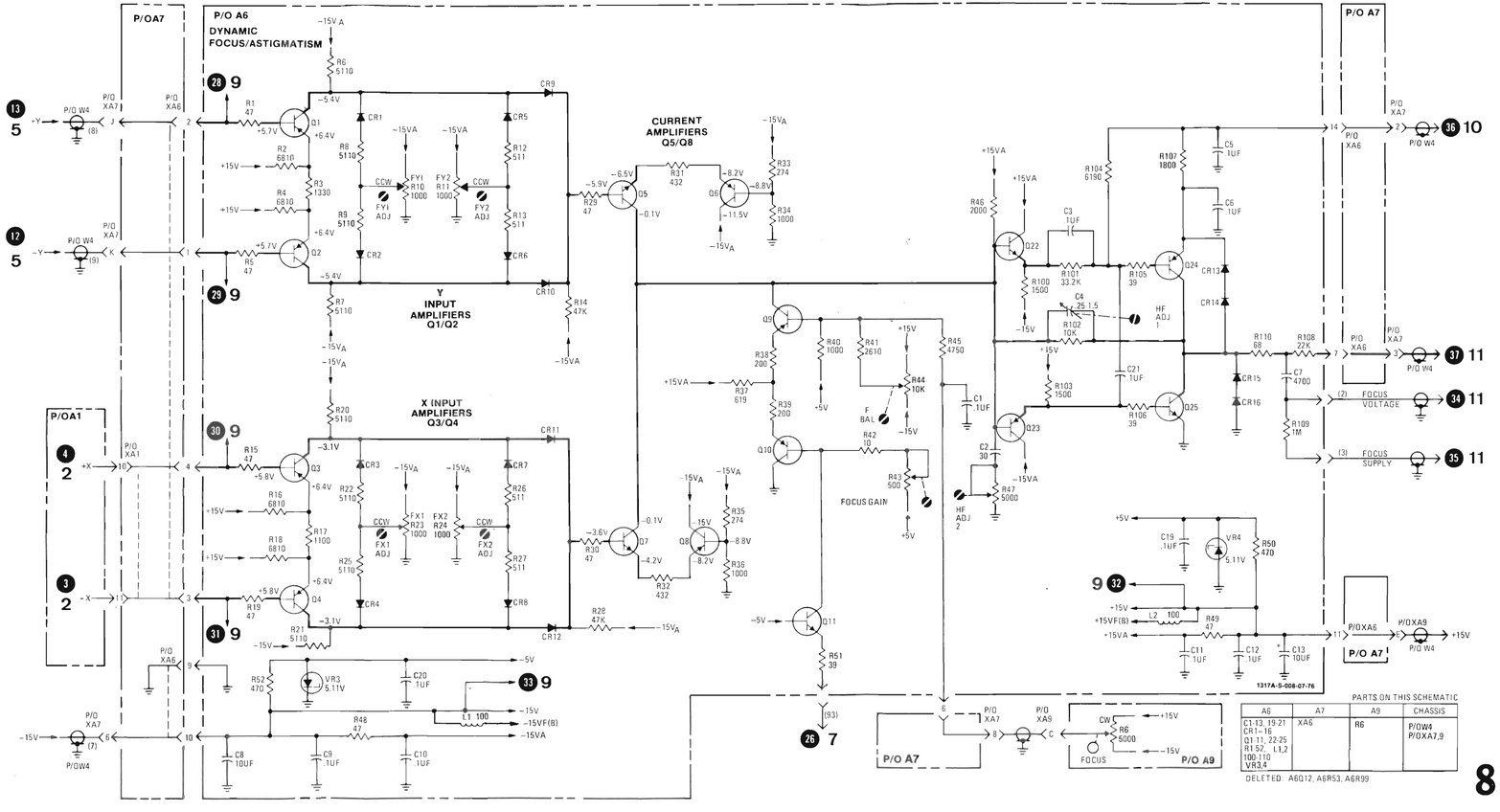


Figure 8-17.
FOCUS Circuit
8-21/(8-22 blank)

Table 8-10. Dynamic Astigmatism Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

1. Disconnect all inputs from X-, Y-, and Z-INPUT connectors.

2. Adjustments:

   Z-axis GAIN (A5R20) ..... fully cw

   Z-axis BAL (A5R65)..... Equal voltages at emitters of A5Q3 and A5Q4

3. Control settings:

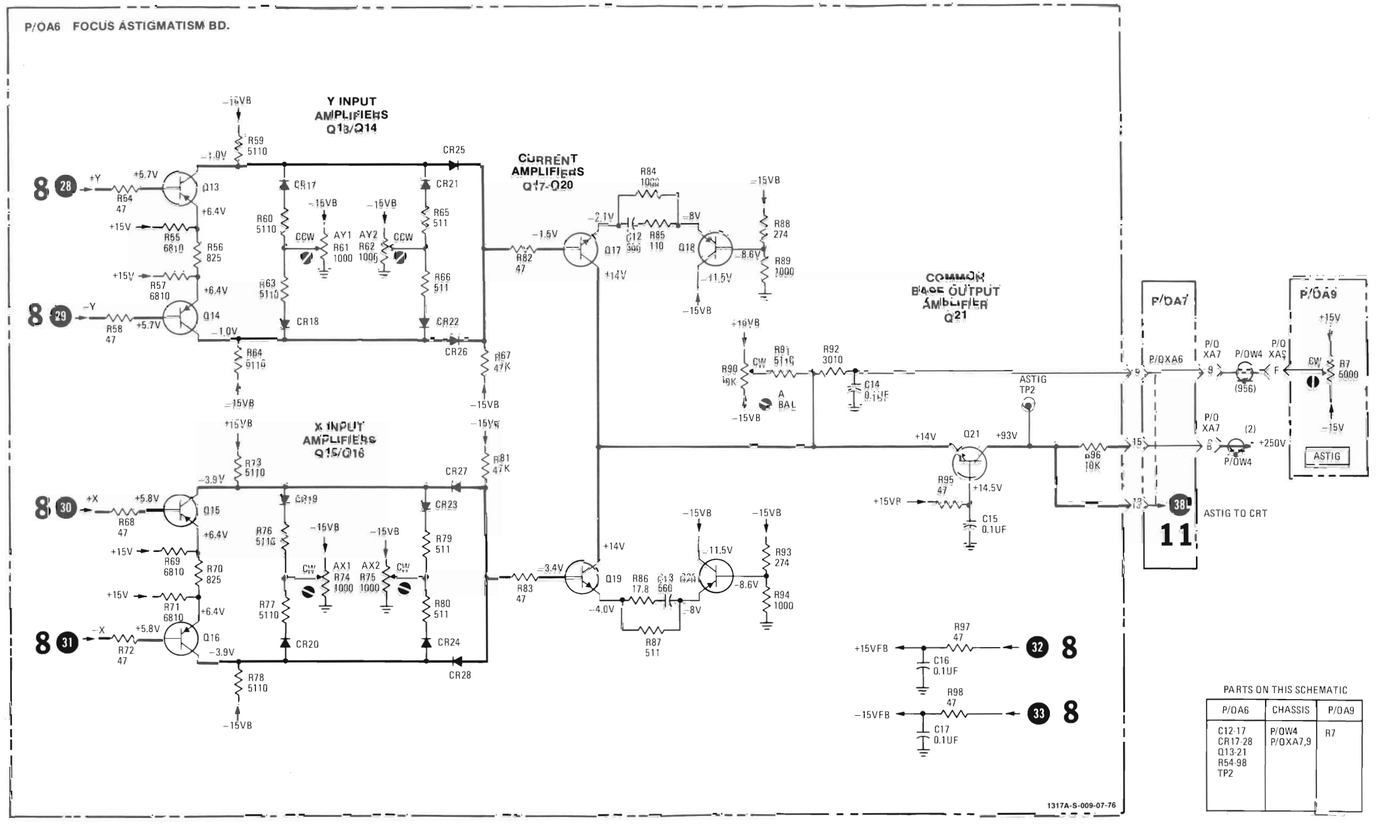
   POSN X ..... Centered

   POSN Y ..... Centered

   GAIN X ..... fully cw

   GAIN Y ..... fully cw

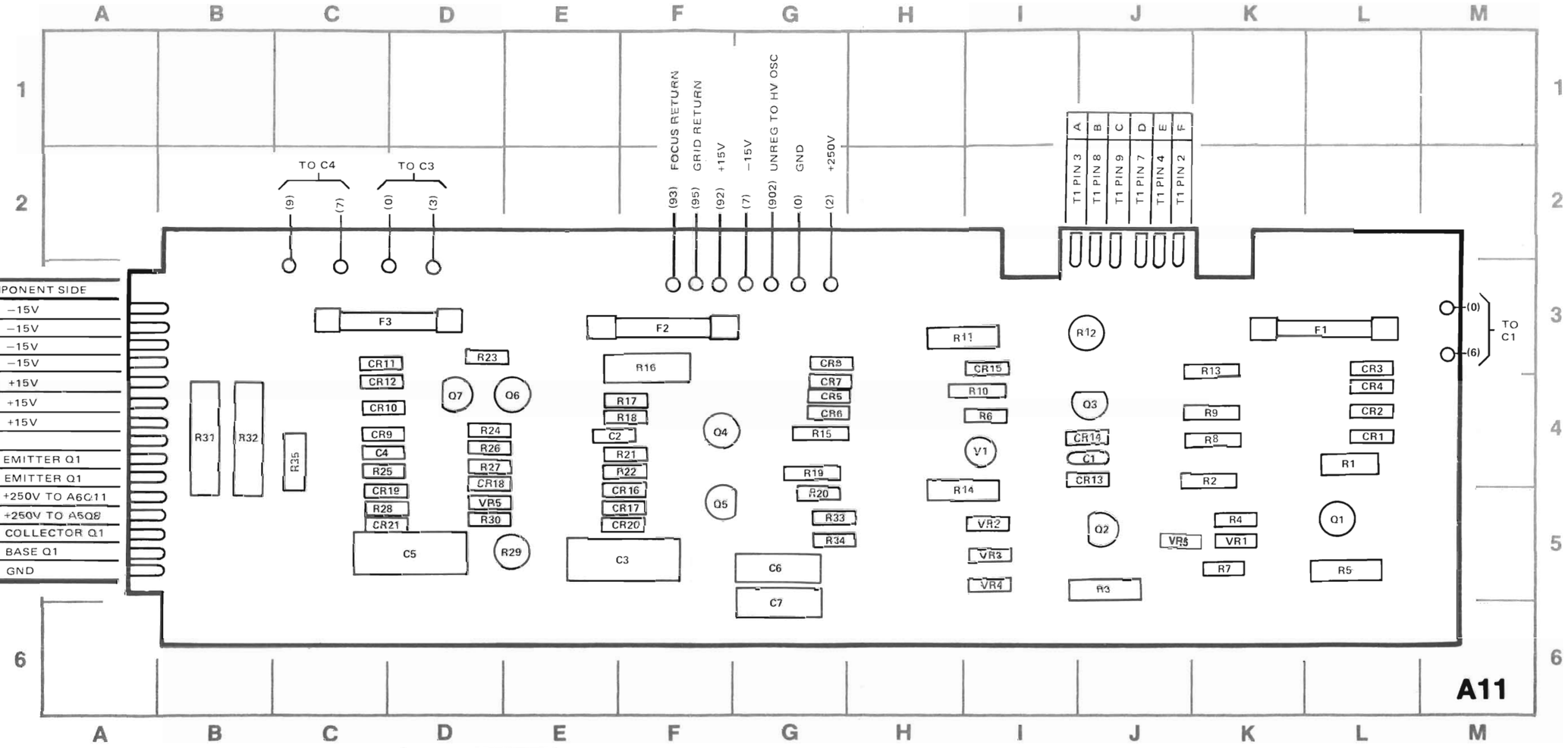
   INTENSITY .....+7.0V at Test Point A5TP1



PARTS ON THIS SCHEMATIC

P/OA6	CHASSIS	P/OA9
C12-17 CR17-28 Q13-21 R54-98 TP2	P/OW4 P/OXA7,9	R7

Figure 8-18.
Astigmatism Circuit
8-23

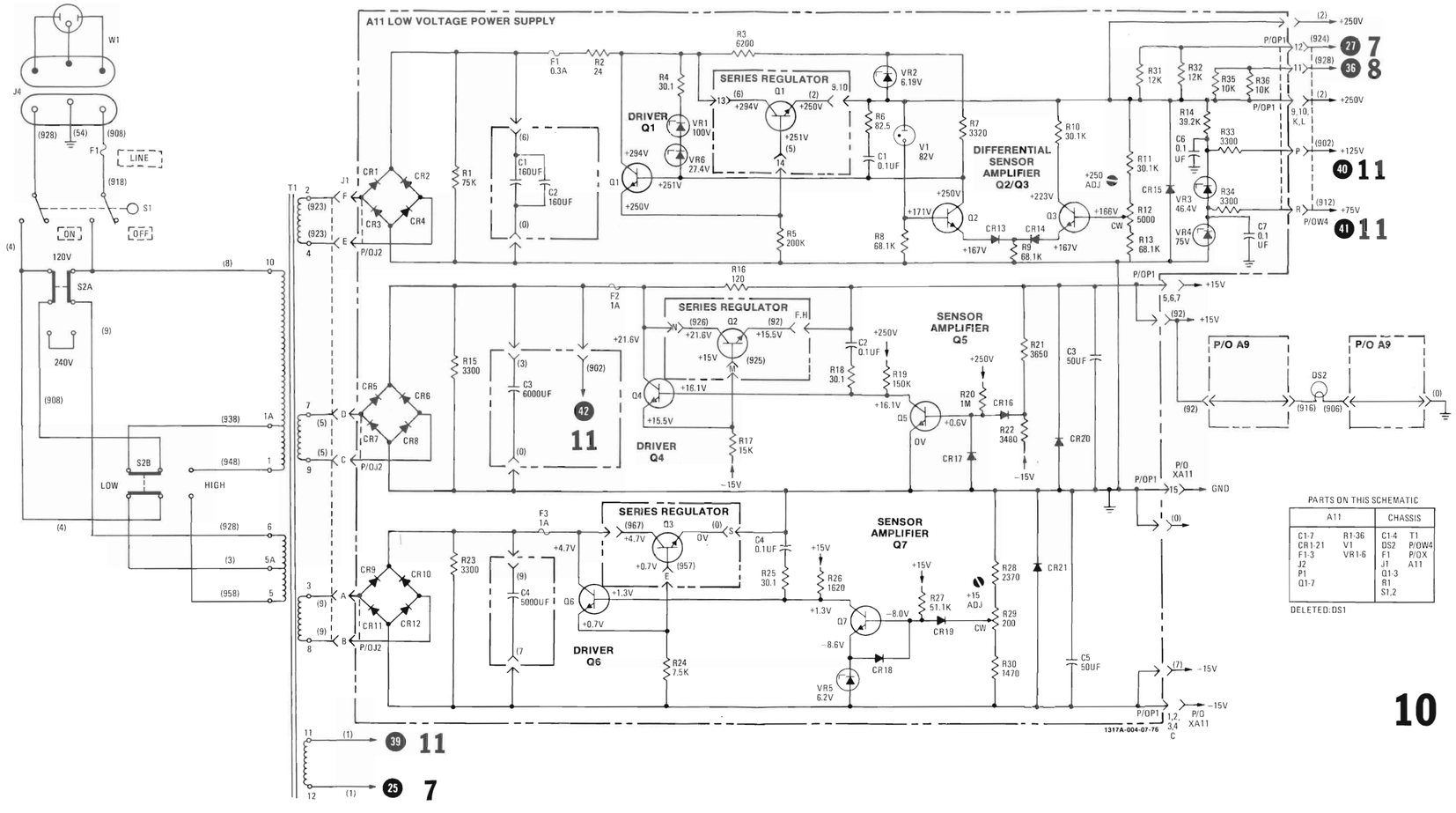


CIRCUIT SIDE		COMPONENT SIDE	
A	FOCUS RETURN	1	−15V
B	GRID RETURN	2	−15V
C	−15V	3	−15V
D	COLLECTOR Q3	4	−15V
E	BASE Q3	5	+15V
F	EMITTER Q2	6	+15V
H	EMITTER Q2	7	+15V
J		8	
K	+250V	9	EMITTER Q1
L	+250V	10	EMITTER Q1
M	BASE Q2	11	+250V TO A6C11
N	COLLECTOR Q2	12	+250V TO A6Q8
P	+250V TO CRT ACCEL.	13	COLLECTOR Q1
R	+250V TO CRT MESH	14	BASE Q1
S	EMITTER Q3	15	GND

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	J-4	CR14	J-4	R3	J-5	R23	D-3
C2	F-4	CR15	I-3	R4	K-5	R24	D-3
C3	F-5	CR16	F-4	R5	L-5	R25	C-4
C4	C-4	CR17	F-5	R6	I-4	R26	D-3
C5	D-5	CR18	D-3	R7	K-5	R27	D-3
C6	G-5	CR19	C-5	R8	K-4	R28	C-5
C7	G-5	CR20	F-5	R9	K-4	R29	E-5
CR1	L-4	CR21	C-5	R10	I-4	R30	D-5
CR2	L-4	F1	L-3	R11	I-3	R31	B-3
CR3	L-3	F2	F-3	R12	J-3	R32	B-3
CR4	L-4	F3	C-3	R13	K-3	R33	G-5
CR5	G-4	Q1	L-5	R14	I-5	R34	G-5
CR6	G-4	Q2	J-5	R15	G-4	R35	C-4
CR7	G-4	Q3	J-4	R16	F-3	V1	I-4
CR8	G-3	Q4	F-4	R17	F-4	VR1	K-5
CR9	C-4	Q5	F-5	R18	F-4	VR2	I-5
CR10	C-4	Q6	E-4	R19	G-4	VR3	I-5
CR11	C-3	Q7	D-4	R20	G-5	VR4	I-5
CR12	C-4	R1	L-4	R21	F-4	VR5	D-5
CR13	J-4	R2	K-4	R22	F-4	VR6	J-5

1317A-L-029

Figure 8-19. All Component Locator



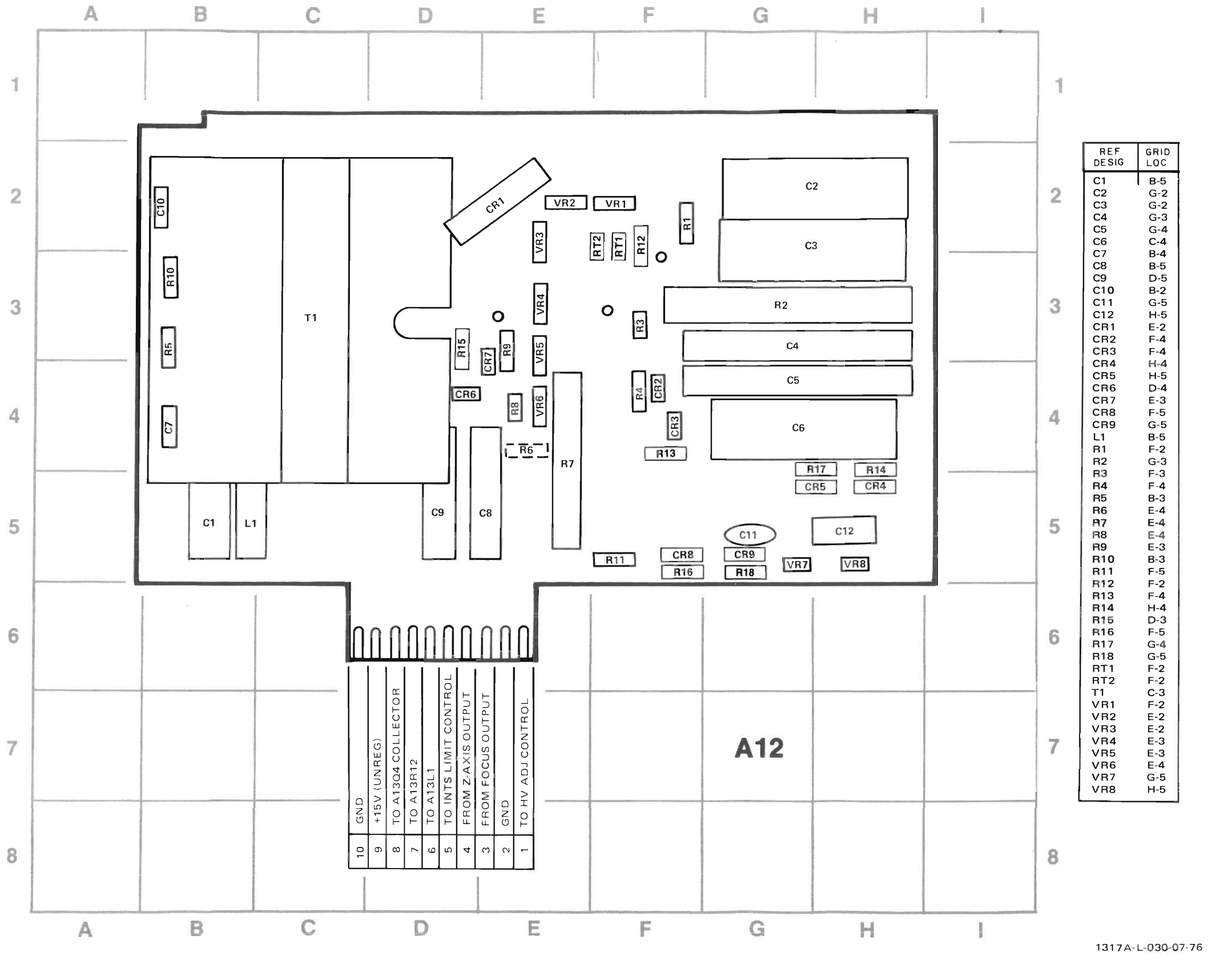
PARTS ON THIS SCHEMATIC

A11		CHASSIS	
C1-7	R1-36	C1-4	T1
CR1-21	V1	DS2	P/OW4
F1-3	VR1-6	F1	P/OX
J2		J1	A11
P1		Q1-3	
Q1-7		R1	
		S1,2	

DELETED: DS1

10

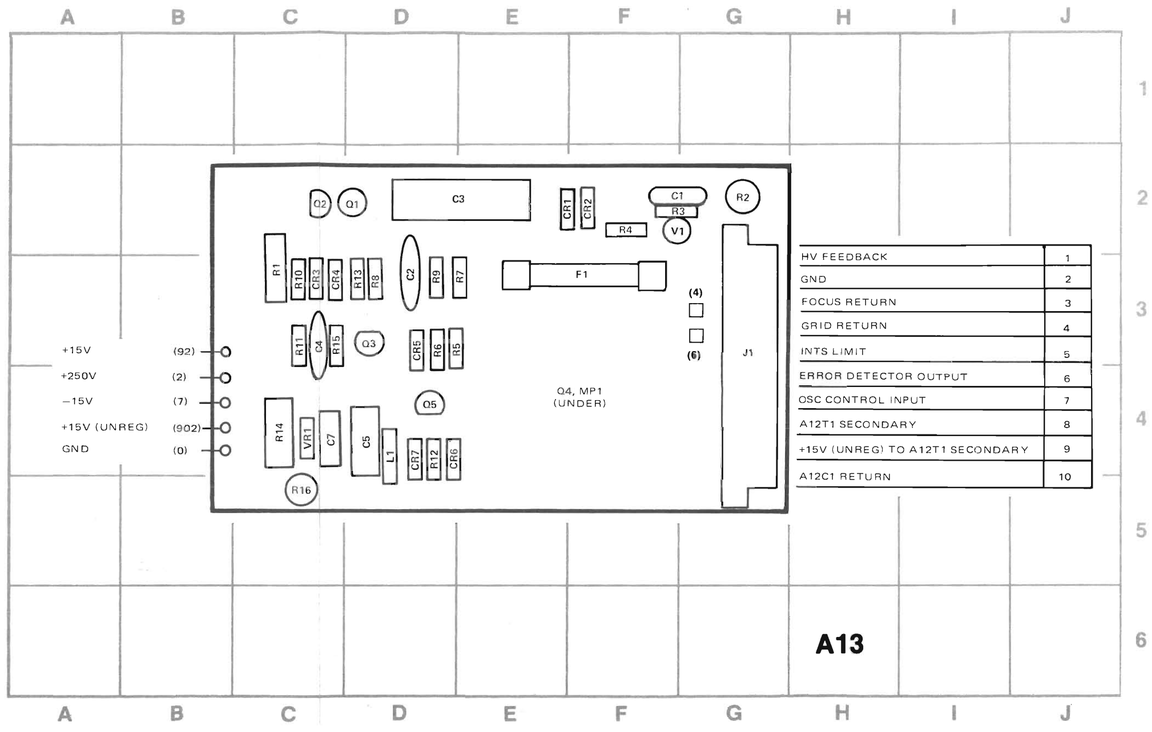
Figure 8-20.
Low Voltage Power Supply



REF DESIG	GRID LOC
C1	B-5
C2	G-2
C3	G-2
C4	G-3
C5	G-4
C6	C-4
C7	B-4
C8	B-5
C9	D-5
C10	B-2
C11	G-5
C12	H-5
CR1	E-2
CR2	F-4
CR3	F-4
CR4	H-4
CR5	H-5
CR6	D-4
CR7	E-3
CR8	F-5
CR9	G-5
L1	B-5
R1	F-2
R2	G-3
R3	F-3
R4	F-4
R5	B-3
R6	E-4
R7	E-4
R8	E-4
R9	E-3
R10	B-3
R11	F-5
R12	F-2
R13	F-4
R14	H-4
R15	D-3
R16	F-5
R17	G-4
R18	G-5
RT1	F-2
RT2	F-2
T1	C-3
VR1	F-2
VR2	E-2
VR3	E-2
VR4	E-3
VR5	E-3
VR6	E-4
VR7	G-5
VR8	H-5

1317A-L-030-07-76

Figure 8-21. A12 Component Locator



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	F-2	C7	C-4	CR5	D-3	L1	D-4	Q4	F-4	R4	F-2	R9	D-3	R14	C-4
C2	D-3	CR1	E-2	CR6	D-4	MP1	F-4	Q5	D-4	R5	D-3	R10	C-3	R15	C-3
C3	E-2	CR2	F-2	CR7	D-4	Q1	D-2	R1	C-3	R6	D-3	R11	C-3	R16	C-5
C4	C-3	CR3	C-3	F1	F-3	Q2	C-2	R2	G-2	R7	E-3	R12	D-4	V1	F-2
C5	D-4	CR4	C-3	J1	G-3	Q3	D-3	R3	F-2	R8	D-3	R13	D-3	VR1	C-4

1317A-L-031

Figure 8-22. A13 Component Locator

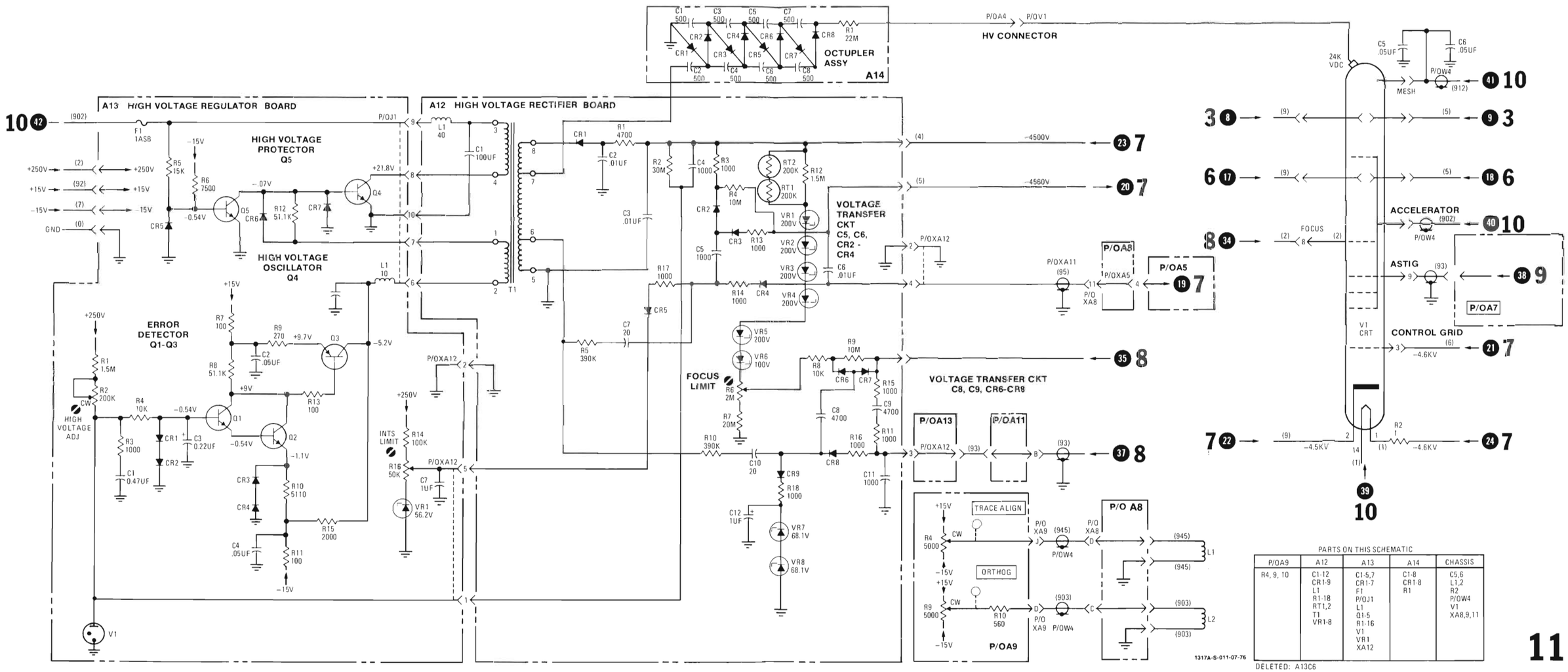


Figure 8-23.
High Voltage Power Supply

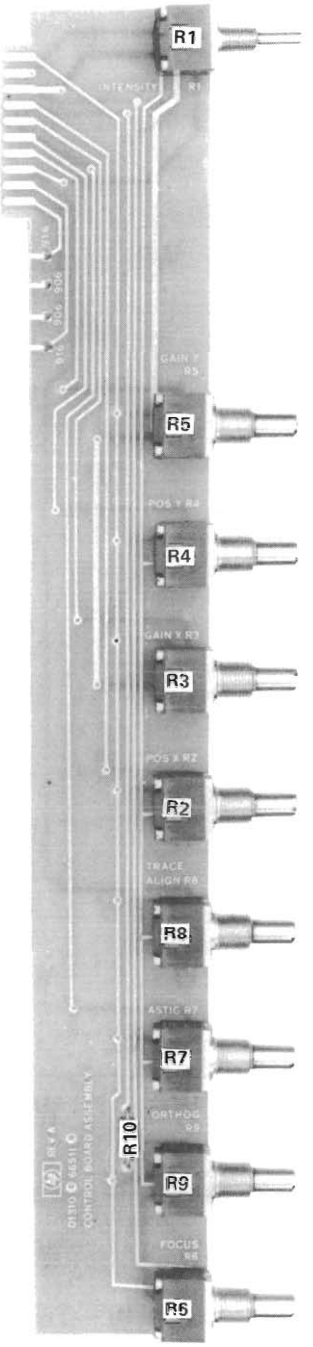
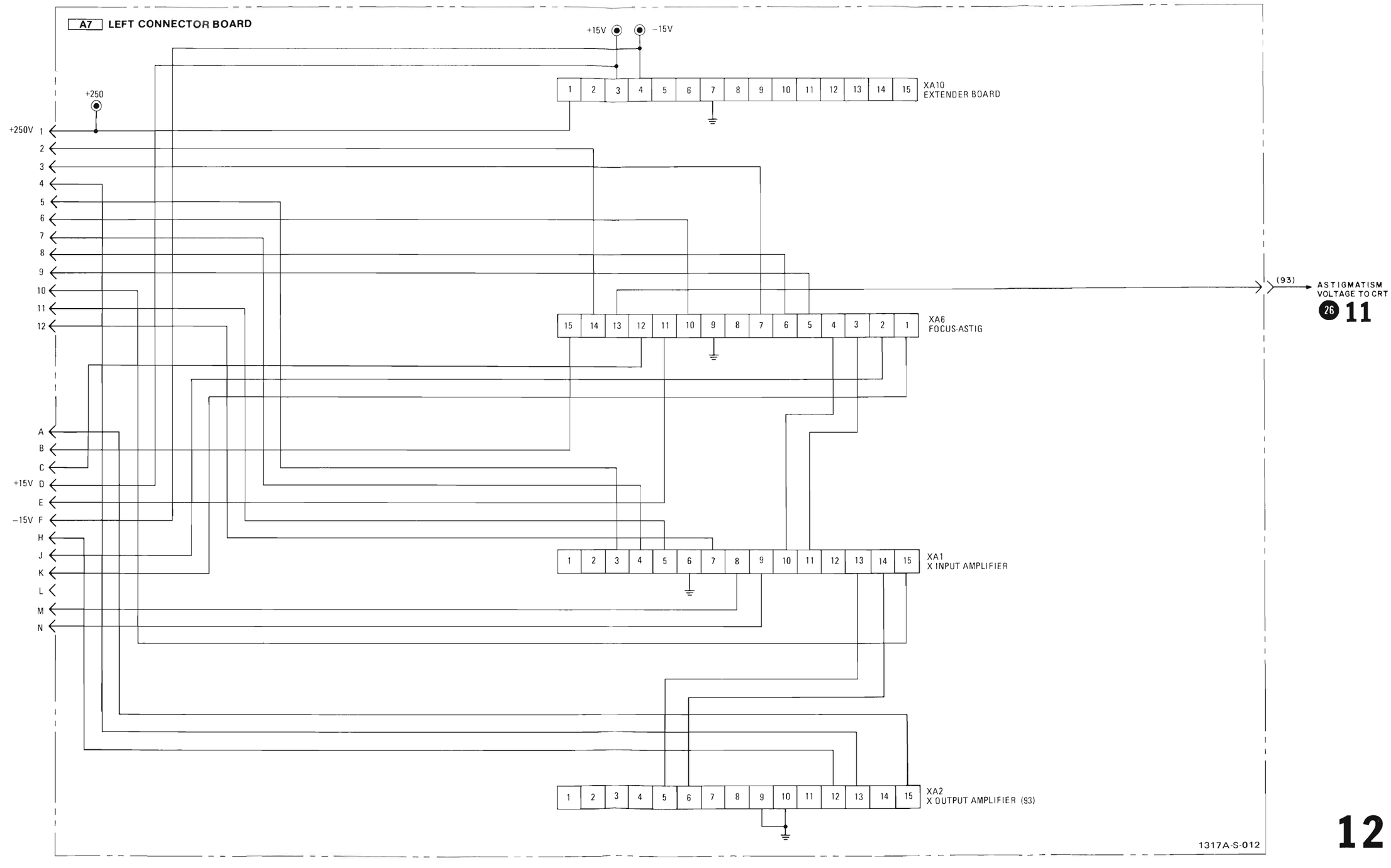
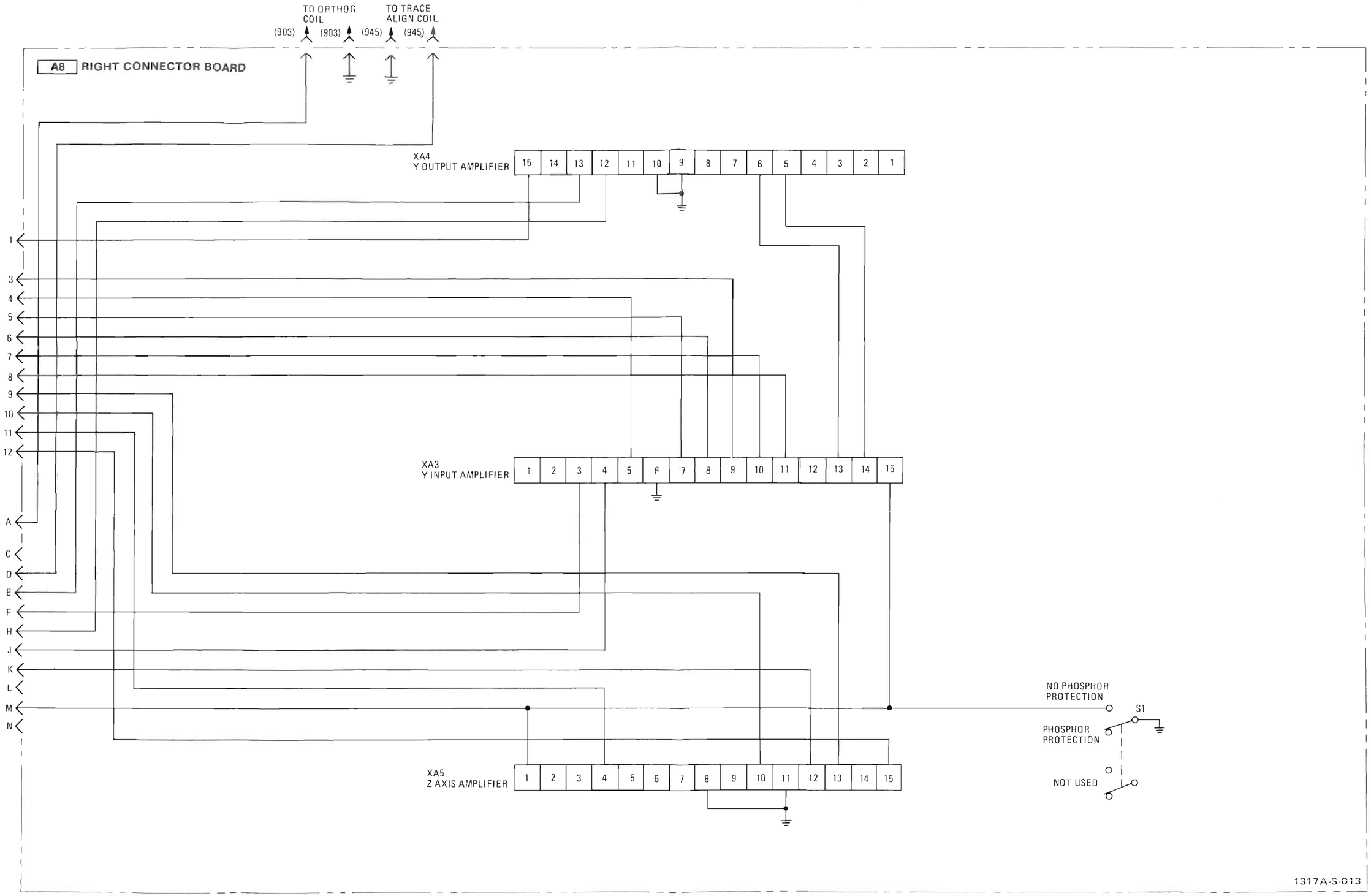


Figure 8-24 A9 Component Identification



12

Figure 8-25.
Left Connector Board Schematic 12



13

Figure 8-26. Right Connector Board Schematic 13

HEWLETT hp PACKARD

SALES & SERVICE OFFICES

AFRICA, ASIA, AUSTRALIA

AMERICAN SAMOA
Calculators Only
Oceanic Systems Inc.
P.O. Box 777
Pago Pago Bayfront Road
Pago Pago 96799
Tel: 633-5513
Cable: OCEANIC-Pago Pago

ANGOLA
Telectra
Empresa Técnica de Equipamentos Eléctricos, S.A.R.L.
R. Barbosa Rodrigues, 42-1°DT.°
Caixa Postal, 6487
Luanda
Tel: 35515/6
Cable: TELECTRA Luanda

AUSTRALIA
Hewlett-Packard Australia Pty. Ltd.
31-41 Joseph Street
Blackburn, Victoria 3130
P.O. Box 36
Doncaster East, Victoria 3109
Tel: 89-6351
Telex: 31-024
Cable: HEWPARD Melbourne

Hewlett-Packard Australia Pty. Ltd.
31 Bridge Street
Pymble
New South Wales, 2073
Tel: 449-6566
Telex: 21561
Cable: HEWPARD Sydney

Hewlett-Packard Australia Pty. Ltd.
153 Greenhill Road
Parkside, 5063, S.A.
Tel: 272-5911
Telex: 82536 ADEL
Cable: HEWPARD ADELAIDE

Hewlett-Packard Australia Pty. Ltd.
141 Stirling Highway
Nedlands, W.A. 6009
Tel: 86-5455
Telex: 93859 PERTH
Cable: HEWPARD PERTH

Hewlett-Packard Australia Pty. Ltd.
121 Wollongong Street
Fyshwick, A.C.T. 2609
Tel: 95-3733
Telex: 62650 Canberra
Cable: HEWPARD CANBERRA

Hewlett Packard Australia Pty. Ltd.
5th Floor
Teachers Union Building
495-499 Boundary Street
Spring Hill, 4000 Queensland
Tel: 29-1544
Telex: 42133 BRISBANE

GUAM
Medical/Pocket Calculators Only
Guam Medical Supply, Inc.
Jay Ease Building, Room 210
P.O. Box 8947
Tamuning 96911
Tel: 646-4513
Cable: EARMED Guam

HONG KONG
Schmidt & Co (Hong Kong) Ltd
P.O. Box 297
Connalight Centre
39th Floor
Connaught Road, Central
Hong Kong
Tel: H-255291-5
Telex: 74766 SCHMC HX
Cable: SCHMIDTCO Hong Kong

INDIA
Blue Star Ltd.
Kasturi Buildings
Jamshedji Tata Rd.
Bombay 400 020
Tel: 29 50 21
Telex: 2156
Cable: BLUEFROST

Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
Prabhadevi
Bombay 400 025
Tel: 45 78 87
Telex: 4093
Cable: FROSTBLUE

Blue Star Ltd
Band Box House
Prabhadevi
Bombay 400 025
Tel: 45 73 01
Telex: 3751
Cable: BLUESTAR

Blue Star Ltd.
14/40 Civil Lines
Kanpur 208 001
Tel: 6 88 82
Telex: 292
Cable: BLUESTAR

Blue Star Ltd.
7 Hare Street
P.O. Box 506
Calcutta 700 001
Tel: 23-0131
Telex: 7655
Cable: BLUESTAR

Blue Star Ltd.
7th & 8th Floor
Bhandari House
91 Nehru Place
New Delhi 110024
Tel: 634770 & 635166
Telex: 2463
Cable: BLUESTAR

Blue Star Ltd.
Blue Star House
11/11A Magarath Road
Bangalore 560 025
Tel: 55668
Telex: 430
Cable: BLUESTAR

Blue Star Ltd.
Meeakshi Mandiran
xxx/1678 Mahatma Gandhi Rd.
Cochin 682 016 Kerala
Tel: 32069, 32161, 32282
Telex: 046-514
Cable: BLUESTAR

Blue Star Ltd.
1-1-117/1
Sarojini Devi Road
Secunderabad 500 003
Tel: 70126, 70127
Cable: BLUEFROST
Telex: 459

Blue Star Ltd.
2/34 Kodambakkan High Road
Madras 600034
Tel: 82056
Telex: 041-379
Cable: BLUESTAR

Blue Star Ltd.
Nathraj Mansions
2nd Floor Bistupur
Jamshedpur 831 001
Tel: 7383
Cable: BLUESTAR
Telex: 240

INDONESIA
BERCA Indonesia P.T.
P.O. Box 496
1st Floor JL. Cikini Raya 61
Jakarta
Tel. 56038, 40369, 49886
Telex: 42895
Cable: BERCACON

BERCA Indonesia P.T.
63 JL. Raya Gubeng
Surabaya
Tel: 44309

ISRAEL
Electronics & Engineering Div. of Motorola Israel Ltd.
16, Kremenetski Street
P.O. Box 25016
Tel-Aviv
Tel: 03-389 73
Telex: 33569
Cable: BASTEL Tel-Aviv

JAPAN
Yokogawa-Hewlett-Packard Ltd.
Ohashi Building
1-59-1 Yoyogi
Shibuya-ku, **Tokyo**
Tel. 03-370-2281/92
Telex: 232-2024YHP
Cable: YHPMARKET TOK 23-724

Yokogawa-Hewlett-Packard Ltd.
Nissei Ibaraki Building
2-8 Kasuga 2-chrome, Ibaraki-shi
Osaka 567
Tel. (0726) 23-1641
Telex: 5332-385 YHP OSAKA

Yokogawa-Hewlett-Packard Ltd.
Nakamo Building
24 Kami Sasajima-cho
Nakamura-ku, **Nagoya**, 450
Tel: (052) 571-5171

Yokogawa-Hewlett-Packard Ltd
Tanigawa Building
2-24-1 Tsuruya-choo
Kanagawa-ku
Yokohama, 221
Tel: 045-312-1252
Telex: 382-3204 YHP YOK

Yokogawa-Hewlett-Packard Ltd.
Mito Mitsui Building
105, 1-chrome, San-no-maru
Mito, Ibaragi 310
Tel:: 0292-25-7470

Yokogawa-Hewlett-Packard Ltd.
Inoue Building
1348-3, Asahi-cho, 1-chome
Atsugi, Kanagawa 243
Tel: 0462-24-0452

Yokogawa-Hewlett-Packard Ltd.
Inoue Building
1348-3, Asahi-cho, 1-chome
Atsugi, Kanagawa 243
Tel. 0462-24-0452

Yokogawa-Hewlett-Packard Ltd.
Kimura Building
3rd Floor 20
2-chome, Tsukuba
Kumagaya, Saitama 360
Tel: 0485-24-6563

KENYA
Technical Engineering Services (E.A.)Ltd.,
P.O. Box 18311
Nairobi
Tel: 557726/556762
Cable: PROTON

Medical Only
International Aeradio(E.A.)Ltd.,
P.O. Box 19012
Nairobi Airport
Nairobi
Tel: 336055/56
Telex: 22201/22301

KOREA
Samsung Electronics Co., Ltd.
20th Fl. Dongbang Bldg. 250, 2-KA, C.P.O. Box 2775
Taepyung-Ro, Chung-Ku
Seoul
Tel: (24) 2410-9
Telex: 22575

MALAYSIA
Teknik Mutu Sdn. Bhd.
2 Lorong 13/6A
Section 13
Petaling Jaya, Selangor
Tel: Kuala Lumpur-54994
Telex: MA 37605

Protel Engineering
P.O. Box 917
Lot 259, Satok Road
Kuching, **Sarawak**
Tel: 2400

MOZAMBIQUE
A.N. Goncalves, Lta.
162, 1° Apt. 14 Av. D. Luis
Caixa Postal 107
Lourenco Marques
Tel: 27091, 27114
Telex: 6-203 Negon Mo

NEW ZEALAND
Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
Kilbirnie, Wellington 3
Mailing Address: Hewlett-Packard (N.Z.) Ltd.
P.O. Box 9443
Courtney Place
Wellington
Tel: 877-199
Telex: NZ 3839
Cable: HEWPACK Wellington

Hewlett-Packard (N.Z.) Ltd.
Pakuranga Professional Centre
267 Pakuranga Highway
Box 51092
Pakuranga
Tel: 569-651
Telex: NZ 3839
Cable: HEWPACK,Auckland

Analytical/Medical Only
Medical Supplies N.Z. Ltd.
Scientific Division
79 Carlton Gore Rd., Newmarket
P.O. Box 1234
Auckland
Tel: 75-289
Telex: 2958 MEDISUP
Cable. DENTAL Auckland

Analytical/Medical Only
Medical Supplies N.Z. Ltd
P.O. Box 1994
147-161 Tory St.
Wellington
Tel: 850-799
Telex: 3858
Cable. DENTAL, Wellington

Analytical/Medical Only
Medical Supplies N.Z. Ltd.
P.O. Box 309
239 Stanmore Road
Christchurch
Tel: 892-019
Cable. DENTAL, Christchurch

Analytical/Medical Only
Medical Supplies N.Z. Ltd.
303 Great King Street
P.O. Box 233
Dunedin
Tel: 88-817
Cable: DENTAL, Dunedin

NIGERIA
The Electronics Instrumentations Ltd
N6B/770 Oyo Road
Oluseun House
P.M.B. 5402
Ibadan
Tel: 61577
Telex: 31231 TEIL Nigeria
Cable: THETEIL Ibadan

The Electronics Instrumentations Ltd.
144 Agege Motor Road, Mushin
P.O. Box 6645
Lagos
Cable: THETEIL Lagos

PAKISTAN
Mushko & Company, Ltd.
Dosman Chambers
Abdullah Haroon Road
Karachi-3
Tel: 511027, 512927
Telex: KR894
Cable: COOPERATOR Karachi

Mushko & Company, Ltd.
38B, Satellite Town
Rawalpindi
Tel. 41924
Cable: FEMUS Rawalpindi

PHILIPPINES
The Online Advanced Systems Corporation
Filcapital Bldg.
11th Floor, Ayala Ave.
Makati, **Rizal**
Tel: 85-34-91, 85-35-81
Telex: 3274 ONLINE

RHODESIA
Field Technical Sales
45 Kelvin Road North
P.O. Box 3458
Salisbury
Tel: 705231 (5 lines)
Telex: RH 4122

SINGAPORE
Hewlett-Packard Singapore (Pte.) Ltd.
Blk. 2, 6th Floor, Jalan Bukit Merah
Redhill Industrial Estate
Alexandra P.O. Box 58.
Singapore 3
Tel: 633022
Telex: HPSG RS 21486
Cable. HEWPACK, Singapore

SOUTH AFRICA
Hewlett-Packard South Africa (Pty.) Ltd.
Private Bag Wendywood
Sandton, Transvaal 2144
Hewlett-Packard House
Daphne Street, Wendywood,
Sandton, Transvaal 2144
Tel. 802-104016
Telex. SA43-4782JH
Cable. HEWPACK JOHANNESBURG

Hewlett-Packard South Africa (Pty.) Ltd.
P.O. Box 120
Howard Place, Cape Province, 7450
Pine Park Center, Forest Drive,
Pinelands, Cape Province, 7405
Tel: 53-7955 thu 9
Telex: 57-0006

Hewlett-Packard South Africa (Pty.) Ltd.
P.O. Box 37099
Overport, Durban 4067
641 Ridge Road, Durban
Durban, 4001
Tel: 88-7478/9
Telex. 6-7954
Cable: HEWPACK

TAIWAN
Hewlett-Packard Far East Ltd.,
Taiwan Branch
39 Chung Shiao West Road
Sec. 1, 7th Floor
Taipei
Tel: 3819160-4 (5 Lines)
Telex: 21824 HEWPACK
Cable: HEWPACK TAIPEI

Hewlett-Packard Far East Ltd.
Taiwan Branch
68-2, Chung Cheng 3rd. Road
Kaohsiung
Tel: (07) 242318-Kaohsiung

Analytical Only
San Kwang Instruments Co., Ltd.,
No. 20, yung Sui Road
Taipei, 100
Tel: 3715171-4 (5 lines)
Telex: 22894 SANKWANG
Cable: SANKWANG TAIPEI

TANZANIA
Medical Only
International Aeradio (E.A.), Ltd.
P.O. Box 861
Daressalaam
Tel: 21251 Ext. 265
Telex: 41030

THAILAND
UNIMESA Co., Ltd
Elcom Research Building
Bangjak Sukumvit Ave
Bangkok
Tel. 932387, 930338
Cable: UNIMESA Bangkok

UGANDA
Medical Only
International Aeradio(E.A.), Ltd.,
P.O. Box 2577
Kampala
Tel 54388
Cable: INTAERIO Kampala

ZAMBIA
R.J. Tilbury (Zambia) Ltd.
P.O. Box 2792
Lusaka
Tel: 73793
Cable: ARJAYTEE, Lusaka

OTHER AREAS NOT LISTED, CONTACT:
Hewlett-Packard Intercontinental
3200 Hillview Ave.
Palo Alto, California 94304
Tel: (415) 493-1501
TWX: 910-373-1267
Cable: HEWPACK Palo Alto
Telex: 034-8300, 034-8493

CANADA

ALBERTA
Hewlett-Packard (Canada) Ltd.
11620A - 168 Street
EdmontonT5M 3T9
Tel: (403) 452-3670
TWX: 610-831-2431 EDTH

Hewlett-Packard (Canada) Ltd.
915-42 Ave S.E. Suite 102
Calgary T2G 1Z1
Tel: (403) 287-1672
Twx: 610-821-6141

BRITISH COLUMBIA
Hewlett-Packard (Canada) Ltd.
837 E. Cordova Street
Vancouver V6A 3R2
Tel: (604) 254-0531
TWX: 610-922-5059 VCR

MANITOBA
Hewlett-Packard (Canada) Ltd.
513 Century St.
St. James
Winnipeg R3H 0L8
Tel: (204) 786-7581
TWX: 610-671-3531

NOVA SCOTIA
Hewlett-Packard (Canada) Ltd.
800 Windmill Road
P.O. Box 9331
Dartmouth B2Y 3Z6
Tel: (902) 469-7820
TWX: 610-271-4482 HFX

ONTARIO
Hewlett-Packard (Canada) Ltd.
1785 Woodward Dr
Ottawa K2C 0P9
Tel: (613) 225-6530
TWX: 610-562-8968

Hewlett-Packard (Canada) Ltd.
6877 Goreway Drive
Mississauga L4V 1M8
Tel: (416) 678-9430
TWX: 610-492-4246

QUEBEC
Hewlett-Packard (Canada) Ltd.
275 Hymus Blvd
Pointe Claire H9R 1G7
Tel: (514) 697-4232
TWX: 610-422-3022
TLX: 05-821521 HPCL

FOR CANADIAN AREAS NOT LISTED:
Contact Hewlett-Packard (Canada) Ltd. in Mississauga.

CENTRAL AND SOUTH AMERICA

ARGENTINA
Hewlett-Packard Argentina S.A.
Av. Leandro N. Alem 822 - 12°
1001**Buenos Aires**
Tel: 31-6063, 4, 5, 6 and 7
Telex: Public Booth N° 9
Cable: HEWPACK ARG

BOLIVIA
Stambuk & Mark (Bolivia) Ltda.
Av. Mariscal, Santa Cruz 1342
La Paz
Tel: 40626, 53163, 52421
Telex: 3560014
Cable: BUKMAR

BRAZIL
Hewlett-Packard do Brasil I.E.C. Ltda.
Avenida Rio Negro, 980
Alphaville
06400 Barueria **Sao Paulo**
Tel: 429-2148/9;429-2118/9

Hewlett-Packard do Brasil I.E.C. Ltda.
Rua Padre Chagas, 32
90000-**Pórto Alegre**-RS
Tel: (0512) 22-2998, 22-5621
Cable: HEWPACk poHto Alegre

Hewlett-Packard do Brasil I.E.C. Ltda.
Rua Siqueira Campos, 53, 4° andar-Copacabana
20000-**Rio de Janeiro**-GB
Tel: 257-80-94-DDD (021)
Telex: 391-212-I905 HEWP-BR
Cable: HEWPACK
Rio de Janeiro

CHILE
Calcagni y Metcalfe Ltda.
Alameda 580-Of. 807
Casilla 2118
Santiago, 1
Tel: 398613
Telex: 3520001 CALMET
Cable: CALMET Santiago

Medical Only
General Machinery Co., Ltda.
Paraguay 494
Casilla 13910
Santiago
Tel: 31123, 31124
Cable: GEMCO Santiago

COLOMBIA
Instrumentacidn
Henrik A. Langebaek & Kier S.A.
Carrera 7 No. 48-75
Apartado Aéreo 6287
Bogotá, I.D.E.
Tel: 69-88-77
Cable: AARIS Bogotá
Telex: 044-400

COSTA RICA
Cientifica Costarricense S.A.
Calle Central, Avenidas 1 y 3
Apartado 10159
San José
Tel: 21-86-13
Cable: GALGUR San José

ECUADOR
Medical Only
A.F. Viscaino Compañia Ltda
Av. Rio Amazonas No. 239
P.O. Box 2925
Quito
Tel: 242-150,247-033/034
Cable: Astor Quito

Calculators Only
Computadoras y Equipos Electrdnicos
P.O. Box 2695
990 Toledo (y Cordero)
Quito
Tel: 525-982
Telex: 02-2113 Sagita Ed
Cable: Sagita-Quito

EL SALVADOR
Instrumentacion y Procesamiento Electronico de el Salvador
Bulevar de los Heroes II-48
San Salvador
Tel: 252787

GUATEMALA
IPESA
Avenida La Reforma 3-48, Zona 9
Guatemala City
Tel: 63627, 64786
Telex: 4192 Teletro Gu

MEXICO
Hewlett-Packard Mexicana, S.A. de C.V.
Torres Adalid No. 21, 11 Piso
Col. del Valle
Mexico 12, D.F.
Tel: (905) 543-42-32
Telex: 017-74-507

Hewlett-Packard Mexicana, S.A. de C.V.
Ave. Constitucidn No. 2184
Monterrey, N.L.
Tel: 48-71-32, 48-71-84
Telex: 038-843

NICARAGUA
Roberto Terán G
Apartado Postal 689
Edificio Terán
Managua
Tel. 25114, 23412,23454
Cable: ROTERAN Managua

PANAMA
Electrdnico Balboa, S.A.
P.O. Box 4929
Calle Samuel Lewis
Cuidad de Panama
Tel: 64-2700
Telex: 3431103 Curunda Canal Zone
Cable: ELECTRON Panama

PARAGUAY
C.J. Melamed S.R.L.
Divisidn: Aparatos y Equipos Médicos
Divisidn: Aparatos y Equipos Científicos y de Investigacidn
P.O. Box 676
Chile-482, Edificio Victoria
Asuncidn
Tel: 4-5069, 4-6272
Cable: RAMEL

PERU
Compañia Electro Médica S.A.
Los Flamencos 145
San Isidro Casilla 1030
Lima 1
Tel: 41-4325
Cable: ELMED Lima

PUERTO RICO
Hewlett-Packard Inter-Americas
Puerto Rico Branch Office
Calle 272, Urb. Country Club
Carolina 00639
Tel: (809) 762-7355/7455/7655
Telex: HPIC-PR 3450514

URUGUAY
Pablo Ferrando S.A.
Comercial e Industrial
Avenida Italia 2877
Casilla de Correo 370
Montevideo
Tel: 40-3102
Cable: RADIUM Montevideo

VENEZUELA
Hewlett-Packard de Venezuela C.A.
Apartado 50933, Caracas 105
Edificio Segre
Tercera Transversal
Los Ruices Norte
Caracas 107
Tel: 35-01-07, 35-00-84, 35-00-65, 35-00-31
Telex: 25146 HEWPACK
Cable: HEWPACK Caracas

FOR AREAS NOT LISTED, CONTACT:
Hewlett-Packard
Inter-Americas
3200 Hillview Ave.
Palo Alto, California 94304
Tel: (415) 493-1501
TWX: 910-373-1260
Cable. HEWPACK Palo Alto
Telex: 034-8300, 034-8493

EUROPE, NORTH AFRICA AND MIDDLE EAST

AUSTRIA
Hewlett-Packard Ges.m.b.H
Handelskai 52
P.O. box 7
A-1205 **Vienna**
Tel: (0222) 35 16 21 to 27
cable: HEWPAK Vienna
Telex: 75923 hewpak a

BELGIUM
Hewlett-Packard Benelux
S.A./N.V.
Avenue de Col-Vert, 1,
(Groenkraaglaan)
B-1170 **Brussels**
Tel: (02) 672 22 40
Cable: PALOBEN Brussels
Telex: 23 494 paloben bru

CYPRUS
Kyprionics
19, Gregorios & Xenopoulos Rd.
P.O. Box 1152
CY-**Nicosia**
Tel. 45628/29
Cable: KYPRONICS PANDEHIS
Telex: 3018

CZECHOSLOVAKIA
Vyvojova a Provozni Zakladna
Vyzkumnych Ustavu v Bechovicich
CSSR-25097
Bechovice u Prahy
tel: 89 93 41
Telex: 121333

DDR
Entwicklungslabor der TU Dresden
Forschungsinstitut Meinsberg
DDR-7305
Waldheim/Meinsberg
Tel: 37 667
Telex: 518741
Firma Forgber
Schlegelstrasse 15
1040 **Berlin**
Tel. 28 27 411
Telex: 112889

DENMARK
Hewlett-packard A/S
Datavej 52
DK-3460 **Birkerod**
Tel: (02) 81 66 40
Cable: HEWPACK AS
Telex: 166 40 hpas
Hewlett-Packard A/S
Navervej 1
DK-8600 **Silkeborg**
Tel: (06) 82 71 66
Telex: 166 40 hpas
Cable: HEWPACK AS

FINLAND
Hewlett-Packard OY
Nahkahousuntie 5
P.O. Box 6
SF-00211 **Helsinki** 21
Tel: 6923031
Cable: HEWPACKOY Helsinki
Telex: 12-1563

FRANCE
Hewlett-Packard France
Quartier de Courtaboeuf
Boite Postale No. 6
F-91401 **Orsay** Cédex
Tel: (1) 907 78 25
Cable: HEWPACK Orsay
Telex: 600048
Hewlett-Packard France
"Le Saquin"
Chemin des Mouilles
Boite Postale No 12
F-69130 **Ecully**
Tel: (78) 33 81 25.
Cable: HEWPACK Eculy
Telex: 310617
Hewlett-Packard France
Agence Régionale
Péricentre de la Cépière
Chemin de la Cépière, 20
F-31300 **Toulouse-Le Mirail**
Tel:(61) 40 11 12
Cable: HEWPACK 51957
Telex: 510957
Hewlett-Packard France
Agence Régionale
Aéroport principal de
Marseille-Marignane
F-13721**Marignane**
Tel: (91) 89 12 36
Cable: HEWPACK MARGN
Telex: 410770
Hewlett-Packard France
Agence Régionale
63, Avenue de Rochester
Boîte Postale
F-35014 **Rennes** Cédex
Tel: (99) 36 33 21
Cable: HEWPACK 74912
Telex: 740912
Hewlett-Packard France
Agence Régionale
74, Allée de la Robertsau
F-67000 **Strasbourg**
Tel: (88) 35 23 20/21
Telex: 890141
Cable: HEWPACK STRBG
Hewlett-Packard France
Agence Régionale
Centre Vauban
201, rue Colbert
Entrée A2
F-59000 **Lille**
Tel: (20) 51 44 14
Telex: 820744

GERMAN FEDERAL REPUBLIC
Hewlett-Packard GmbH
Vertriebszentrale Frankfurt
Bernerstrasse 117
Posttach 560 140
D-6000 **Frankfurt** 56
Tel: (0611) 50 04-1
Cable: HEWPACKSA Frankfurt
Telex: 04 13249 hpffmd
Hewlett-Packard GmbH
Technisches Buero Böblingen
Herrenbergerstrasse 110
D-7030 **Böblingen**, Württemberg
Tel: (07031) 667-1
Cable: HEPAK Böblingen
Telex: 07265739 bbn
Hewlett-Packard GmbH
Technisches Buero Düsseldorf
Emanuel-Leutze-Str.1 (Seestern)
D-4000 **Düsseldorf**
Tel: (0211) 59 71-1
Telex: 085/86 533 hpdd d
Hewlett-Packard GmbH
Technisches Buero Hamburg
Wendenstrasse 23
D-2000 **Hamburg** 1
Tel: (040) 24 13 93
Cable: HEWPACKSA Hamburg
Telex: 21 63 032 hphh d
Hewlett-Packard GmbH
Technisches Buero Hannover
Am Grossmarkt 6
D-3000 **Hannover 91**
Tel: (0511) 46 60 01
Telex: 092 3259
Hewlett-Packard GmbH
Technisches Buero Nuremberg
Neumeyer Str. 90
D-8500 **Nuremberg**
Tel: (0911) 56 30 83/85
Telex: 0623 860
Hewlett-Packard GmbH
Technisches Buero München
Unterhachinger Strasse 28
ISAR Center
D-8012 **Ottobrunn**
Tel: (089) 601 30 61/7
Cable: HEWPACKSA München
Telex: 0524985
Hewlett-Packard GmbH
Technisches Buero Berlin
Keith Strasse 2-4
D-1000 **Berlin** 30
Tel: (030) 24 90 86
Telex: 18 3405 hpbln d

GREECE
Kostas Karayannis
18, Ermou Street
GR-**Athens** 126
Tel: 3237731
Cable: RAKAR Athens
Telex: 21 59 62 rkar gr
Analytical Only
"INTECO"
G. Papathanassiou & Co
Marni 17
GR - **Athens** 103
Tel: 522 1915
Cable: INTEKNIKA Athens
Telex: 21 5329 INTE GR
Medical Only
Technomed Hellas Ltd.
52,Skoufa Street
GR - **Athens** 135
Tel: 362 6972, 363 3830
Cable:etalak athens
Telex: 21-4693 ETAL GR

HUNGARY
MTA
Muszerügyi és Méréstechnikai
Szolgalata
Lenin Krt. 67
1391 **Budapest** VI
Tel: 42 03 38
Telex: 22 51 14

ICELAND
Medical Only
Elding Trading Company Inc.
Hafnarhvoli - Tryggvatotu
IS-**Reykjavik**
Tel: 1 58 20
Cable: ELDING Reykjavik

IRAN
Hewlett-Packard Iran Ltd.
No. 13, Fourteenth St
Miremad Avenue
P.O. Box 41/2419
IR-**Tehran**
Tel: 851082-7
Telex: 213405 HEWP IR

IRELAND
Hewlett-Packard Ltd.
King Street Lane
GB-**Winnerah**,Wokingham
Berks. RG11 5AR
Tel: (0734) 78 47 74
Telex: 847178

ITALY
Hewlett-Packard Italiana S.p.A.
Casella postale 3645
I-20100 **Milano**
Tel: (2) 6251 (10 lines)
Cable: HEWPACKIT Milano
Telex: 32046
Hewlett-Packard Italiana S.p.A.
Via Pietro Maroncelli 40 ,
(ang. Via Visentin)
I-35100 **Padova**
Tel: (49) 66 48 88
Telex: 41612 Hewpacki
Medical only
Hewlett-Packard Italiana S.p.A
Via d'Aghiardi, 7
I-56100 **Pisa**
Tel (050) 2 32 04
Telex: 32046 via Milano
Hewlett-Packard Italiana S.p.A.
Via G. Armellini 10
I-00143 **Roma**
Tel. (06) 54 69 61
Telex: 61514
Cable: HEWPACKIT Roma
Hewlett-Packard Italiana S.p.A.
Via San Quintino, 46
I-10121 **Torino**
Tel. (011) 52 82 64/54 84 68
Telex: 32046 via Milano
Medical/Calculators Only
Hewlett-Packard Italiana S.p.A.
Via Principe Nicola 43 G/C
I-95126 **Catania**
Tel:(095) 37 05 04
Hewlett-Packard Italiana S.p.A.
Via Amerigo Vespucci, 9
I-80142 **Napoli**
Tel. (081) 33 77 11
Hewlett-Packard Italiana S.p.A.
Via E. Masi, 9/3
I-40137 **Bologna**
Tel: (051) 30 78 87

KUWAIT
Al-Khaldiya Trading &
Contracting Co.
P.O. Box 830
Kuwait
Tel: 42 49 10
Cable: VISCOUNT

LUXEMBURG
Hewlett-Packard Benelux
S.A./N.V.
Avenue du Col-Vert, 1,
(Groenkraaglaan)
B-1170 **Brussels**
Tel: (02) 672 22 40
Cable: PALOBEN Brussels
Telex: 23 494

MOROCCO
Gerep
190, Blvd. Brahim Roudani
Casablanca
Tel: 25-16-76/25-90-99
Cable: Gerep-Casa
Telex: 23739

NETHERLANDS
Hewlett-Packard Benelux N.V.
Van Heuven Goedhartlaan 121
P.O. Box 667
NL- **Amstelveen** 1134
Tel: (020) 47 20 21
Cable: PALOBEN Amsterdam
Telex: 13 216 hepa nl

NORWAY
Hewlett-Packard Norge A/S
Nesveien 13
Box 149
N-1344 **Haslum**
Tel. (02) 53 83 60
Telex: 16621 hpnas n

POLAND
Biuro Informacji Technicznej
Hewlett-Packard
Ul Stawki 2 6P
00-950**Warsaw**
Tel: 39 67 43
Telex. 81 24 53 hepa pl

UNIPAN
Zaklad Doswiadczalny
Budowy Aparatury Naukowej
Ul. Krajowej Rady
Narodowej 51/55
00-800 **Warsaw**
Tel: 20 62 21
Telex: 81 46 48
Zaklady Naprawcze Sprzetu
Medycznego
Plac Komuny Paryskiej 6
90-007 **Lodz**
Tel: 334-41, 337-83

PORTUGAL
Telectra-Empresa Técnica de
Equipamentos Eléctricos S.a.r.l.
Rua Rodrigo da Fonseca 103
P.O. Box 2531
P-**Lisbon** 1
Tel. (19) 68 60 72
Cable: TELECTRA Lisbon
Telex: 12598
Medical only
Mundinter
Intercambio Mundial de Comércio
S.a.r.l.
Av.A.A.de Aguiar 138
P.O. Box 2761
P - **Lisbon**
Tel: (19) 53 21 31/7
Cable: INTERCAMBIO Lisbon

RUMANIA
Hewlett-Packard Reprezentanta
BD.N. Balcescu 16
Bucharest
Tel: 158023/138885
Telex: 10440
I.I.R.U.C.
Intreprinderea Pentru
Intretinerea
Si Repararea Utilajelor de Calcul
B-dul prof. Dimitrie Pompei 6
Bucharest-Sectorul 2
Tel: 12 64 30
Telex: 01183716

SAUDI ARABIA
Modern Electronic Establishment
King Abdul Aziz str.(Head office)
P.O. Box 1228
Jeddah
Tel: 31173-332201
Cable: ELECTRA
P.O. Box 2728 (Service center)
Riyadh
Tel: 62596-66232
Cable: RAOUFCO

SPAIN
Hewlett-Packard Española, S.A.
Jerez No. 3
E-**Madrid** 16
Tel:(1) 458 26 00 (10 lines)
Telex: 23515 hpe
Hewlett-Packard Española, S.A
Milanesado 21-23
E-**Barcelona** 17
Tel: (3) 203 6200 (5 lines)
Telex: 52603 hpbe e
Hewlett-Packard Española, S.A.
Av Ramón y Cajal, 1-9°
(Edificio Sevilla I)
E-**Seville 5**
Tel: 64 44 54/58
Hewlett-Packard Española S.A.
Edificio Albia II 7° B
E-**Bilbao**-1
Tel: 23 83 06/23 82 06
Calculators Only
Hewlett-Packard Española S.A.
Gran Via Fernando El Catolico, 67
E-**Valencia**-8
Tel. 326 67 28/326 85 55

SWEDEN
Hewlett-Packard Sverige AB
Enighetsvägen 3
Fack
S-161 20 **Bromma 20**
Tel: (08) 730 05 50
Cable: MEASUREMENTS
Stockholm
Telex: 10721
Hewlett-Packard Svenge AB
Frötallsgatan 30
S-421 32 **Västra Frölunda**
Tel: (031) 49 09 50
Telex: 10721 Via Bromma Office

SWITZERLAND
Hewlett-Packard (Schweiz) AG
Zürcherstrasse 20
P.O. Box 307
CH-8952 **Schlieren-Zurich**
Tel: (01) 730 52 40
Cable: HPAG CH
Telex: 53933 hpag ch
Hewlett-Packard (Schweiz) AG
Château Bloc 19
CH-1219 **Le Lignon-Geneva**
Tel. (022) 96 03 22
Cable: HEWPACKAG Geneva
Telex: 27 333 hpag ch

SYRIA
Medical/Calculator only
Sawah & Co
Place Azmé
B.P. 2308
SYR-**Damascus**
Tel: 16367, 19697, 14268
Cable: SAWAH, Damascus

TURKEY
Telekom Engineering Bureau
P.O. Box 437
Beyoglu
TR-**Istanbul**
Tel: 49 40 40
Cable. TELEMATION Istanbul
Telex: 23609
Medical only
E.M.A.
Muhendislik Kollektif Sirketi
Adakale Sokak 41/6
TR-**Ankara**
Tel: 175622
Analytical only
Yilmaz Ozyurek
Milli Mudafaa Cad No. 16/6
Kizilay
TR-**Ankara**
Tel: 25 03 09
Telex: 42576 Ozek tr

UNITED KINGDOM
Hewlett-Packard Ltd.
King Street Lane
GB-**Winnersh**, Wokingham
Berks. RG11 5AR
Tel: (0734) 78 47 74
Cable: Hewpie London
Telex:847178/9
Hewlett-Packard Ltd.
"The Graftons"
Stamford New Road
GB-**Altrincham**
Cheshire WA14 1DQ
Tel: (061) 9289021
Cable: Hewpie Manchester
Telex: 668068

Hewlett-Packard Ltd.
Lygon Court
Dudley Road
GB-**Halesowen**, Worcs
Tel: (021) 550 9911
Telex: 339105
Hewlett-Packard Ltd.
Wedge House
799, London Road
GB-**Thornton Heath**
Surrey CR4 6XL
Tel: (01) 6640103
Telex: 946825
Hewlett-Packard Ltd.
c/o Makro
South Service Wholesale Centre
Wear Industrial Estate
Washington
GB-**New Town**, County Durham
Tel: Washington 464001 ext. 57/58
Hewlett-Packard Ltd
10, Wesley St.
GB-**Castleford**
West Yorkshire WF10 1AE
Tel: (09775) 50402
Telex: 557355
Hewlett-Packard Ltd
1, Wallace Way
GB-**Hitchin**
Herts
Tel: (0462) 52824/56704
Telex: 825981

USSR
Hewlett-Packard
Representative Office USSR
Pokrovsky Boulevard 4/17-KV 12
Moscow 101000
Tel:294-2024
Telex: 7825 hewpak su

YUGOSLAVIA
Iskra-standard/Hewlett-Packard
Miklosiceva 38/VII
61000 **Ljubljana**
Tel: 31 58 79/32 16 74
Telex: 31300

SOCIALIST COUNTRIES NOT SHOWN PLEASE CONTACT:
Hewlett-Packard Ges.m.b.H
P.O. Box 7
A-1205 **Vienna**, Austria
Tel: (0222) 35 16 21 to 27
Cable: HEWPAK Vienna
Telex: 75923 hewpak a

MEDITERRANEAN AND MIDDLE EAST COUNTRIES NOT SHOWN PLEASE CONTACT:
Hewlett-Packard S.A.
Mediterranean and Middle
East Operations
35, Kolokotroni Street
Platia Kefallanou
GR-Kifissia-**Athens**, Greece
Tel: 8080337/359/429
8081741/742/743/744
Telex: 21-6588
Cable: HEWPACKSA Athens

FOR OTHER AREAS NOT LISTED CONTACT
Hewlett-Packard S.A.
7, rue du Bois-du-Lan
P.O. Box
CH-1217 Meyrin 2 - **Geneva**
Switzerland
Tel: (022) 41 54 00

UNITED STATES

ALABAMA
8290 Whitesburg Dr., S.E.
P.O. Box 4207
Huntsville 35802
Tel: (205) 881-4591
Medical Only
228 W. Valley Ave.,
Room 220
Birmingham 35209
Tel: (205) 942-2081

ARIZONA
2336 E. Magnolia St.
Phoenix 85034
Tel: (602) 244-1361
2424 East Aragon Rd.
Tucson 85706
Tel: (602) 294-3148

***ARKANSAS**
Medical Service Only
P.O. Box 5646
Brady Station
Little Rock 72205
Tel:)501) 664-8773

CALIFORNIA
1430 East Orangethorpe Ave.
Fullerton 92631
Tel: (714) 870-1000
3939 Lankershim Boulevard
North Hollywood 91604
Tel: (213) 877-1282
TWX: 910-499-2170
6305 Arizona Place
Los Angeles 90045
Tel: (213) 649-2511
TWX: 910-328-6147
***Los Angeles**
Tel: (213) 776-7500
3003 Scott Boulevard
Santa Clara 95050
Tel: (408) 249-7000
TWX: 910-338-0518
***Ridgecrest**
Tel: (714) 446-6165
646 W. North Market Blvd
Sacramento 95834
Tel: (916) 929-7222
9606 Aero Drive
P.O. Box 23333
San Diego 92123
Tel: (714) 279-3200

COLORADO
5600 South Ulster Parkway
Englewood 80110
Tel: (303) 771-3455

CONNECTICUT
12 Lunar Drive
New Haven 06525
Tel: (203) 389-6551
TWX: 710-465-2029

FLORIDA
P.O. Box 24210
2806 W. Oakland Park Blvd.
Ft. Lauderdale 33307
Tel: (305) 731-2020
***Jacksonville**
Medical Service only
Tel: (904) 725-6333
P.O. Box 13910
6177 Lake Ellenor Dr.
Orlando 32809
Tel: (305) 859-2900
P.O. Box 12826
Pensacola 32575
Tel: (904) 434-3081

GEORGIA
P.O. Box 105005
Atlanta 30348
Tel: (404) 955-1500
TWX:810-766-4890
Medical Service Only
***Augusta** 30903
Tel: (404) 736-0592

HAWAII
2875 So. King Street
Honolulu 96814
Tel: (808) 955-4455

ILLINOIS
5201 Tollview Dr.
Rolling Meadows 60008
Tel: (312) 255-9800
TWX: 910-687-2260

INDIANA
7301 North Shadeland Ave.
Indianapolis46250
Tel: (317)842-1000
TWX: 810-260-1797

IOWA
1902 Broadway
Iowa City 52240
Tel: (319) 338-9466
Night: (319) 338-9467

KENTUCKY
Medical Only
Atkinson Square
3901 Atkinson Dr.,
Suite 207
Louisville 40218
Tel. (502) 456-1573

LOUISIANA
P.O. Box 840
3239 Williams Boulevard
Kenner 70062
Tel. (504) 721-6201

MARYLAND
6707 Whitestone Road
Baltimore 21207
Tel. (301) 944-5400
TWX: 710-862-9157
2 Choke Cherry Road
Rockville 20850
Tel. (301) 948-6370
TWX: 710-828-9684

MASSACHUSETTS
32 Hartwell Ave.
Lexington 02173
Tel: (617) 861-8960
TWX: 710-326-6904

MICHIGAN
23855 Research Drive
Farmington Hills 48024
Tel. (313) 476-6400
TWX: 810-242-2900

MINNESOTA
2400 N. Prior Ave.
Roseville 55113
Tel. (612) 636-0700
TWX: 910-563-3734

MISSISSIPPI
***Jackson**
Medical Service only
Tel: (601) 982-9363

MISSOURI
11131 Colorado Ave.
Kansas City 64137
Tel. (816) 763-8000
TWX: 910-771-2087
148 Weldon Parkway
Maryland Heights 63043
Tel: (314) 567-1455
TWX: 910-764-0830

NEBRASKA
Medical Only
7171 Mercy Road
Suite 110
Omaha 68106
Tel. (402) 392-0948

NEW JERSEY
W. 120 Century Rd.
Paramus 07652
Tel. (201) 265-5000
TWX: 710-990-4951

NEW MEXICO
P.O. Box 11634
Station E
11300 Lomas Blvd. N.E.
Albuquerque 87123
Tel. (505) 292-1330
TWX: 910-989-1185
156 Wyatt Drive
Las Cruces 88001
Tel. (505) 526-2485
TWX: 910-983-0550

NEW YORK
6 Automation Lane
Computer Park
Albany 12205
Tel. (518) 458-1550
201 South Avenue
Poughkeepsie 12601
Tel. (914) 454-7330
TWX: 510-248-0012
39 Saginaw Drive
Rochester 14623
Tel: (716) 473-9500
TWX: 510-253-5981
5858 East Molloy Road
Syracuse 13211
Tel: (315) 454-2486
1 Crossways Park West
Woodbury 11797
Tel: (516) 921-0300
TWX: 710-990-4951

NORTH CAROLINA
P.O. Box 5188
1923 North Main Street
High Point 27262
Tel: (919) 885-8101

OHIO
16500 Sprague Road
Cleveland 44130
Tel: (216) 243-7300
TWX: 810-423-9431
330 Progress Rd.
Dayton 45449
Tel: (513) 859-8202
TWX: 810-474-2818
1041 Kingsmill Parkway
Columbus 43229
Tel: (614) 436-1041

OKLAHOMA
P.O. Box 32008
Oklahoma City 73132
Tel: (405) 721-0200

OREGON
17890 SW Lower Boones
Ferry Road
Tualatin 97062
Tel: (503) 620-3350

PENNSYLVANIA
111 Zeta Drive
Pittsburgh 15238
Tel: (412) 782-0400
TWX: 710-795-3124
1021 8th Avenue
King of Prussia Industrial Park
King of Prussia 19406
Tel. (215) 265-7000
TWX: 510-660-2670

SOUTH CAROLINA
6941-0 N. Trenholm Road
Columbia 29260
Tel: (803) 782-6493

TENNESSEE
***Knoxville**
Medical Services only
Tel: (615) 523-5022
1473 Madison Avenue
Memphis 38104
Tel: (901) 274-7472
Nashville
Medical Service only
Tel: (615) 244-5448

TEXAS
P.O. Box 1270
201 E. Arapaho Rd.
Richardson 75080
tel: (214) 231-6101
P.O. Box 27409
6300 Westpark Drive
Suite 100
Houston 77027
Tel: (713) 781-6000
205 Billy Mitchell Road
San Antonio 78226
Tel: (512) 434-8241

UTAH
2160 South 3270 West Street
Salt Lake City 84119
Tel: (801) 487-0715

VIRGINIA
Medical Only
P.O. Box 12778
No. 7 Koger Exec. Center
Suite 212
Norfolk 23502
Tel:(804) 497-1026/7
P.O.Box 9854
2914 Hungary Springs Road
Richmond 23228
Tel: (804) 285-3431

WASHINGTON
Bellefield Office Pk
1203-114th Ave. S.E.
Bellevue 98004
Tel: (206) 454-3971
TWX: 910-443-2446

***WEST VIRGINIA**
Medical/Analytical Only
Charleston
Tel: (304) 345-1640

WISCONSIN
9004 West Lincoln Ave.
West Allis 53227
Tel: (414) 541-0550

FOR U.S. AREAS NOT LISTED:
Contact the regional office
nearest you: Atlanta, Georgia.
North Hollywood, California.
Rockville, Maryland. Rolling Meadows,
Illinois. Their complete
addresses are listed above.

***Service Only**

MANUAL IDENTIFICATION

Model Number:	1317A
Date Printed:	January 1977
Part Number:	01317-90905

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

To use this supplement:

Make all ERRATA corrections.

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes
1908A	1
1916A	1,2

Serial Prefix or Number	Make Manual Changes

▲ NEW ITEM

ERRATA

Table 6-2,

Change: A1Q1, HP Part No. 1855-0262, TRANSISTOR-J FET, DUAL N CHAN D MODE SI, Mfr Code 28480, HP Part No. 1855-0262.

Delete: A1Q1.

Add: A2U2, HP Part No. 1826-0155, Qty 1, IC 1406, CONV, 14-DIP-C, Mfr Code 04713, Mfr Part No. MC 1406L.

Add: A5Q14, HP Part No. 1853-0232, TRANSISTOR PNP, SI, TO-39, P.D. IW, FT=200 MHz, Mfr Code 28480, Mfr Part No. 1853-0232.

Add: A5Q15, HP Part No. 1854-0419, TRANSISTOR NPN, SI, TO-39, P.D. IW, FT=200 MHz, Mfr Code 28480, Mfr Part No. 1854-0419.

Change: A5R19, HP Part No. to 0757-0419, RESISTOR, 681 OHM, 1%, .125W F TC=0±100, Mfr Code 24546, Mfr Part No. C4-1/8-TO-681R-F.

Change: A11, HP and Mfr Part No. to 01310-66533 (2 places).

Change: A11VR6, HP Part No. to 1902-0185, DIODE ZNR, 27.4V, 5% P.D. 0.4W, Mfr Code 28480, Mfr Part No. 1902-0185.

Change: A12T1 (HV TRANSFORMER), HP and Mfr Part No. to 01310-61105.

Change: A13R1 (RESISTOR, 1.58 OHM, 1%, .5W), HP and Mfr Part No. to 0698-8148.

Change: V1 (CRT), HP and Mfr Part No. to 5083-4551.

NOTE

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

HEWLETT hp PACKARD

Printed in U.S.A.

ERRATA (Cont'd)

Schematic: 7,
Change: A5R19 value to 681 OHM.
Schematic: 11,
Change: A13R1 value to 1.58M OHM.

CHANGE 1

Table 6-2,
Change: E3 (INSULATOR XSTR), HP and Mfr Part No. to 0340-0875.
Change: MP14 (PANEL: REAR), HP and Mfr Part No. to 01317-00205.
Change: MP15 (PANEL: FRONT), HP and Mfr Part No. to 01317-00206.
Change: MP18 (PLATE: INPUT RIGHT), HP and Mfr Part No. to 01317-04116.
Change: MP19 (PLATE: INPUT LEFT), HP and Mfr Part No. to 01317-04114.
Change: MP22 (COVER: TOP), HP and Mfr Part No. to 01317-64102.
Change: MP23 (COVER: BOTTOM), HP and Mfr Part No. to 01317-04118.
Change: MP24 (COVER: CRT), HP and Mfr Part No. to 01321-04109.
Add: MP25, HP Part No. 01317-04117, Qty 1, BOTTOM COVER ACCESS PLATE, Mfr Code 28480, Mfr Part No. 01317-04117.
Change: S1 (SWITCH: TGL, DPDT, 10A/250VAC, ON-OFF), HP and Mfr Part No. to 3101-2332.
Change: S2 (Switch: SL; DPDT NS; 3A/125 VAC) HP and Mfr Part No. 3101-2042.

▲ CHANGE 2

Table 6-2,
Change: L1, HP and Mfr Part Nos. to 01336-66001.
Change: MP12, HP and Mfr Part Nos. to 01310-60607.