



OPERATING AND SERVICE MANUAL

X-Y DISPLAY MODEL 1332A

(Including Options: 007, 011, 039, 100, 101, 105, 106, 110, 120, 121, 200, 201, 205, 206, 210, 211, 215, 216, 300, 301, 302, 303, 304, 305, 310, 315, 322, 323, 324, 325, 326, 330, 550, 561, 562, 570, 580, 611, 631, 639, and 910.)

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1616A.

With changes described in Section VII, this manual also applies to instruments with serial numbers prefixed 1414A through 1615A.

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

Manual Part Number 01332-90904
Microfiche Part Number 01332-90804

PRINTED: JULY 1976

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CERTIFICATION

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

WARRANTY AND ASSISTANCE

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

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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.

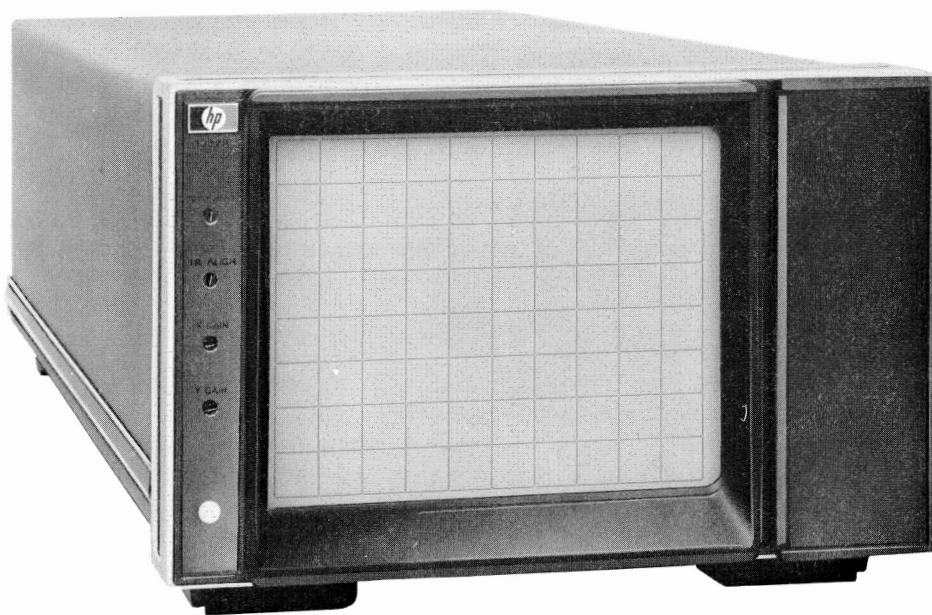
DANGEROUS PROCEDURE WARNINGS.

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.**

SS-2-1/76



1332A-P-001

Figure 1-1. Model 1332A X-Y Display

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. The Hewlett-Packard Model 1332A is a cathode-ray tube display that is capable of meeting a wide variety of OEM medical and electronic instrument display needs. The cathode-ray tube has the resolution and picture quality required for medical diagnostic systems plus an extremely bright display required for differentiating between many gray shades.

1-3. This manual contains installation and operating instructions, as well as maintenance information for the 1332A. Instrument specifications and procedures for verifying proper operation are included. Procedures are also included for adjusting the instrument to its performance specifications. Schematic diagrams, the theory of operation, and troubleshooting information are provided for use in maintaining the instrument.

1-4. This section of the manual contains the performance specifications for the 1332A, and a list of options available. It also lists the accessories supplied with the 1332A and other accessories that are available. Instrument and manual identification information are also included.

1-5. SPECIFICATIONS.

1-6. Table 1-1 is a complete list of the 1332A critical specifications that are controlled by tolerances. Table 1-2 contains general information that describes operating characteristics of the 1332A.

1-7. Any change in the specifications due to manufacturing, design, or traceability to the U.S. National Bureau of Standards will be listed on a manual change sheet included with this manual. The manual and manual change sheet supersede all previous information concerning specifications of the 1332A.

1-8. ACCESSORIES SUPPLIED.

1-9. The following accessories are supplied with the 1332A:

- One Blue Contrast Filter, HP Part No. 01332-02706.
- One 0.375A Fuse for 220/240-Vac operation, HP Part No. 2110-0063.
- One 2.3 m (7.5 ft) line cord, HP Part No. 8120-1538.

1-10. ACCESSORIES AVAILABLE.

1-11. The following accessories are available for the 1332A:

- Model 10380A OEM Horizontal Frame Kit.
- Model 10381A Rack Mount Hardware Kit for Model 10380A.
- Model 10382A Bench Hardware Kit for Model 10380A.
- Model 10383A Rack Mount Adapter.
- Model 10384A Rack Mount Kit for Two Displays.
- Model 10385A Rack Mount Kit for Two Displays.
- Model 10386A OEM Vertical Frame.
- BNC Shorting Caps, HP Part No. 1250-0645.
- Camera Model 197A Option 006.
- Model 10488A Input Signal Cable.

1-12. OPTIONS.

1-13. Standard options are modifications installed on HP instruments at the factory and are available on request. Table 1-3 lists available options for the 1332A. For information on field-installable options, refer to Application Note 199, "Small Screen Displays, Medical Diagnostic System Application and Interfacing."

1-14. INSTRUMENT AND MANUAL IDENTIFICATION.

1-15. Instrument identification by serial number is located on the rear panel. Hewlett-Packard uses a two-section serial number consisting of four-digit prefix and a five-digit suffix separated by a letter designating the country in which the instrument was manufactured. (A = U.S.A.; G = West Germany; J = Japan; U = United Kingdom.)

1-16. This manual applies to instruments with a serial number as shown on the title page. If changes have been made in the instrument since this manual was printed, a "Manual Changes" supplement supplied with the manual will define these changes. Be sure to record these changes in your manual. Back-dating information in Section VII adapts the manual to instrument with serial numbers lower than that shown on title page. Part Numbers for the manual and the microfiche copy of the manual are also shown on the title page.

Table 1-1. Specifications

VERTICAL AND HORIZONTAL AMPLIFIERS

RISE TIME: <70 ns (10% to 90% points) for full screen deflection.

DEFLECTION FACTOR:

Horizontal: 100 mV/div (1 V p-p for 10-div deflection). Front-panel adjustment from approx 80 mV/div to 200 mV/div. 1 div = 1.19 cm (0.47 in.).

Vertical: 100 mV/div (0.8 p-p for 8-div deflection). Front-panel adjustment from approx 80 mV/div to 200 mV/div. 1 div = 1.19 cm (0.47 in.).

SETTLING TIME: signal settles to within one spot diameter of final value in <300 ns for any large or small movement. Off screen deflection not to exceed specified dynamic range.

INPUT RC: 1 M Ω nominal shunted by <60 pF.

POLARITY: positive vertical input moves beam up; positive horizontal input moves beam to right.

POSITION: front panel controls allow zero input to be set off-screen in any direction from anywhere within the viewing area.

DYNAMIC RANGE: beam may be deflected off screen up to one-half screen diameter in any direction,

provided that zero input position is on screen, without degradation.

CROSSTALK: <0.254 mm (0.010 in.) with one input terminated in 50 ohms and the other driven by a 1-volt p-p, 500-kHz signal. <0.381 mm (0.015 in.) at 5 MHz when driven from a 50-ohm source.

Z-AXIS AMPLIFIER

RISE TIME: <25 ns (cw bandwidth: approx 5 MHz).

BLANKING RANGE: 0 to 1 V (with internal gain adjustment set for maximum gain).

BLANKING POLARITY: +1 V input fully unblanks CRT.

GAIN: Internally adjustable over 2.5:1 attenuation ratio.

INPUT RC: 1 M Ω nominal shunted by <60 pF.

CATHODE-RAY TUBE

LINEARITY: <3% of full scale along major axes.

GEOMETRY: <3% pincushion and barrel distortion over usable display area.

Table 1-2. General Information

VERTICAL AND HORIZONTAL AMPLIFIERS

BANDWIDTH: dc to 5 MHz (3 dB down) for 7.62-cm (3-in.) deflection.

PHASE SHIFT: <1° (dc to 1 MHz).

MAXIMUM INPUT: ± 50 V (dc + peak ac).

DRIFT:

Position: <0.5 mm/hour (0.020 in./hour) and <1.02 mm (0.040 in.) in 24 hours with covers installed.

Gain: <1.0% under all combinations of specified line voltage and temperature from +20°C to +55°C with covers installed after 15-minute warmup.

Z-AXIS AMPLIFIER

MAXIMUM INPUT: ± 50 V (dc + peak ac).

LIGHT OUTPUT STABILITY: measurements made at one hour intervals will not vary by >10%, for any location within usable display area, under all specified conditions of line voltage and temperature.

CATHODE-RAY TUBE

TYPE: post-deflection accelerator, approx 22 kV acceleration potential, aluminized P31 phosphor standard (see options for additional phosphor selection), electrostatic focus and deflection.

VIEWING AREA: 114 sq cm (17.67 sq in.) approx 9.6 cm vertically by 11.9 cm horizontally (3.8 in. by 4.7 in.).

QUALITY AREA: center 9 divisions horizontally and center 7 divisions vertically.

GRATICULE: 8 x 10 divisions. Internal graticule is standard (1 div = 1.2 cm [0.47 in.]).

SPOT SIZE: <0.030 cm (0.012 in.) at center screen and varying by not more than 10% over entire quality area with intensity held constant. Measured using shrinking raster method.

LINE RESOLUTION: approx 31.5 lines/cm (80 lines/in.).

LINE BRIGHTNESS: ≥ 170 cd/m² (50 fl) at a writing speed of 0.254 cm/ μ s (0.1 in./ μ s), 60 Hz refresh rate, P31 phosphor, 0.3 mm (0.012 in.) spot size.

UNIFORMITY: light output of spots located anywhere in the quality area will not vary by more than 40%.

CONTRAST RATIO: 4:1 or greater measured by photo-metrically summing the trace brightness and background, then dividing by the background brightness.

Table 1-2. General Information (Cont'd)

SAFETY PROTECTION

IMPLOSION: protective safety panel between CRT and bezel protects viewer.

HIGH VOLTAGE SHOCK: anode lead is permanently bonded to CRT.

X-RAY EMISSION: less than 0.05 milliroentgen/hour. Not measureable with Victoreen Model 440 RF/C in background noise.

DESIGN AND MANUFACTURE: standard instrument is designed and manufactured to meet Underwriters Laboratories safety standards. See options for UL labeled instruments.

GENERAL

X-, Y-, AND Z-INPUT CONNECTORS: BNC type mounted on rear panel (shield grounded).

FRONT PANEL CONTROLS WITH KNOBS: position X, position Y, focus, and intensity.

FRONT PANEL SCREWDRIVER ADJUSTMENTS: trace align, astigmatism, gain X, gain Y.

POWER: nominal line voltage settable to 100, 120, 220, and 240 Vac; +5% -10% 48 Hz to 440 Hz 50 VA maximum (approx 40 W).

NOTE

Instruments with UL 544 labeled options (for medical and dental equipment) operate from 48 to 66 Hz only.

DIMENSIONS: see outline drawing.

WEIGHT: net, 8.6 kg (19 lb) with cover and feet; shipping, 10.5 kg (23 lb).

ENVIRONMENT

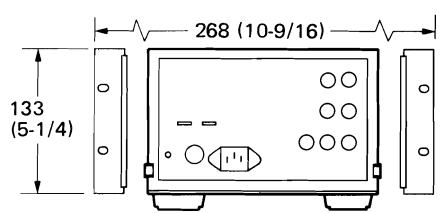
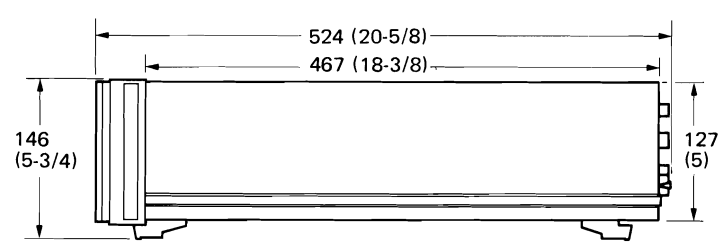
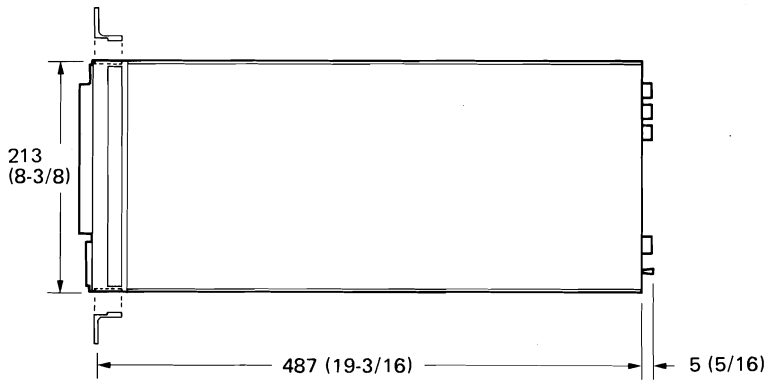
TEMPERATURE: 0°C to +55°C operating; -40°C to +70°C non-operating.

HUMIDITY: 95% relative humidity to 40°C.

ALTITUDE: 4600 m (15 000 ft) non-operating, 6300 m (25 000 ft) non-operating.

SHOCK: 30 G level with 11 ms duration and 1/2 sine wave shape.

VIBRATION: vibrated in three planes for 15 minutes each with 0.254 mm (0.010 in.) excursion 10 to 55 Hz.



NOTE

1. Dimensions are for general information only. If dimensions are required for building special enclosures, contact your HP Field Engineer.
2. Dimensions are in millimetres and (inches).

Table 1-3. Model 1332A Options

Option	Description	Kit Part Number
100	X- and Y-axis amplifier deflection factor changed to 500 mV/div, 5 V p-p full screen deflection.	See Replaceable Parts List
101	X- and Y-axis amplifier deflection factor changed to 1 V/div, 10 V p-p full screen deflection.	01332-88703
105	X- and Y-axis amplifier polarity changed so negative input moves beam to the right and up.	None
106	X- and Y-axis amplifier changed to fully differential inputs.	See Replaceable Parts List
110	X- and Y-axis amplifier input impedance changed to 50 ohms. Maximum input 3.5 V dc + pk ac (not compatible with options 100, 101).	01332-88705
120	X- and Y-axis amplifier rise time changed to 25 ns.	01332-66506 01332-88702 01332-88703 01332-88704 01332-88705
200	Z-axis amplifier CRT blanking range changed to 0 to 5 V.	01332-88710
201	Z-axis amplifier CRT blanking range changed to 0 to 10 V.	01332-88711
205	Z-axis amplifier polarity changed so negative input un-blanks trace.	None
206	Z-axis amplifier changed to fully differential input.	See Replaceable Parts List
210	Z-axis amplifier input impedance changed to 50 ohms. Maximum input 3.5 V dc + pk ac (not compatible with options 200, 201).	01332-88715
215	Z-axis amplifier gain output changed to vary linearly ($\pm 20\%$) with linear change in Z-axis input voltage (gamma correction).	01332-88718
216	TTL blanking level added to Z-axis amplifier. High state (+2.5 V to +5 V) blanks any analog Z-input signal. Low state (0.0 V to 0.8 V) returns blanking to analog Z-axis input.	01332-88713
300	Power cord for use in Great Britain and Singapore. 7.5 foot, 240 volt max, three conductor IEC.	8120-1703
301	Power cord for use in Australia and New Zealand. 7.5 foot, 240 volt max, three conductor IEC.	8120-1369
302	Power cord for use in East and West Europe. 7.5 foot, 240 volt max, three conductor IEC.	8120-1692
303	Power cord for use in USA, Canada, Japan and Mexico. 7.5 foot, 240 volt max, three conductor IEC to NEMA.	8120-0698
304	Power cord for use in USA, Canada, Japan and Mexico. 30 inch coiled (extends to six feet), 120 volt max three conductor IEC to NEMA 5-15P.	8120-2061

Table 1-3. Model 1332A Options (Cont'd)

Option	Description	Kit Part Number
305	Exchanges standard power cord for a 2.5-ft power cord for use in rack installation. Option 305 power cord conforms to standard CEE22-V1.	8120-1396
310	Power dissipation increased to approximately 50 watts. +10%, -20% tolerance at 100, 120, and 240 Vac.	See Replaceable Parts List
315	Display shipped with covers, feet, trim and tilt stand.	See Replaceable Parts List
322	Exchanges standard Z-axis INTENSITY control for a precision 10-turn control with turns counting dial.	See Replaceable Parts List
323	Front panel controls: astigmatism. Trace align, X-gain, and Y-gain become internal adjustments on amplifier board assembly A2.	See Replaceable Parts List
324	Remote program connector added to rear panel. X, Y, and Z signal inputs wired to the positive signal inputs. (Note: input capacitance increases to approximately 120 pF).	See Replaceable Parts List
325	Scale illumination added. Illuminates phosphor background defining internal graticule.	01332-88719 with 5083-4176 CRT
326	Front panel controls: Intensity, focus position X, and position Y become screwdriver adjustments.	01332-88723
330	Designed to meet Underwriter's Laboratories listing for Dental and Medical Electronics Equipment. Includes special three conductor ac line cord, covers, feet, tilt stand, trim, and U.L. label.	See Replaceable Parts List
550	Designed to provide full CRT shield. Uses the standard CRT shield (MP3) plus a special CRT front shield. This option is not available for instruments with serial prefix numbers below 1540A.	1220-0208
561	Clear CRT Filter.	See Replaceable Parts List
562	Clear RFI coated surface and a metalized front panel.	See Replaceable Parts List
570	Special CRT for high uniformity of light output. CRT light output within 8.35 cm (3.3 in.) dia. circle varies by no more than 10%.	See Replaceable Parts List
580	Display shipped with special covers, feet, trim, and tilt stand to meet CSA standards.	See Replaceable Parts List
910	Standard instrument shipped with two Operating and Service Manuals.	NA
<p>NOTE</p> <p>For cathode-ray tube options see table 6-2.</p>		

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information and instructions necessary for installing the Model 1332A. Included are initial inspection procedures, power requirements, systems application 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 marks 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. Check for supplied accessories (paragraph 1-8) and 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. POWER REQUIREMENTS.

2-6. The 1332A operates from any power source supplying 100, 120, 220, or 240 Vac (+5% —10%), single phase, 48 Hz to 440 Hz that can deliver approximately 50 VA of power.

2-7. 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 0.75-ampere fuse (HP Part No. 2110-0063) and replace with 0.375-ampere fuse (HP Part No. 2110-0065).
- d. Connect power cord.

2-8. POWER CORDS AND RECEPTACLES.

2-9. 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.

2-10. **SYSTEM APPLICATIONS.** This instrument is designed and manufactured primarily for OEM systems and is shipped without protective covers.

WARNING

Operator protection from hazardous voltages within the instrument must be provided by the system in which the instrument is to be used.

2-11. REPACKING FOR SHIPMENT.

2-12. 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.

2-13. 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.

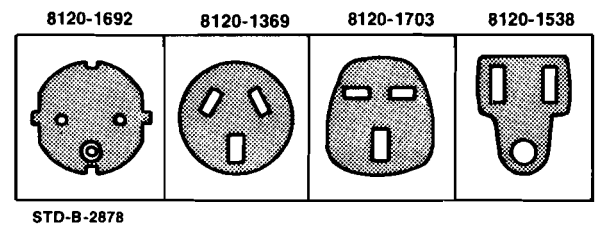


Figure 2-1. Power Receptacles

SECTION III

OPERATION

3-1. INTRODUCTION.

3-2. This section contains information and instructions for operation of the HP Model 1332A Display. It is an X, Y, Z display with analog voltage input for X-, Y-, and Z-axis controls. All signals must be externally supplied through rear-panel connectors.

3-3. CONTROLS AND CONNECTORS.

3-4. The 1332A is intended for use as a general purpose, graphic display. The X-gain, X-position, Y-gain, Y-position, intensity, focus, astigmatism, and trace align controls are accessible at the front of the instrument. The 1332A controls and connectors are illustrated and briefly described in figure 3-1.



The INTENSITY control will adjust display brightness from completely off (ccw) to maximum brightness (cw). To avoid damage to CRT phosphor, increase intensity slowly until display brightness is at a comfortable viewing level.

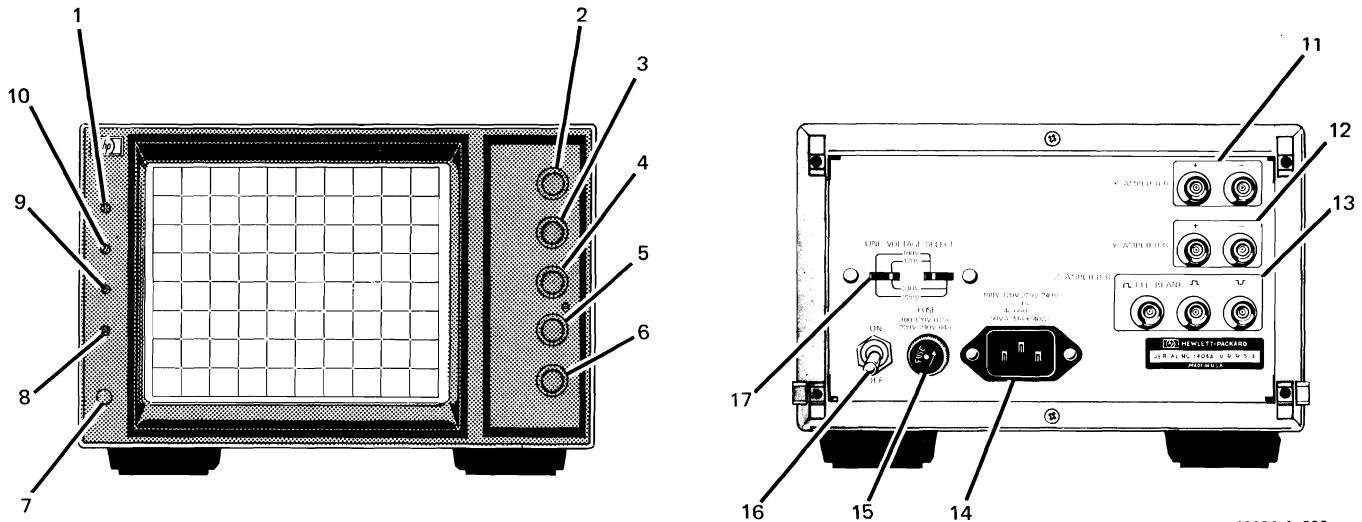
3-5. INSTRUMENT MODIFICATIONS.

3-6. Factory-installed modifications are available to provide operational characteristics which differ from standard instruments. These options are briefly described in table 1-3. For additional information concerning available options contact your nearest HP Sales/Service Office.

3-7. PREOPERATIONAL PROCEDURE.

3-8. Turn on and prepare the 1332A for operation as follows:

- a. Set INTENSITY fully counterclockwise.
 - b. Set horizontal and vertical POSITION controls to midrange.
 - c. Set power switch to ON. Power indicator lamp should light.
- CAUTION**
- A high-intensity display over an extended period will burn the CRT phosphor.
- d. Adjust INTENSITY control. Display dot brightness should vary from completely extinguished (full ccw position) to acceptable viewing brightness as control is turned cw. Adjust for comfortable viewing brightness of display dot.
 - e. Adjust POSITION \blacklozenge control through its full range. Display dot will move vertically on CRT, disappearing from viewing area at either extreme of control.
 - f. Adjust POSITION $\blacktriangleleft\blacktriangleright$ control through its full range. Display dot will move horizontally across CRT, disappearing from viewing area at either extreme of control.
 - g. Set horizontal and vertical POSITION controls to center display dot on CRT.
 - h. Set FOCUS and ASTIGMAT controls for smallest, sharpest display dot.
 - i. Apply 1-kHz, 1-volt, p-p signal to X INPUT connector on rear panel of instrument.
 - j. Adjust TR ALIGN control to align trace horizontally.
 - k. Set X GAIN control for trace length of exactly 10 divisions.
 - l. Connect 1-kHz, 0.8-volt, p-p signal to Y INPUT connector on rear panel of instrument.
 - m. Adjust Y GAIN control for trace length of exactly 8 divisions.



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- | | |
|---|---|
| <ol style="list-style-type: none"> 1. ASTIGMAT. Adjusts roundness of writing spot. 2. INTENSITY. Controls brightness of display. 3. FOCUS. Adjusts writing spot for sharpness. 4. POSITION ◀▶. Adjusts trace position horizontally. 5. POSITION ⬆⬇. Adjusts trace position vertically. 6. SCALE ILLUM. Controls brightness of CRT graticule (Option 325 only). 7. Power Indicator. Illuminates when ac power is applied to instrument. 8. Y GAIN. Adjusts Y-amplifier gain. | <ol style="list-style-type: none"> 9. X GAIN. Adjusts X-amplifier gain. 10. TR ALIGN. Aligns trace with graticule line. 11. X AMPLIFIER + —. X-axis input. 12. Y AMPLIFIER + —. Y-axis input. 13. Z AMPLIFIER. Z-axis input. 14. Ac power input connector. 15. Line fuse. 16. ON/OFF switch. Applies ac power to instrument. 17. LINE VOLTAGE SELECT. Selects line voltage for 100, 120, 220, or 240 Vac operation. |
|---|---|

Figure 3-1. Controls and Connectors

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. This section contains functional descriptions of the 1332A keyed to an overall block diagram (figure 8-3).

4-3. CIRCUIT DISCUSSION.

4-4. LOW-VOLTAGE POWER SUPPLY (LVPS). The LVPS provides regulated +15 V, -15 V and +100 V operating voltages. It also provides +26 V unregulated for the high voltage oscillator.

4-5. The +15 V and -15 V supplies function in the same manner and only the +15 V supply will be discussed. Line voltage from the secondary of T1 is rectified by diode bridge A1CR8 thru A1CR11 and filtered by A1C14. The +26 V unregulated is applied to series regulator Q4 through a 1-ampere fuse.

4-6. The output voltage is sensed by A1R48 and A1R49 and compared to a reference voltage generated by A1U1. A1U1 then drives Q1 to maintain the voltage at A1U1 pin 2 equal to the reference voltage at A1U1 pin 3. A1R47 acts as a current sensor. A1R45 and A1R46 convert the current to a voltage at pin 10 and limits the drive to Q1. A1R44 compensates for temperature drift.

4-7. The +100 V supply operates similarly to the +15 V supply with the following exception. A reference voltage, developed at A1U3 pin 4 is applied through a divider network (A1R61/A1R62) to the non-inverting input of A1U3 (pin 3). Another divider network A1R59/A1R60 samples the output voltage and applies it to the inverting input of A1U3 (pin 2). The output of A1U3 (pin 6) drives Q3 to maintain a voltage at A1U3 pin 2 equal to that applied to A1U3 pin 3.

4-8. A1R58, A1Q14, and A1VR8 form a protection circuit for A1U3. The circuit protects against large input-output differential voltages if the output should become grounded. A1VR3 and A1VR4 act as crowbar for the +110-V output by creating a temporary high overload during initial turn on.

4-9. HIGH-VOLTAGE POWER SUPPLY (HVPS). High voltage oscillator Q4 generates a sine-wave voltage signal across the primary of T1. The amplified signal is rectified by A3CR1 and filtered by A3C1, A3C2, and A3R2 to generate the -4000 Vdc cathode voltage. CRT filament voltage is generated by a sinusoidal signal from a secondary winding of T1 and is imposed on the cathode potential of -4000 Vdc.

WARNING

The filament potential is connected to the -4000 Vdc cathode potential which is dangerous to life.

4-10. The cathode voltage is sampled by feedback network A3C3/A3R4, compared with a reference current established by high-voltage adjust A1R84, and fed into regulator A1U4. The output of A1U4 regulates the dc level of T1 base primary winding that drives high voltage oscillator Q4 and maintains the cathode voltage at -4000 V.

4-11. Grid voltage is provided by generating a bias voltage with respect to the cathode voltage. This bias voltage is generated by a capacitively coupled, clipped sine-wave signal at the junction of A3C4 and A3C5. The upper clipping level is set by Int Limit Adj A1R76. The lower clipping level is set by the Z-axis dc output.

4-12. Focus voltage is determined by a resistive divider string including Focus Lim control A3R13 and front-panel Focus control A5R4. Post-accelerator potential of approximately +18 kV is supplied by voltage sextupler assembly A6.

4-13. DEFLECTION AMPLIFIERS. Since the X- and Y-axis amplifiers are identical, only the X-axis amplifier will be discussed.

4-14. The instrument, as shipped from the factory, is wired for single-ended input operation. Internal design, however, allows for differential operation (schematic 2).

4-15. An input signal is applied to A2Q16 which is a source follower impedance converter. Differential shunt feedback amplifier, A2Q17-A2Q20, provides a signal gain governed by X-GAIN adjust A2R55. X GAIN CTR adjust A2R68 sets the voltage level about which A2R55 varies.

4-16. Two balanced feedback amplifiers, A2Q23/A2Q24/A2Q27/A2Q28 and A2Q25/A2Q26/A2Q29/A2Q30 comprise the output operational amplifier. A current input to the output amplifier results in a voltage output which drives the horizontal deflection plates. High-frequency adjustments A2C27 with A2R75 and A2C28 with A2R76 (lead networks), and A2R74 with A2C26 (lag network) provide the built-in rise time of less than 70 nanoseconds.

4-17. Z-AXIS AMPLIFIER. The high-voltage supply for the CRT control grid is returned to, and controlled by, the Z-axis amplifier gate output (schematics 3 and 5). Signal control for the Z-axis amplifier is applied to rear-panel Z AMPLIFIER connector, and current is supplied by the INTENSITY control. A positive-going

amplifier output voltage increases conduction of the CRT and brightens the display.

4-18. Single-ended output of operational amplifier A1Q10-A1Q13 is coupled to the high-voltage circuit A3R11/A3C7. This output maintains a level of approximately -4000 volts on the CRT control grid.

SECTION V

PERFORMANCE CHECK AND ADJUSTMENTS

5-1. INTRODUCTION.



Read the Safety Summary at the front of this manual before installing or operating the instrument.

5-2. This section contains performance checks and adjustment procedures. The performance checks verify that the instrument meets its published specifications (table 1-1). Adjustment procedures are provided to help maintain the instrument within specification limits.

5-3. RECOMMENDED TEST EQUIPMENT.

5-4. Equipment required for the performance checks and adjustment procedures is listed in table 5-1. Any equipment that satisfies the critical characteristics given in the table may be substituted for the recommended model(s).

5-5. PERFORMANCE CHECK RECORD.

5-6. A Performance Check Record form is provided at the end of this section for the purpose of recording the results of the performance checks. This form lists all of the performance checks and their acceptable limits. The form may be removed from the manual and retained as a permanent record of the incoming inspection or routine maintenance performed on the instrument.

5-7. PERFORMANCE CHECKS.

5-8. The performance checks are designed to verify the published instrument specifications. Perform the checks in the sequence given for best results.

5-9. During all tests, install BNC shorting caps (HP Part No. 1250-0645) on all unused inputs. For options with differential inputs, use the +X—, +Y—, or \perp Z-input connector unless indicated otherwise.



Standard instruments are shipped without covers. Operator protection must be provided by the system in which the instrument is used since dangerous voltages are present in the instrument.

5-10. The position of a trace on the CRT always refers to the center of the trace. The distance between traces always refers to the orthogonal distance from trace center; or, from the edge of one trace to the corresponding edge of the other trace.

5-11. DEFLECTION AMPLIFIER RISE TIME. Rise time, measured between 10% and 90% points on the displayed waveform, shall be equal to or less than the value shown in table 5-2 for both X and Y amplifiers.

Equipment Required:

- Pulse Generator (HP Model 8012B)
- Monitor Oscilloscope
- Two 10:1 Divider Probes
- 44-in. BNC Cable

5-12. Check deflection amplifier rise time as follows:

- a. Connect equipment as shown in figure 5-1.
- b. Set pulse generator output as follows:

Standard	1 V p-p, 100 kHz
Option 100	5 V p-p, 100 kHz
Option 101	10 V p-p, 100 kHz

- c. Set X GAIN and X POSITION controls for full-screen deflection with one dot on first graticule line and other dot on last graticule line.
- d. Set monitor oscilloscope to A—B MODE and measure rise time between 10% and 90% points (dotted lines on CRT).
- e. Rise time shall be less than value shown in table 5-2 for applicable instrument.
- f. Disconnect pulse generator from X AMPLIFIER input connector and connect to Y AMPLIFIER input connector.
- g. Disconnect probes from horizontal deflection plates and connect to vertical deflection plates.
- h. Repeat steps b through e.
- i. For option 106 repeat steps b through e for —X and —Y inputs.
- j. Disconnect test equipment.

Table 5-1. Recommended Test Equipment

Instrument Type	Recommended Model	Required Characteristics	Required For
Monitor Oscilloscope	HP 180C/1801A/1820C	50 MHz vertical BW, dual channel, 1 M Ω input resistance, external-sync input, sweep-ramp output, differential (A—B) capability	Performance Check and Adjustments
10:1 Divider Probes	HP 10004D	Compatible with above	Performance Check
Pulse Generator	HP 8012B	Switchable output polarity (or dual outputs), Transition time ≤ 5 ns	Performance Check
Pulse Generator	HP 214A	1 V, p-p, 100 kHz, symmetrical output	Performance Check
LCR Meter	HP 4332A	RANGE: to 60 pF	Performance Check
Test Oscillator	HP 651B	Output frequency up to 5 MHz, 10 V p-p output into 50 Ω	Performance Check
DC Voltmeter/ Ohmmeter	HP 34703A/34740A	0.5% voltage accuracy, 3-1/2-digit resolution, dc volts and ohms function, constant input resistance on all voltage ranges	Adjustments
1000:1 DC Divider Probe	HP K05-3440A	Voltage rating 10k Vdc, input resistance 100 M Ω	Adjustments
DC Standard	HP 740B	0 to +5 V output (option 216 only)	Performance Check
50 Ω Termination (2)	HP 10100C	BNC-feedthrough type, 2 watt	Performance Check and Adjustments
Shorting Cap (3)	HP Part No. 1250-0645	Short unused input connectors	Performance Check
9-in. BNC Cables (2)	HP Model 10502A	BNC, 9-in. cable	Performance Check and Adjustments
44-in. BNC Cables (5)	HP Model 10501A	BNC, 44-in. cable	Performance Check and Adjustments
BNC Tee (3)	HP Part No. 1250-0781	BNC Tee Adapter	Performance Check
Adapter	HP Part No. 1251-2277	BNC Female to dual banana plug	Performance Check
Test Leads	HP 16138A	Use with LCR Meter	Performance Check
Adapter	HP Model 10110A	BNC male to dual banana post	Performance Check

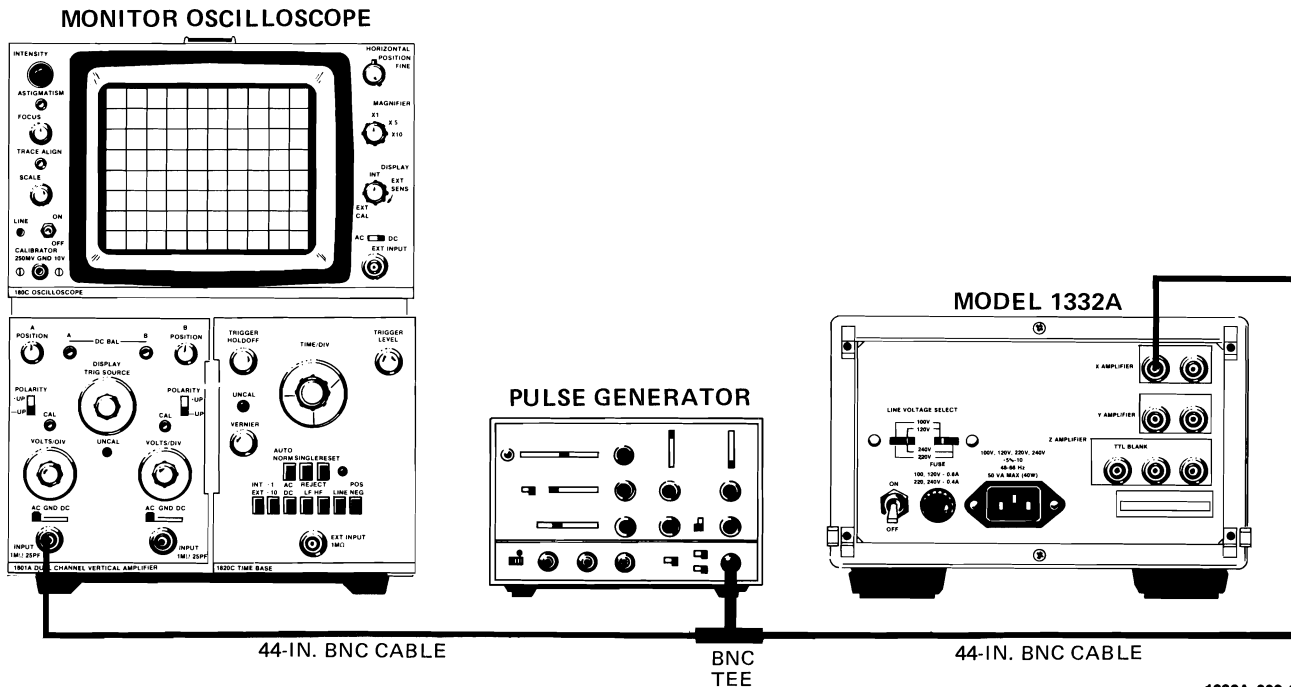


Figure 5-2. Deflection Factor Test Setup

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Equipment Required:

Pulse Generator (HP Model 8012B)
 Pulse Generator (HP Model 214A)
 Monitor Oscilloscope
 Three BNC Tees
 Five 44-in. BNC Cables
 Two 9-in. BNC Cables

5-16. Check diagonal settling time as follows:

- a. Connect equipment as shown in figure 5-3, except do not connect Z AMPLIFIER input at this time.
- b. Set HP Model 214A pulse generator for 1 V p-p, 100 kHz symmetrical output.
- c. Set POSITION and INTENSITY controls for bright dots at diagonal extremes of quality area (8 div x 8 div) of CRT.
- d. Set INTENSITY fully ccw.
- e. Connect Z AMPLIFIER input as shown in figure 5-3.
- f. Set Model 8012B pulse generator for 1 V p-p, 100 kHz, 1 μ s width pulse output.
- g. Set sweep time of monitor oscilloscope to 0.1 μ s/div and display switch to ALT, B TRIGGER.
- h. Set monitor oscilloscope trigger controls to achieve stable display. If necessary slightly readjust

symmetry control on HP Model 214A to achieve synchronization between channels A and B.

i. Set HP Model 8012B delay to 10 ns and vernier cw. Note clean bright dot on lower left of CRT.

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

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

l. Measure time difference between two transitions displayed on monitor oscilloscope. Difference shall be equal to or less than 300 ns.

m. If test limits are not met, refer to X- and Y-HIGH FREQUENCY adjustments.

n. Disconnect test equipment.

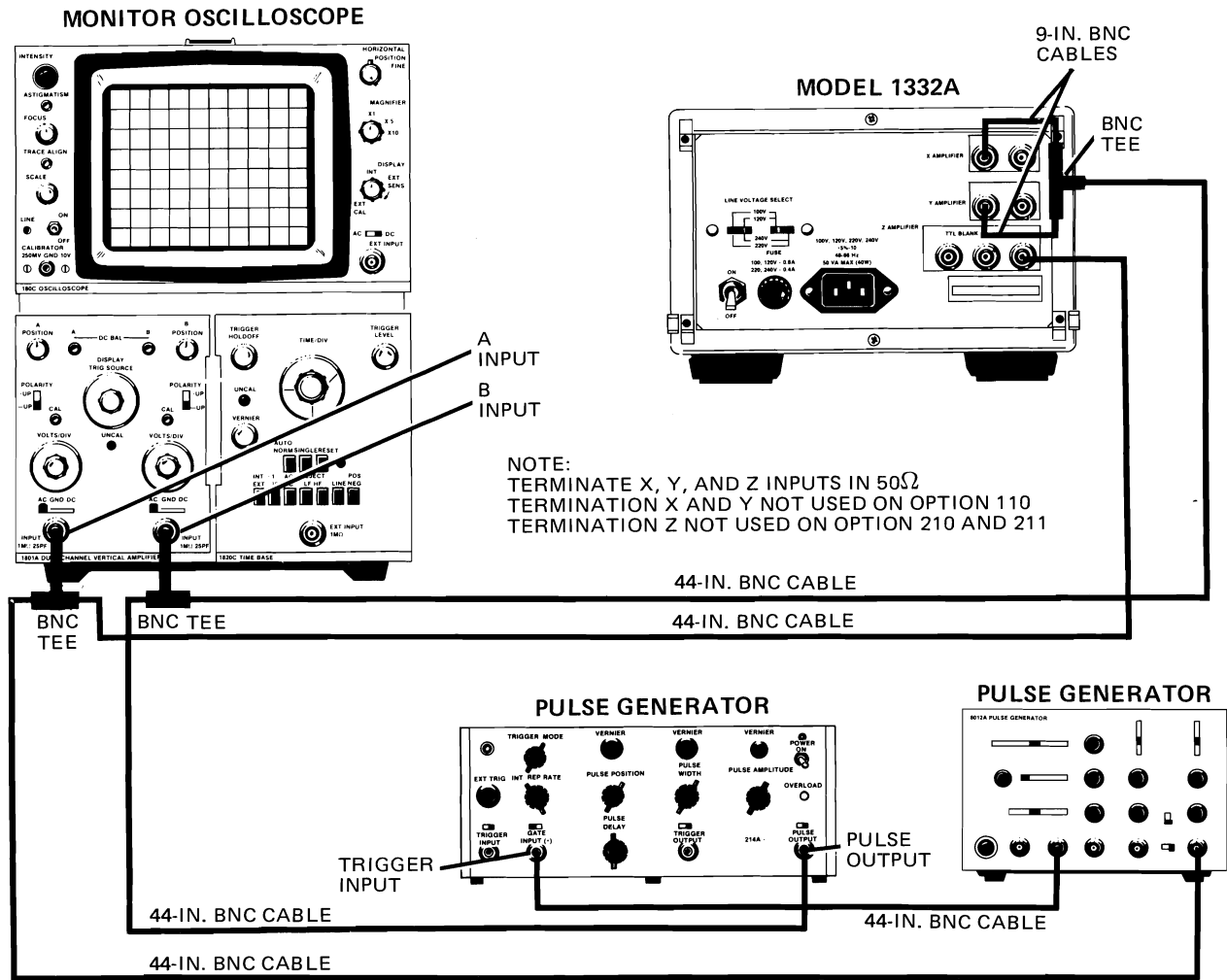
5-17. DEFLECTION POLARITY. A positive vertical input moves beam up. A positive horizontal input moves beam to right.

Equipment Required:

Pulse Generator (HP Model 8012B)
 44-in. BNC Cable

5-18. Check deflection polarity as follows:

- a. Connect pulse generator output to 1332A +X AMPLIFIER input.



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Figure 5-3. Diagonal Settling Time Test Setup

- b. Set pulse generator output as follows:
 POLARITY positive
 AMPLITUDE 0.5 V
 Frequency/Pulse width 1% duty cycle
- c. Set POSITION and INTENSITY to view two dots on CRT screen. Dimmer dot should be to right for standard instruments and to left for Option 105.
- d. Connect pulse generator output to 1332A +Y AMPLIFIER input.
- e. Set POSITION and INTENSITY to view two dots on CRT screen. Dimmer dot should be above brighter dot for standard instruments and below bright dot for Option 105.

NOTE

For Option 106 instruments perform steps f and g.

- f. Reconnect pulse generator output to -Y AMPLIFIER input. Dimmer dot should be below brighter dot.
- g. Reconnect pulse generator output to -X AMPLIFIER input. Dimmer dot should be to left.
- h. Disconnect test equipment.

5-19. POSITION CONTROL. Front-panel controls allow zero input to be set off screen in any direction from anywhere within the viewing area.

Equipment Required: None

5-20. Check position control as follows:

- a. With no input to X amplifier, rotate X POSITION control fully cw. Beam should go off screen to right.

b. Rotate X POSITION control fully ccw. Beam should go off screen to left.

c. With no input to Y amplifier, rotate Y POSITION control fully cw. Beam should move upward and off screen.

d. Rotate Y POSITION control fully ccw. Beam should move downward and off screen.

5-21. INPUT RESISTANCE. Measure input resistance of X, Y, and Z amplifiers.

Equipment Required:

Dc Voltmeter/Ohmmeter

5-22. Check input resistance as follows:

a. Measure each input resistance with ohmmeter leads connected positive-negative and then negative-positive and take average of both readings.

b. Perform measurements listed in table 5-3.

NOTE

Model 1332A instrument having differential inputs, in addition to low-impedance input termination, contains a termination resistor between each input and ground.

Table 5-3. Input Resistance

Amplifier	Standard	Option 110	Option 210	Option 211
X axis	1 meg nominal	50 ±1	NA	NA
Y axis	1 meg nominal	50 ±1	NA	NA
Z axis	1 meg nominal	NA	50 ±1	75 ±1.5

5-23. INPUT CAPACITANCE. Capacitance of X-, Y-, and Z-AMPLIFIER inputs must be 60 pF or less.

NOTE

For Options 110, 210, and 211 instruments proceed to paragraph 5-25.

Equipment Required:

LCR Meter
Test Leads
Adapter (HP Model 10110A)

5-24. Check input capacitance as follows:

a. Using LCR meter, measure input capacitance at X, Y, and Z AMPLIFIER inputs. Capacitance shall be 60 pF or less.

NOTE

If a capacitance bridge is used, special care must be taken to null out capacitance of connecting cable and to null out the effect of the 1 megohm input resistance.

5-25. DEFLECTION AMPLIFIER DYNAMIC RANGE.

The dynamic range shall extend to at least 1/2 screen diameter beyond full screen.

Equipment Required:

Pulse Generator (HP Model 8012B)
Monitor Oscilloscope
BNC Tee
Three 44-in. BNC Cables

5-26. Check deflection amplifier dynamic range as follows:

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

b. Set pulse generator for positive 100-kHz output with pulse width set for 50 percent duty cycle.

c. Set monitor oscilloscope trigger to internal and sweep speed to display approximately one complete cycle of waveform on 1332A CRT.

d. Set 1332A X GAIN fully ccw.

e. Adjust pulse generator output for 10-division p-p deflection.

f. Using 1332A X POSITION control, position baseline of displayed waveform to left side of screen (Option 105: right side).

g. Increase pulse generator output amplitude by 50 percent. Shape of baseline portion of square wave should not move horizontally or change shape.

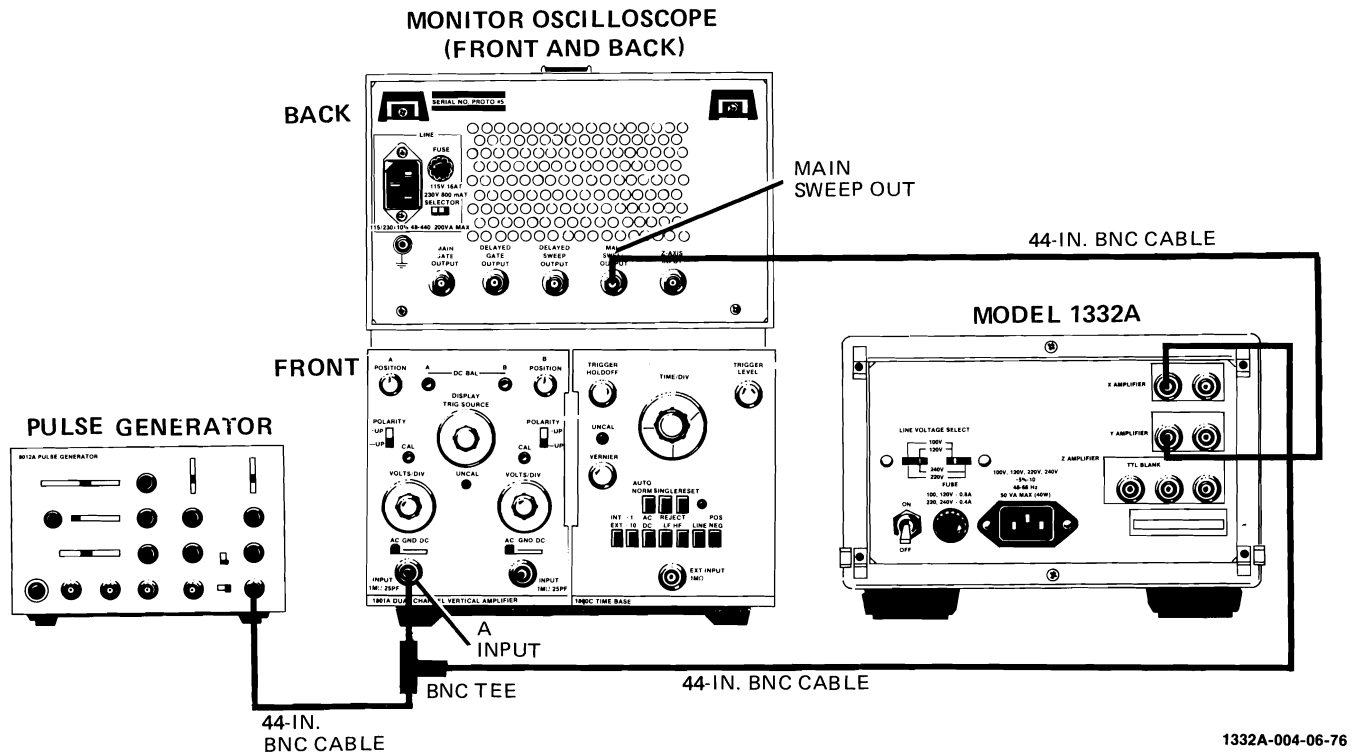
h. Change pulse generator polarity to negative and repeat steps b through g except in step f, position base line to right side of screen (Option 105: left side).

i. Interchange X and Y AMPLIFIER inputs.

j. Set pulse generator output amplitude for 8-division p-p deflection on 1332A.

k. Repeat steps b through h. In step f, for positive pulse polarity, position baseline to lower edge of CRT (Option 105: upper edge); for negative pulse polarity, position baseline to upper edge of CRT (Option 105: lower edge).

l. Disconnect test equipment.



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Figure 5-4. Deflection Amplifier Dynamic Range Test Setup

5-27. CROSSTALK. Crosstalk between deflection amplifiers shall be less than 0.254 mm (0.010 in.) with one input terminated in 50 ohms and the other driven by a 1-volt, 500-kHz signal.

Equipment Required:

- Test Oscillator
- Two 50-ohm Terminations
- 44-in. BNC Cable

5-28. Check crosstalk as follows:

- a. Connect test oscillator to X AMPLIFIER input.
- b. Connect 50-ohm termination to Y AMPLIFIER input (not required for Option 110).

NOTE

For Option 106 instruments connect a 50-ohm termination to -Y INPUT.

- c. Set test oscillator output for 1 V p-p, 500 kHz.
- d. Set 1332A Y GAIN to midrange.
- e. Set 1332A X GAIN for 10-division deflection. Trace opening shall be less than 0.254 mm (0.010 in.) measured from trace center to trace center.
- f. Add 50-ohm termination to X AMPLIFIER input (not required for Option 110).

NOTE

For Option 106 instruments add 50-ohm terminations to both +X and -Y inputs.

- g. Set test oscillator output for 1 V p-p, 5 MHz.
- h. Set 1332A X GAIN for 10-division deflection. Trace opening shall be 0.38 mm (0.015 in.) or less measured from trace center to trace center.
- i. Connect test oscillator to Y AMPLIFIER input.
- j. Repeat steps b through h for Y AMPLIFIER, except set Y GAIN for 8-division deflection.
- k. Disconnect test equipment.

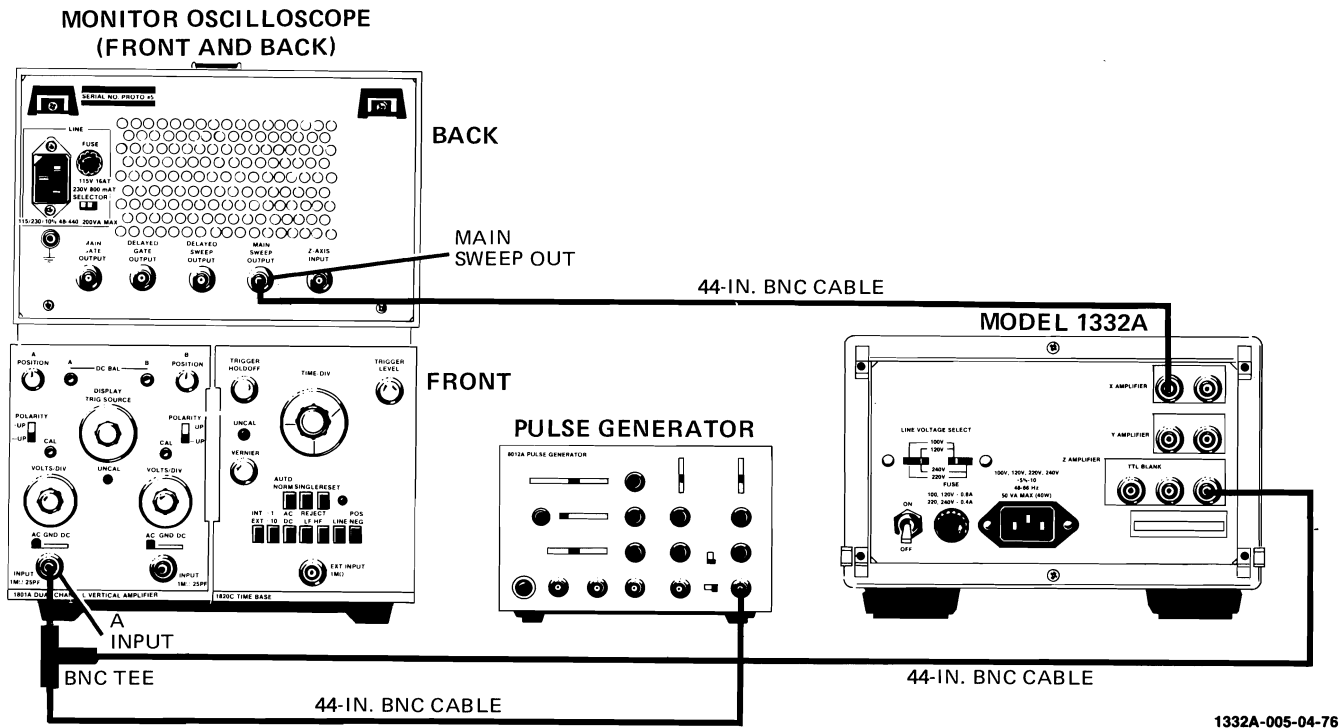
5-29. Z-AXIS POLARITY AND GAIN. Positive input unblanks trace. Negative input unblanks trace on Option 205 instruments.

Equipment Required:

- Pulse Generator
- Monitor Oscilloscope
- BNC Tee
- Three 44-in. BNC Cables

5-30. Check Z-axis polarity and gain as follows:

- a. Connect instrument as shown in figure 5-5.



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Figure 5-5. Z-axis Polarity and Gain Test Setup

b. Set pulse generator controls as follows:

Frequency 100 kHz
 Pulse Width for 10% duty cycle
 Polarity positive (Option 205: negative)
 Amplitude 1 V p-p (Option 200: 5 V p-p
 and for Option 201: 10 V p-p)

c. Set monitor oscilloscope sweep and trigger controls so that display begins on positive transition and terminates just after negative transition (figure 5-6).

d. Set 1332A INTENSITY so that widest square-wave segments are just blanked off. Presentation on

1332A CRT shall consist of fully unblanked line segments and fully unblanked segments between them. Unblanked segments shall be shorter than blanked intervals.

e. Set pulse generator polarity to negative.

f. Readjust monitor oscilloscope to achieve display as shown in figure 5-6.

g. Set 1332A INTENSITY control so that shortest square-wave segments are just blanked off. Presentation on 1332A CRT shall consist of fully blanked line segments and fully unblanked segments between them. Unblanked intervals shall be wider than blanked segments.

h. Rotate A1R11, Z gain adj, fully ccw.

i. Increase pulse generator amplitude until blanked segments on 1332A just disappear. Pulse amplitude on monitor oscilloscope shall be ≥ 2.5 volts).

j. Reset A1R11, Z gain adj, full cw.

NOTE

On Option 205 and 206 instruments invert pulse generator output polarity in all the above tests. Set monitor oscilloscope sweep and trigger controls so that presentation begins on a negative transition and terminates immediately following a positive transition.

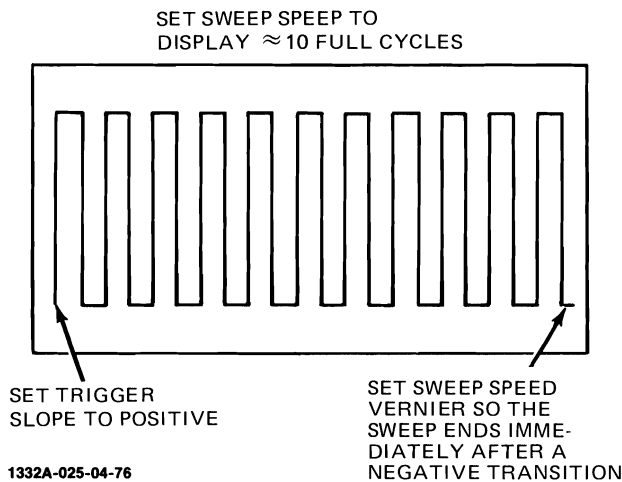


Figure 5-6. Monitor Oscilloscope Presentation

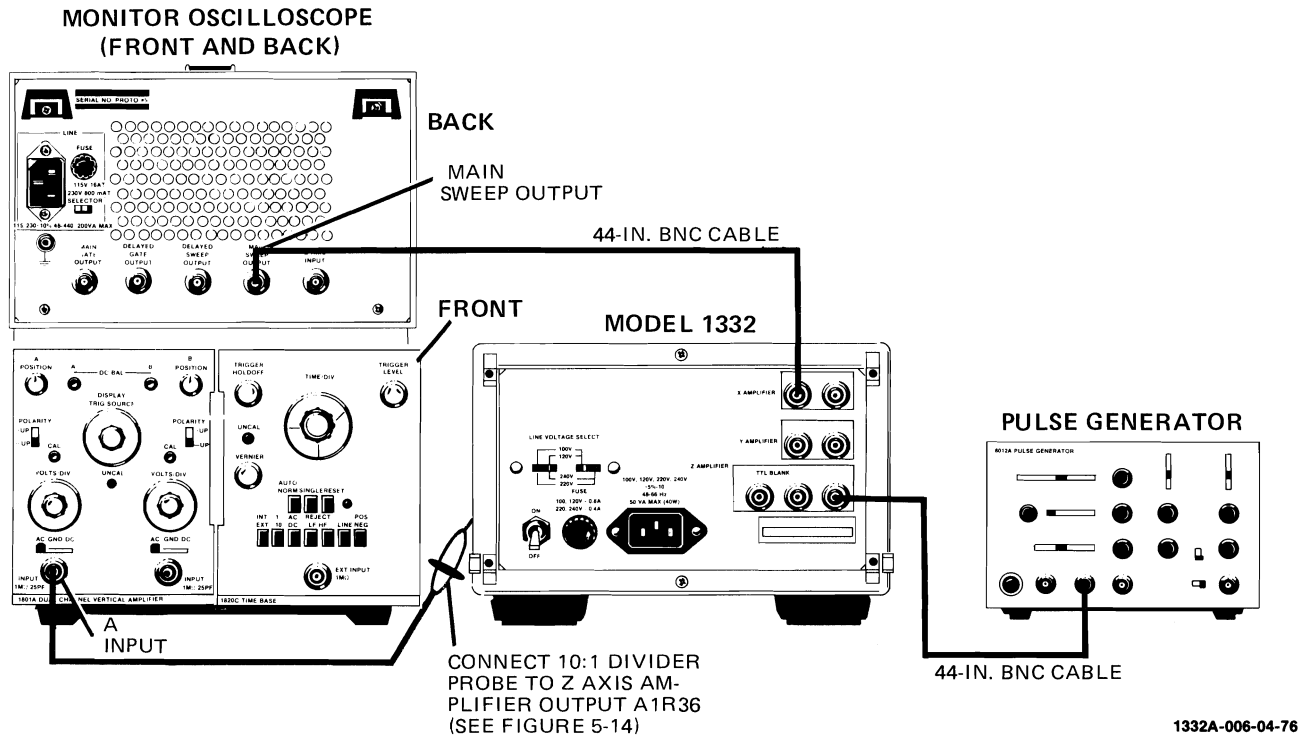


Figure 5-7. Z-axis Rise Time Test Setup

k. Disconnect test equipment.

5-31. Z-AXIS RISE TIME. Rise time of the Z-axis amplifier shall be less than 25 nanoseconds.

Equipment Required:

- Pulse Generator (HP Model 8012B)
- Monitor Oscilloscope
- 10:1 Divider Probe
- Two 44-in. BNC Cables

5-32. Check Z-axis rise time as follows:

- a. Connect equipment as shown in figure 5-7.
- b. Set pulse generator frequency to 100 kHz and pulse width for 50 percent duty cycle.
- c. Set pulse generator amplitude and 1332A INTENSITY control for pulse at A1TP1 (as seen on monitor oscilloscope) of highest amplitude attainable without clamping on either positive or negative excursions.
- d. Rise time shall be ≤ 25 ns for both positive and negative going transitions.
- e. Disconnect test equipment.

5-33. LINEARITY. With eleven equally-spaced pulses displayed, leading edge of each pulse shall be within 3% of full scale.

Equipment Required:

- Pulse Generator (HP Model 8012B)
- Monitor Oscilloscope
- BNC Tee
- Three 44-in. BNC Cables
- 50-ohm Termination

5-34. Check linearity as follows:

- a. Connect equipment as shown in figure 5-8.
- b. Set pulse generator controls for 0.5 volt, 100 kHz, 1 μ s wide pulse.
- c. Set monitor oscilloscope sweep speed to 2 μ s/div, internal trigger.
- d. Adjust 1332A X POSITION so sweep starts 1 to 2 divisions off screen.
- e. Adjust pulse generator frequency and 1332A X POSITION control for exactly 11 pulses displayed on 1332A CRT (figure 5-9).
- f. Using 1332A X POSITION and pulse generator frequency control, position leading edge of first pulse exactly on left edge of graticule and leading edge of 11th pulse exactly on right edge of graticule.
- g. Every other leading edge must fall on corresponding graticule line within 0.3 division. Spacing between any two leading edges must be 1 ± 0.3 division.

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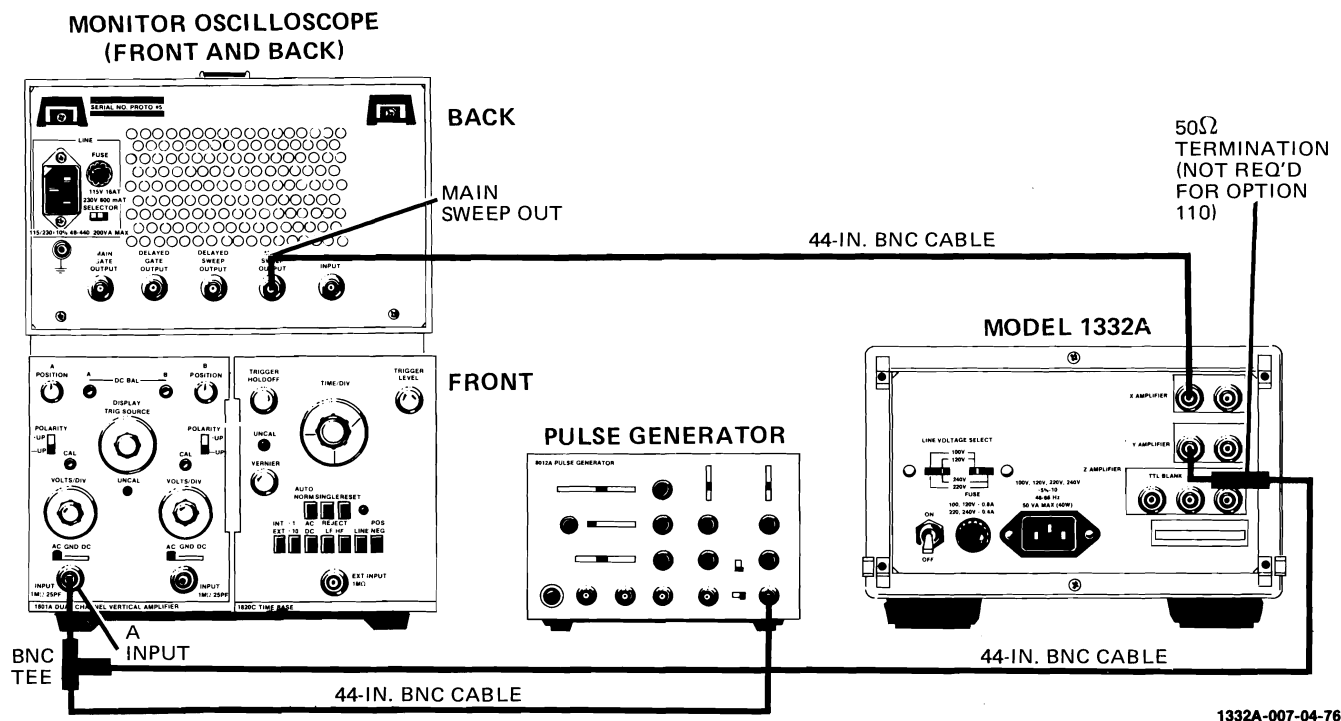


Figure 5-8. Linearity Test Setup

h. Interchange X- and Y-AMPLIFIER inputs and repeat for Y-axis, except adjust for 9 pulses and position on bottom and top graticule lines. Every other leading edge must fall on corresponding graticule line within 0.24 division. Spacing between any two leading edges must be 1 ± 0.24 division.

i. Disconnect test equipment.

5-35. GEOMETRY. Trace deviation from vertical shall be equal to or less than 0.24 division over height of graticule.

Equipment Required:

Test Oscillator
44-in. BNC Cable

5-36. Check geometry as follows:

a. Connect test oscillator to 1332A Y AMPLIFIER input.

b. Set test oscillator output for approximately 10 kHz and display amplitude of 8 divisions.

c. Position trace to coincide with vertical center line of graticule. Exactly align trace using orthog adj, A1R77.

d. Move trace to left edge of graticule. Total trace deviation from vertical must be ≤ 0.24 division when measured from trace center to trace center within 8-division graticule.

e. Move trace to right edge of graticule, and repeat trace deviation test in step d.

f. Connect test oscillator output to X AMPLIFIER input.

g. Set test oscillator output for approximately 10 kHz and horizontal display of 10 divisions.

h. Position trace to coincide with horizontal center line of graticule.

NOTE

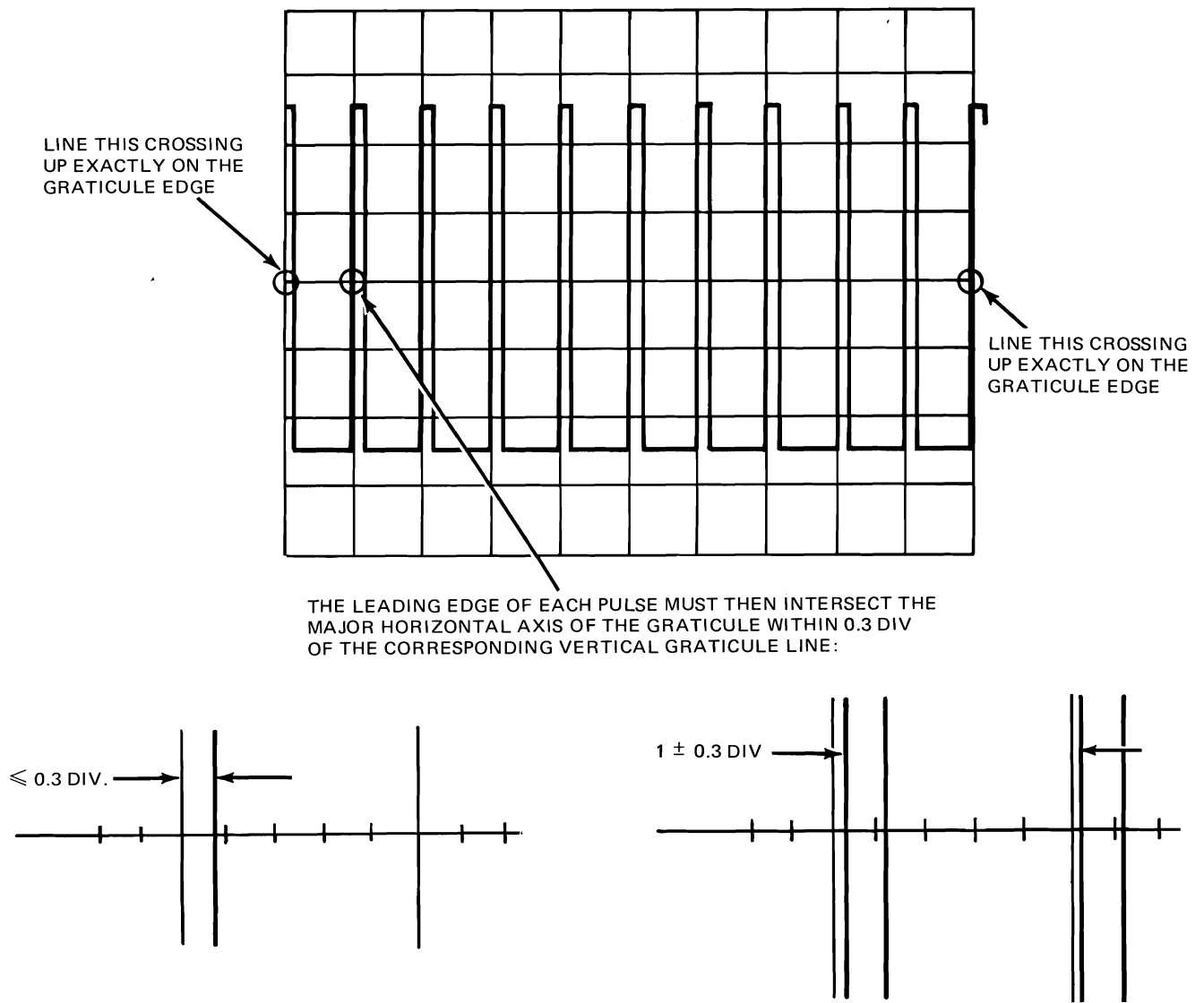
If necessary, adjust TR ALIGN to align trace exactly with graticule line.

i. Move trace to top edge of graticule. Total trace deviation from horizontal shall be ≤ 0.3 division when measured within 10-division graticule.

j. Move trace to bottom of graticule and repeat step i.

k. Disconnect test equipment.

5-37. CMRR - OPTION 106 ONLY. Applying identical signals to +X and -X AMPLIFIER inputs, the resulting display on the CRT will be the common mode signal. Amplitude of common mode signal must be at least 40 dB below input signal at 10 kHz and at least 25 dB below input signal at 1 MHz.



AND THE SPACING BETWEEN ANY TWO LEADING EDGES, MEASURED AT THEIR INTERSECTION WITH THE MAJOR HORIZONTAL AXIS, MUST BE $1 \text{ DIV} \pm 0.3 \text{ DIV}$:

1332A-L-011

Figure 5-9. Linearity Presentation

Equipment Required:

- Test Oscillator
- Monitor Oscilloscope
- Two BNC Tees
- 50-ohm Termination
- Two 44-in. BNC Cables
- Two 9-in. BNC Cables
- Shorting Cap

5-38. Check CMRR - Option 106 as follows:

a. Connect equipment as shown in figure 5-10, except do not connect $-X$ AMPLIFIER input at this time.

b. Place shorting cap on $-X$ AMPLIFIER input connector (Option 110 does not use 50-ohm termination).

c. Set sine-wave oscillator output to 10 kHz, 1 V p-p. For Option 100 instruments set to 10 kHz, 5 V p-p. For Option 101 instruments set to 10 kHz, 10 V p-p.

d. Adjust 1332A X GAIN for 10-division horizontal display.

e. Remove shorting cap and connect cable to $-X$ AMPLIFIER input as shown in figure 5-10.

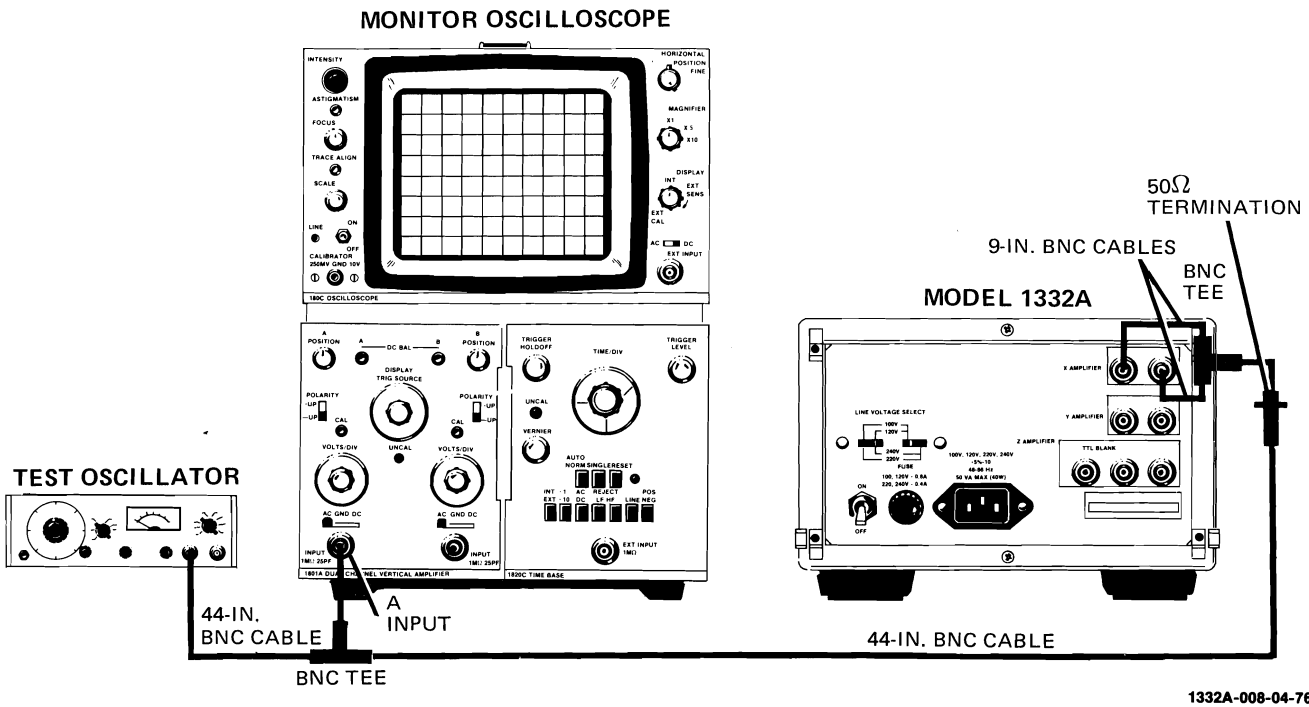


Figure 5-10. CMRR Test Setup

1332A-008-04-76

- f. Deflection on 1332A shall be ≤ 0.1 division.
- g. Repeat steps b through d, except increase frequency to 1 MHz. Horizontal deflection on 1332A shall be ≤ 0.4 division.
- h. Repeat steps a through g for Y AMPLIFIER inputs, except adjust 1332A Y GAIN for 8-division deflection.
- i. Vertical deflection (at 1 MHz) on 1332A shall be ≤ 0.32 division.
- j. Disconnect test equipment.

Z-axis input signal. A logic low level (0 volt to +0.8 volt) returns control of display brightness to analog Z-axis input.

Equipment Required:

- Dc Standard Adapter (HP Part No. 1251-2277)
- 44-in. BNC Cable

5-39. TTL BLANKING - OPTION 216 ONLY. A logic high level (+2.5 volts to +5.0 volts) blanks any analog

- 5-40. Check TTL blanking - Option 216 as follows:
 - a. Connect equipment as shown in figure 5-11.
 - b. Adjust dc standard for +2.5 Vdc output.
 - c. Rotate 1332A INTENSITY control fully cw. Trace should not appear on screen.

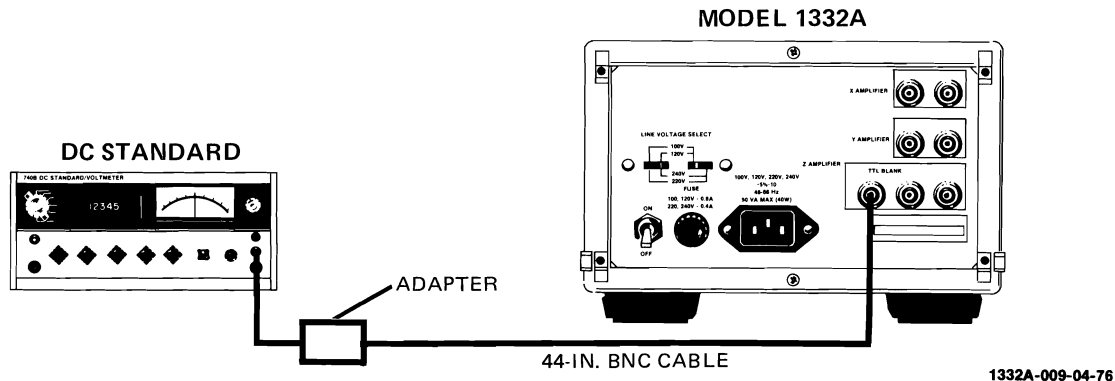


Figure 5-11. TTL Blanking Test Setup

- d. Rotate 1332A INTENSITY control fully ccw.
- e. Set dc standard output to +0.8 Vdc.
- f. Rotate 1332A INTENSITY control cw. Spot shall appear on CRT.
- g. Disconnect cable from 1332A TTL BLANKING input.

5-41. ADJUSTMENTS.

WARNING

Read the Safety Summary at the front of this manual before performing the adjustment procedures.

5-42. The following paragraphs describe procedures to calibrate the instrument so that it will perform as specified in table 1-1. The entire adjustment procedure can be done in sequence, or any separate adjustment can be made by following the steps outlined in the appropriate paragraph. However, do not attempt to subdivide major sections. See figure 5-14 for adjustment locations.

5-43. Use a nonmetallic screwdriver and recently calibrated test equipment with characteristics as specified in table 5-1. After adjustments are complete, check instrument performance by doing the performance check procedure at the beginning of this section.

5-44. Install BNC shorting caps on all unused inputs during all tests. Also, for options with differential inputs, use the +X, +Y, or \square Z input unless otherwise stated.

5-45. For options without a graticule in the CRT, the filter faceplate may be temporarily replaced with an external graticule. Handle the filter faceplate carefully and be sure to replace it.

5-46. The position of a trace on the CRT always refers to the center of the trace, and the distance between traces always refers to the orthogonal distance from trace center to trace center or from the edge of one trace to the corresponding edge of the other trace.

5-47. If an assembly or an adjustable component is replaced, set all adjustments on the replaced assembly to midrange (except A1R76, intensity limit, which should not be changed) before turning the instrument on. If the CRT is replaced, rotate A1R76 fully ccw and set front-panel INTENSITY control fully ccw before applying power.

NOTE

Allow the 1332A and all test equipment to warm up for one hour before making any adjustments.

5-48. LOW-VOLTAGE POWER SUPPLY.

Equipment Required:

Dc Voltmeter

5-49. There are no low-voltage power supply adjustments, however, each supply should be checked for proper output. Measure each power supply output at the test points listed in table 5-4.

Table 5-4. Low-voltage Power Supply

Supply	Test Point	Test Limits
+100 V	A1TP2	+95 V to +105 V
+ 15 V	A1TP3	+14.25 V to +15.75 V
- 15 V	A1TP1	-14.25 V to -15.75 V

5-50. HIGH-VOLTAGE POWER SUPPLY ADJUSTMENT.

WARNING

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

Equipment Required:

Dc Voltmeter
1000:1 Divider Probe

5-51. Adjust the high-voltage power supply as follows:

- a. Measure output of +100-volt supply at test point A1TP2. Note reading.
- b. Connect 1000:1 divider probe to digital voltmeter.
- c. Set dc voltmeter to 100 millivolt range.
- d. Measure +100-volt power supply through 1000:1 divider probe. Note reading.
- e. Divide reading noted in step a into reading noted in step d.
- f. Measure voltage output of CRT cathode power supply at HVTP test point on assembly A3.
- g. Adjust HV Adj A1R84 for reading of -40 times value derived in step e.

h. Disconnect test equipment.

5-52. FOCUS CENTERING ADJUSTMENT.

Equipment Required: None

5-53. Adjust focus centering as follows:

a. Set spot of normal intensity at center screen using INTENSITY and X POSITION controls.

b. Set FOCUS control to midrange.

c. Adjust focus limit, A3R13, and front-panel ASTIGMAT control, A2R90, for sharpest focused, round spot.

5-54. INTENSITY LIMIT ADJUSTMENT.

Equipment Required:

Dc Voltmeter
Monitor Oscilloscope
10:1 Divider Probe

5-55. Adjust intensity limit as follows:

a. Connect monitor oscilloscope, through 10:1 divider probe, to A3TP1.

b. Set 1332A X-, and Y-POSITION, and INTENSITY controls fully cw.

c. Adjust Intensity Limit, A1R76, for 8 V p-p amplitude at A3TP1.

d. Measure dc voltage at Z-amplifier output (front end of A1R36).

e. Rotate INTENSITY control ccw for dc voltage indication of 52 volts less than measured in step d.

f. Center 1332A X- and Y-POSITION controls.

g. If spot is visible, readjust intensity limit A1R76 until spot is just cut off.

h. Disconnect test equipment.

5-56. TRACE ALIGNMENT AND ORTHOGONALITY.

Equipment Required:

Test Oscillator
44-in. BNC Cable

5-57. Adjust trace alignment and orthogonality as follows:

a. Connect test oscillator output to 1332A X AMPLIFIER input.

b. Set oscillator frequency to 10 kHz and amplitude for 10 horizontal divisions of display.

c. Position trace to center screen.

d. Align trace with center horizontal graticule line using front-panel control TR ALIGN.

e. Reconnect test oscillator output to 1332A Y AMPLIFIER input.

f. Adjust test oscillator output amplitude for 8 vertical divisions of display.

g. Position trace to center screen.

h. Align trace with center vertical graticule line using orthog adj, A1R77.

i. With test oscillator output still connected to Y-AMPLIFIER input, move trace to left or right side of CRT using Y-POSITION control and check for trace bow.

j. Connect test oscillator output to X-AMPLIFIER input, move trace to top or bottom of CRT using X-POSITION control, and check for trace bow.

k. Alternate connecting test oscillator output to X- and Y-AMPLIFIER inputs, adjusting Pattern Adj, A1R79, for minimum amount of trace bow in both axes.

5-58. Z-AXIS HIGH FREQUENCY ADJUSTMENT.

Equipment Required:

Pulse Generator (HP Model 8012B)
Monitor Oscilloscope
10:1 Divider Probe
44-in. BNC Cable
5-ohm Termination

5-59. Adjust the high frequency limit of the Z-axis amplifier as follows:

a. Set 1332A X- and Y-POSITION controls fully cw.

b. Set 1332A INTENSITY full ccw.

NOTE

For Option 200 and 201 instruments, install jumper across A1R3.

c. Connect pulse generator output to monitor oscilloscope vertical input, terminated in 50 ohms.

d. Adjust pulse generator for a positive 1 V p-p, 100 kHz output with 50% duty cycle pulse width.

NOTE

For Option 205 instruments, set pulse generator to negative polarity.

e. Reconnect pulse generator output to 1332A Z AMPLIFIER input through 50-ohm termination.

NOTE

50-ohm terminations are not required on Option 210 and 211 instruments.

f. Connect monitor oscilloscope vertical input through 10:1 divider probe to 1332A Z-axis output (front end of A1R36).

g. Set Z-gain A1R11 fully cw. Displayed waveform should go from baseline of $<+5$ Vdc to peak of $>+55$ Vdc.

h. Adjust HF adj #1, A1R34, and HF adj #2, A1C8, for best pulse shape with rise time of ≤ 25 ns.

NOTE

For Option 200 and 201 instruments, perform the following steps.

i. Remove shorting jumper across A1R3.

j. Readjust pulse generator output amplitude to 5 V p-p for Option 200 (10 V p-p for Option 201), 10 kHz and 50% duty cycle pulse width.

k. Repeat step g.

l. Adjust input compensation A1C1 for best wave shape as seen on monitor oscilloscope.

NOTE

For Option 200 with 206 or 201 with 206 instruments, perform the following steps:

m. Set pulse generator polarity to negative and amplitude to 5 V p-p (Option 200 with 206) or 10 V p-p (Option 201 with 206).

n. Reconnect pulse generator output to 1332A \square Z AMPLIFIER input.

o. Adjust input compensation A1C2 for best wave shape as seen on monitor oscilloscope.

p. Disconnect test equipment.

5-60. X AND Y GAIN ADJUSTMENTS.**Equipment Required:**

Test Oscillator
Monitor Oscilloscope
BNC Tee
Three 44-in. BNC Cables

5-61. Adjust X and Y gain as follows:

a. Connect output of test oscillator to monitor oscilloscope vertical input and 1332A X AMPLIFIER input.

b. Set test oscillator output for 1-kHz, 0.5 V p-p signal (Option 100 to 2.5 V p-p and Option 101 to 5 V p-p) as seen on monitor oscilloscope.

c. Rotate X- and Y-GAIN fully cw.

d. Adjust X-gain ctr A2R68 for 7 horizontal divisions of display.

e. Reconnect test oscillator output to 1332A Y AMPLIFIER input.

f. Adjust Y-gain ctr A2R24 for 5.7 vertical divisions of display.

g. Disconnect test equipment.

5-62. X- AND Y-AXIS HIGH FREQUENCY ADJUSTMENT.**Equipment Required:**

Pulse Generator (HP Model 8012B)
Monitor Oscilloscope
Three 44-in. BNC Cables
Two 9-in. BNC Cables
Two 10:1 Divider Probes
50-ohm Termination
BNC Tee

5-63. Adjust high frequency limits on X and Y amplifiers as follows:

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

NOTE

For Option 100 and 101 instruments, install shorting jumpers across A2R3 and A2R4 for Y-axis, and A2R47 and A2R48 for X-axis. For Option 205 instrument, connect monitor oscilloscope gate output to Z AMPLIFIER input. For Option 206 instrument, connect monitor oscilloscope to \square Z AMPLIFIER input.

b. Set X- and Y-GAIN fully cw.

c. Set pulse generator output for 100 kHz (50 kHz for Option 121), amplitude for 8 vertical divisions of display, and 50% duty cycle.

d. Set monitor oscilloscope sweep and trigger controls for stable display of one full cycle of square wave.

e. Position both ends of square wave on screen.

f. Adjust HF adj #1, A2R30, for best displayed wave shape.

g. Connect monitor oscilloscope vertical inputs to Y-axis deflection plates through 10:1 divider probes.

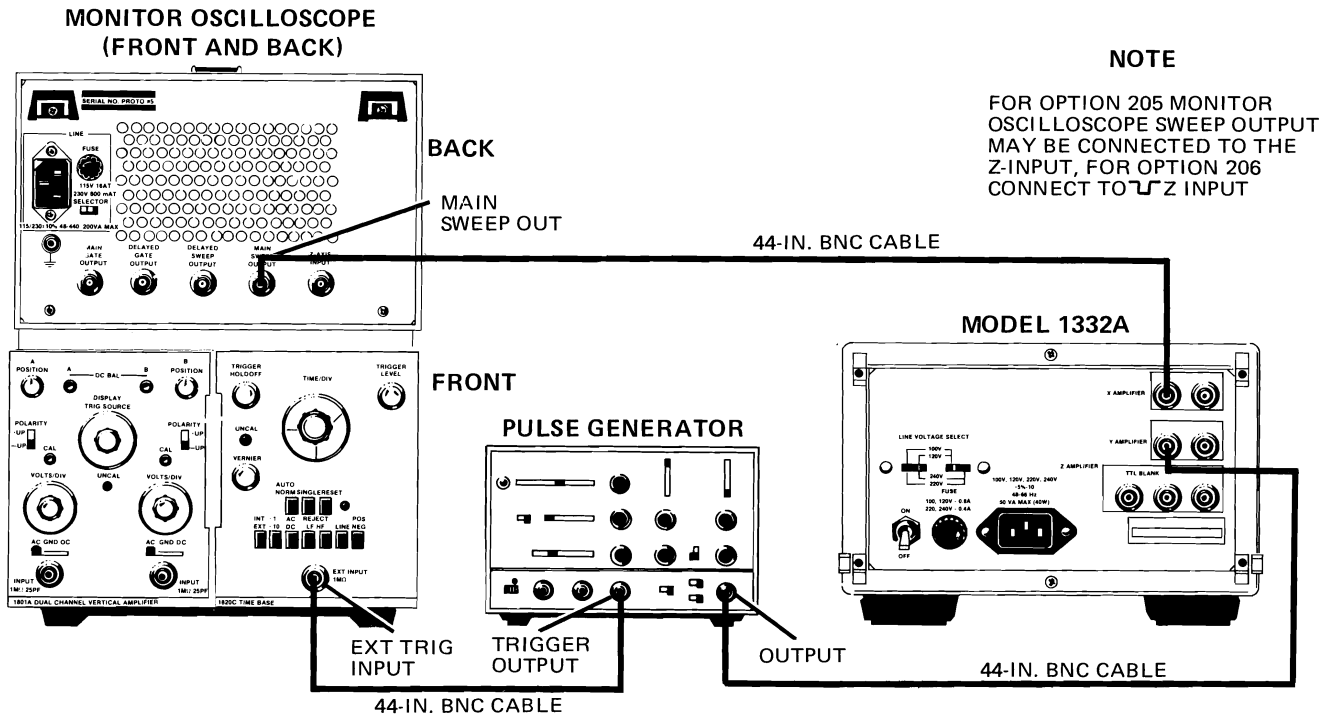


Figure 5-12. X- and Y-axis Test Setup (Number 1)

h. Set monitor oscilloscope to operate in differential (A—B) mode.

i. Adjust Y HF adj #2, A2C11, and Y HF adj #3, A2C10, for 70 ns rise time (Option 120: 25 ns rise time and Option 121: 7 μ s rise time) as seen on monitor oscilloscope (adjust HF adj A2C10 and A2C11 adjustment screws to equal lengths).

j. Measure pulse perturbations (overshoot, ringing). Perturbation must be <3% deviation from pulse top in either direction.

k. Interchange connections to 1332A X and Y AMPLIFIER inputs.

l. Remove divider probes from Y-axis deflection plates.

m. Set pulse generator amplitude for 10 horizontal divisions of display.

n. Set monitor oscilloscope sweep and trigger controls for stable presentation of one full cycle of square wave.

o. Position both ends of square wave on screen.

p. Adjust 1332A HF adj #1, A2R74, for best displayed wave shape.

NOTE

For Option 121 instrument, proceed to step v.

q. Disconnect all inputs from 1332A. Do not change equipment settings.

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

s. Set test oscillator output frequency to 1 MHz.

t. Adjust test oscillator amplitude for 8 vertical divisions of display.

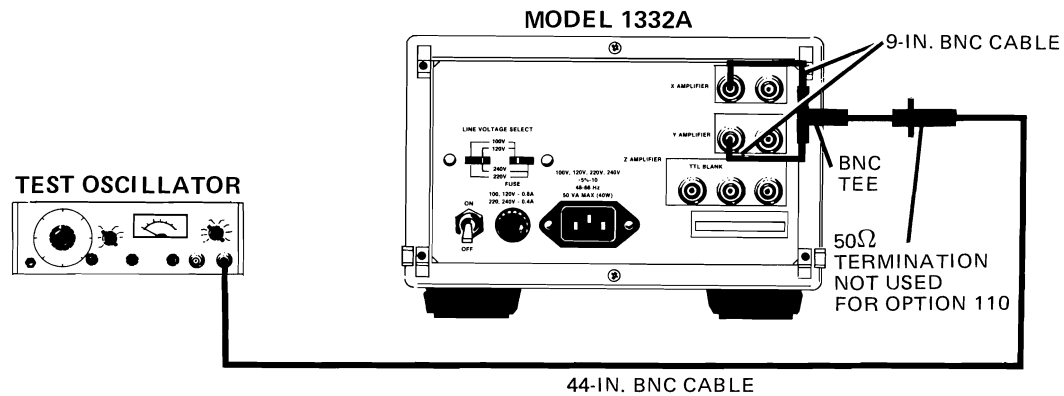
u. Adjust HF adj #2, A2C27, and HF adj #3, A2C28, for straight line display (A2C27 and A2C28 adjustment screws to equal length).

v. Reconnect equipment as shown in figure 5-12, except interchange X- and Y-inputs.

w. Connect monitor oscilloscope vertical inputs to 1332A X-deflection plates through 10:1 divider probes.

x. Set monitor oscilloscope controls to operate in differential (A—B) mode.

y. Rise time shall be \leq 70 ns and perturbations must be \leq 3% deviation from pulse top in either direction.



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Figure 5-13. X- and Y-axis Test Setup (Number 2)

NOTE

For Option 120 instrument, rise time must be ≤ 25 ns. If necessary, readjust A2C27 and A2C28 for rise time and A2C10 and A2C11 for ellipse opening of ≤ 0.1 division. If A2C10 and A2C11 are readjusted, recheck Y-axis rise time and pulse perturbations.

NOTE

For Option 121 instrument, perform the following steps:

- z. Repeat steps v, w, and x.
- aa. Adjust A2C27 and A2C28 for rise time of $7 \mu s \pm 0.7 \mu s$.

NOTE

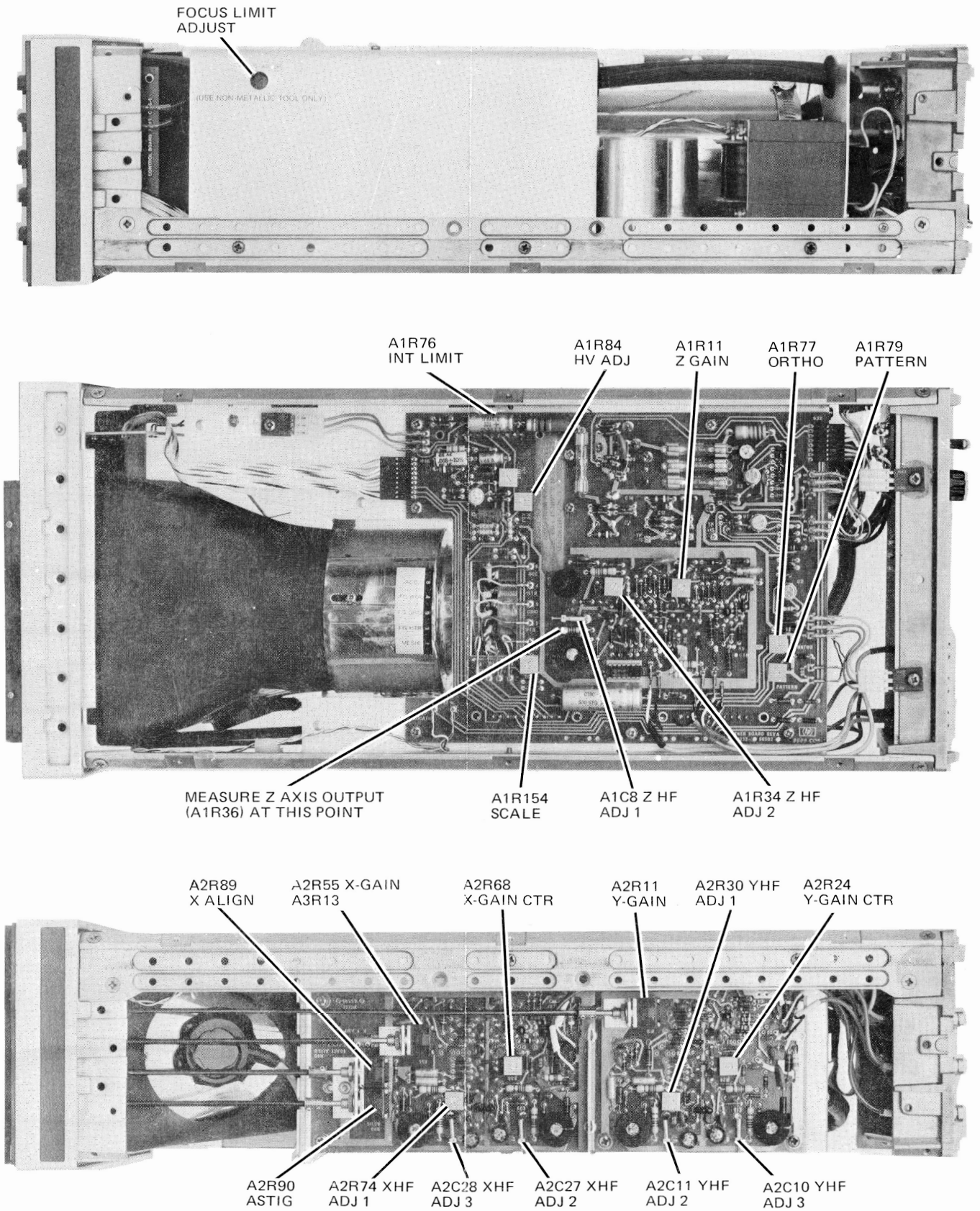
For Option 100 and 101 instruments, perform the following steps:

- ab. Remove jumpers across A2R3, A2R4, A2R47, and A2R48.
- ac. Repeat steps a through f except set pulse generator frequency to 10 kHz.
- ad. Adjust input compensation, A2C1, for best appearing square-wave shape (do not adjust A2R30).

NOTE

For Option 100 and 106 or 101 and 106 instruments, connect pulse generator to $-Y$ INPUT and adjust A2C2 for best square-wave shape.

- ae. Disconnect test equipment.



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Figure 5-14.
Adjustment Location
5-17/(5-18 blank)

**PERFORMANCE CHECK RECORD
MODEL 1332A**

Instrument Serial Number _____ Date _____

Check	Specification	Measured
<p>DEFLECTION AMPLIFIER RISE TIME</p> <p>X and Y Amplifier Standard Option 120 Option 121</p>	<p>< 70 ns < 25 ns < 7 μs</p>	<p>_____ _____ _____</p>
<p>DEFLECTION FACTOR</p> <p>X Amplifier Minimum Maximum</p> <p>Y Amplifier Minimum Maximum</p>	<p>< 5 div > 6.3 div < 5 div > 6.3 div</p>	<p>_____ _____ _____ _____</p>
<p>DIAGONAL SETTling TIME</p>	<p>< 300 ns</p>	<p>_____</p>
<p>DEFLECTION POLARITY</p> <p>Standard-dimmer dot above brighter dot</p> <p>Option 105 and 106-dimmer dot below brighter dot</p>	<p>(\checkmark) (\checkmark)</p>	<p>_____ _____</p>
<p>POSITION CONTROL</p> <p>Off Screen right Off Screen left Off Screen top Off Screen bottom</p>	<p>(\checkmark) (\checkmark) (\checkmark) (\checkmark)</p>	<p>_____ _____ _____ _____</p>
<p>INPUT RESISTANCE</p> <p>X Amplifier Standard Option 110</p> <p>Y Amplifier Standard Option 110</p> <p>Z Amplifier Standard Option 210 Option 211</p>	<p>1 meg nominal 50 \pm1 1 meg nominal 50 \pm1 1 meg nominal 50 \pm1 75 \pm1.5</p>	<p>_____ _____ _____ _____ _____ _____ _____ _____</p>
<p>INPUT CAPACITANCE</p> <p>Standard X Amplifier Y Amplifier Z Amplifier</p>	<p>< 60 pF < 60 pF < 60 pF</p>	<p>_____ _____ _____</p>

**PERFORMANCE CHECK RECORD (Cont'd)
MODEL 1332A**

Instrument Serial Number _____ Date _____

Check	Specification	Measured
<p align="center">DEFLECTION AMPLIFIER DYNAMIC RANGE</p> <p align="center">X Amplifier Y Amplifier</p>		<p align="center">_____ _____</p>
<p align="center">CROSSTALK</p>	<p align="center">< 0.010 inch</p>	<p align="center">_____</p>
<p align="center">Z-AXIS POLARITY AND GAIN</p> <p align="center">per text steps d and g</p>		<p align="center">_____</p>
<p align="center">Z-AXIS RISE TIME</p>	<p align="center">< 25 ns</p>	<p align="center">_____</p>
<p align="center">LINEARITY</p> <p align="center">per text step g</p>		<p align="center">_____</p>
<p align="center">GEOMETRY</p>	<p align="center">< 0.24 div < 0.3 div</p>	<p align="center">_____ _____</p>
<p align="center">CMRR-OPTION 106 ONLY</p> <p align="center">10 kHz Y Amplifier X Amplifier</p> <p align="center">1 MHz Y Amplifier X Amplifier</p>	<p align="center">< 0.1 div < 0.1 div</p> <p align="center">< 0.4 div < 0.32 div</p>	<p align="center">_____ _____</p> <p align="center">_____ _____</p>
<p align="center">TTL BLANKING-OPTION 216 ONLY</p> <p align="center">per text steps f and h</p>		<p align="center">_____</p>

SECTION VI REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts. The abbreviations used in the parts list are described in table 6-1. Table 6-2 lists the parts in alphanumeric order by reference designation and includes the manufacturer and manufacturer's part number. Table 6-3 lists replaceable parts for available Options. Table 6-4 lists manufacturers' code numbers.

6-3. ORDERING INFORMATION.

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

- a. Instrument model and serial number.
- b. HP part number of item(s).
- c. Quantity of part(s) desired.
- d. Reference designation 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.			SE	SELENIUM
		IMPG	IMPREGNATED	OBD	ORDER BY DESCRIPTION	SEC	SECOND(S)
C	CENTI (10 ⁻²)	INCD	INCANDESCENT	OH	OVAL HEAD	SECT	SECTION(S)
CAR	CARBON	INCL	INCLUDE(S)	OX	OXIDE	SI	SILICON
CCW	COUNTERCLOCKWISE	INS	INSULATION(ED)			SIL	SILVER
CER	CERAMIC	INT	INTERNAL	P	PEAK	SL	SLIDE
CMO	CABINET MOUNT ONLY			PC	PRINTED (ETCHED) CIRCUIT(S)	SP	SINGLE POLE
COAX	COAXIAL	K	KILO (10 ³)	PF	PICOFARADS	SPL	SPECIAL
COEF	COEFFICIENT	KG	KILOGRAM	PHL	PHILLIPS	ST	SINGLE THROW
COMP	COMPOSITION	LB	POUND(S)	PIV	PEAK INVERSE VOLTAGE(S)	TA	TANTALUM
CONN	CONNECTOR(S)	LH	LEFT HAND	PNP	POSITIVE-NEGATIVE-POSITIVE	TD	TIME DELAY
CRT	CATHODE-RAY TUBE	LOG	LOGARITHMIC TAPER	P/O	PART OF	TFL	TEFLON
CW	CLOCKWISE	LPF	LOW-PASS FILTER(S)	PORC	PORCELAIN	TGL	TOGGLE
		LVR	LEVER	POS	POSITION(S)	THYR	THYRISTOR
D	DECI (10 ⁻¹)	M	MILLI (10 ⁻³)	POT	POTENTIOMETER(S)	TI	TITANIUM
DEPC	DEPOSITED CARBON	MEG	MEGA (10 ⁶)	P-P	PEAK-TO-PEAK	TNLDIO	TUNNEL DIODE(S)
DP	DOUBLE POLE	MET FILM	METAL FILM	PRGM	PROGRAM	TOL	TOLERANCE
DT	DOUBLE THROW	MET OX	METAL OXIDE	PS	POLYSTYRENE	TRIM	TRIMMER
		MFR	MANUFACTURER	PWV	PEAK WORKING VOLTAGE		
ELECT	ELECTROLYTIC	MINAT	MINIATURE			U	MICRO (10 ⁻⁶)
ENCAP	ENCAPSULATED	MOM	MOMENTARY	RECT	RECTIFIER(S)	V	VOLTS
EXT	EXTERNAL	MTG	MOUNTING	RF	RADIO FREQUENCY	VAR	VARIABLE
		MY	MYLAR	RFI	RADIO FREQUENCY INTERFERENCE	VDCW	DC WORKING VOLT(S)
F	FARAD(S)	N	NANO (10 ⁻⁹)			W	WATT(S)
FET	FIELD-EFFECT TRANSISTOR(S)	N/C	NORMALLY CLOSED	RH	ROUND HEAD	W/	WITH
		NE	NEON			W/	OR
FH	FLAT HEAD	N/O	NORMALLY OPEN			WIV	WORKING INVERSE
FIL H	FILLISTER HEAD	NOP	NEGATIVE POSITIVE				VOLTAGE
FXD	FIXED		ZERO (ZERO TEMPERATURE COEFFICIENT)	RMO	RACK MOUNT ONLY	W/O	WITHOUT
				RMS	ROOT MEAN SQUARE	WW	WIREWOUND

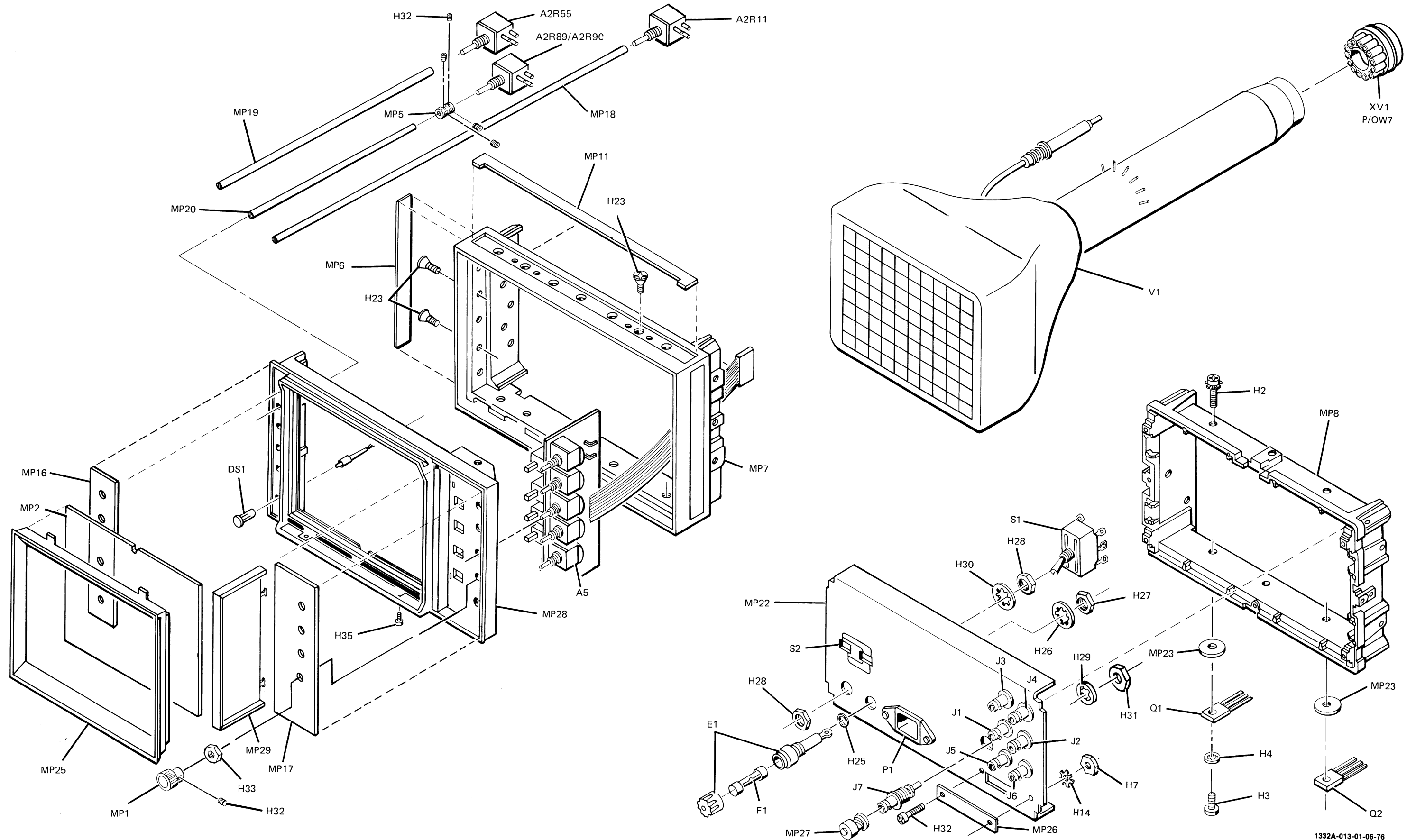


Figure 6-1. Illustrated Parts Breakdown (Sheet 1 of 2) 6-3

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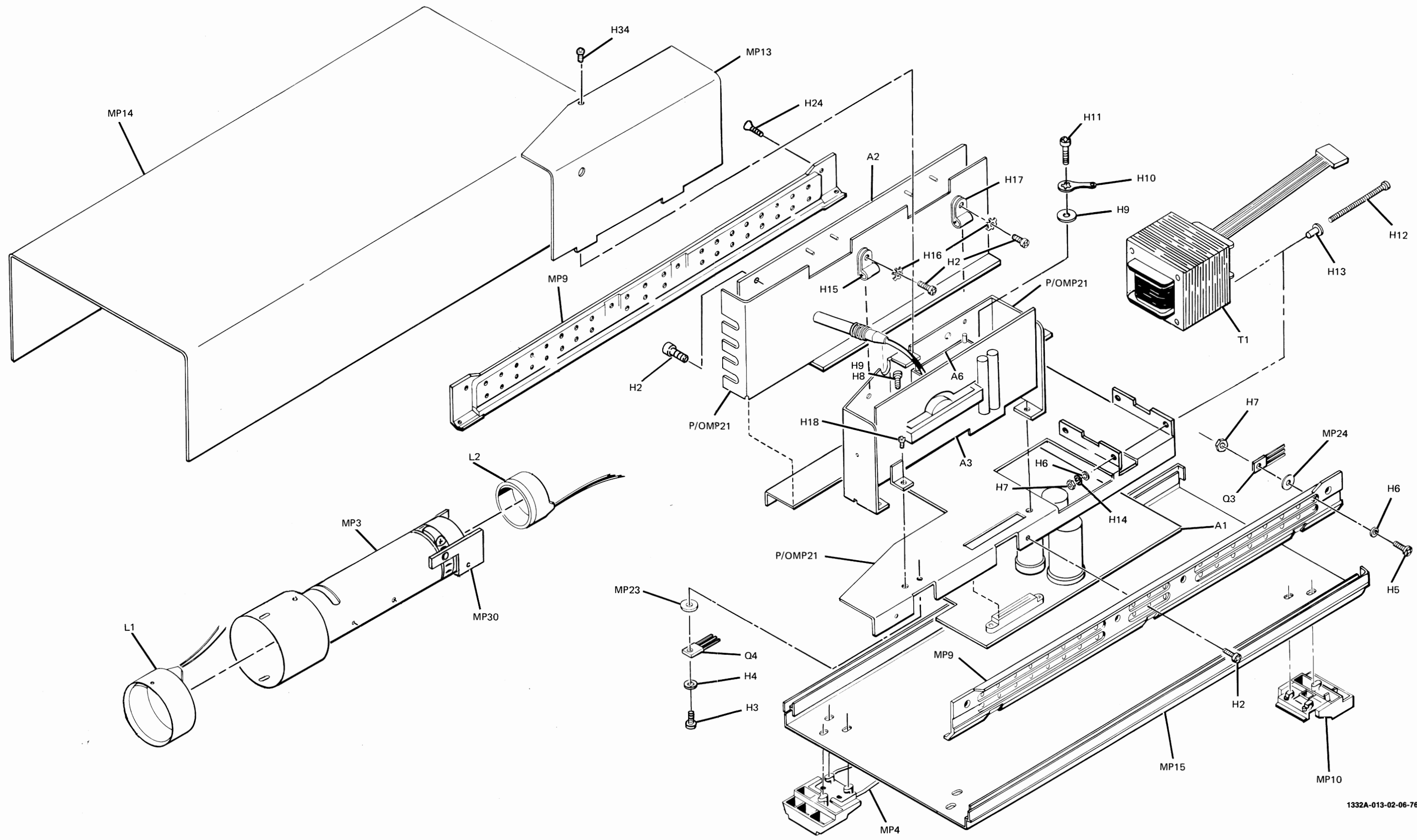


Figure 6-1. Illustrated Parts Breakdown (Sheet 2 of 2)

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	01332-66509	1	BOARD ASSY, MAIN	28480	01332-66509
A2	01335-66512	1	BOARD ASSY, X-Y	28480	01335-66512
A3	01332-66508	1	BOARD ASSY, HIGH VOLTAGE	28480	01332-66508
A4			NOT ASSIGNED		
A5	01332-66505	1	BOARD ASSY, CONTROL	28480	01332-66505
A6	0960-0383	1	HIGH VOLTAGE MULTIPLIER ASSY	28480	0960-0383
DS1	1450-0746	1	LIGHT; IND; INCANDESCENT; WHT OPA LENS	28480	1450-0746
E1	1400-0084	1	FUSEHOLDER; EXTR POST; BAY CAP; 15A	28480	1400-0084
F1	2110-0063	1	FUSE .75A 250V	71400	AGC-3/4
F1	2110-0065	1	FUSE .375A 250V	71400	AGC-3/8
H2	2360-0115	25	SCREW-MACH 6-32 .312-IN-LG PAN HD	28480	2360-0115
H3	2360-0197	3	SCREW-MACH 6-32 .375-IN-LG PAN HD	28480	2360-0197
H4	2190-0909	3	WASHER-LK NO. 6 .146 IN ID .333 IN OD	04713	04A52200F02
H5	2200-0145	1	SCREW-MACH 4-40 .438-IN-LG PAN HD	28480	2200-0145
H6	3050-0235	5	WASHER-FL MTLCL NO. 4 .117 IN ID .25 IN OD	28480	3050-0235
H7	2260-0001	5	NUT-HEX-DBL CHAM 4-40-THD .094-THK	28480	2260-0001
H8	2360-0117	1	SCREW-MACH 6-32 .375-IN-LG PAN HD	28480	2360-0117
H9	3050-0010	2	WASHER-FL MTLCL NO. 6 .147 IN ID .312 IN OD	28480	3050-0010
H10	0360-0001	1	TERMINAL, SLDR LUG, 6 SCR., .141/.086 ID	78452	920
H11	2360-0121	1	SCREW-MACH 6-32 .5-IN-LG PAN HD	28480	2360-0121
H12	2200-0550	2	SCREW-MACH 4-40 2.500-IN-LG PAN HD	28480	2200-0718
H13	1200-0081	4	INSULATOR, BSHG, FLG .115 ID	26365	974-307
H14	2190-0008	2	WASHER-LK EXT T NO. 6 .141 IN ID .32 IN OD	78189	1806-00
H15	1400-0325	1	CLAMP, CABLE .125 DIA .375 W NYL	06915	N-2
H16	3050-0066	2	WASHER-FL MTLCL NO. 6 .147 IN ID .375 IN OD	28480	3050-0066
H17	1400-0023	1	CLAMP-CA .5-IN-WD NYL	28520	3329
H18	2360-0113	1	SCREW-MACH 6-32 .25-IN-LG PAN HD	28480	2360-0113
H20	2200-0139	2	SCREW-MACH 4-40 .25-IN-LG PAN HD	28480	2200-0139
H23	2360-0194	1	SCREW-MACH 6-32 .312-IN-LG 100 DEG FL-HD	28480	2360-0194
H24	2510-0192	8	SCREW-MACH 8-32 100 DEG FL HD	04866	YELLOW PATCH
H25	1400-0090		WASHER-RUBBER 5/8" OD	00000	OBD
H26	2190-0037		WASHER-LK INTL T NO. 1/2 .512 IN ID .789 IN OD	78189	1224-08
H27	2950-0038	1	NUT-SPECIALTY 1/2-24-THD .125-THK	75915	903-12
H28	2950-0035	2	NUT-HEX-DBL CHAM 15/32-32-THD .078-THK	28480	2950-0035
H29	2190-0054	4	WASHER-LK INTL T NO. 1/2 .505 IN ID .63 IN OD	78189	1924-12
H30	2190-0102	1	WASHER-LK INTL T NO. 7/16 .472 IN ID	78189	1222-09
H31	2950-0054	4	NUT-HEX-DBL CHAM 1/2-28-THD .125-THK	28480	2950-0054
H32	2200-0143	16	SCREW-MACH 4-40 PAN HD SST	28480	2200-0143
H33	2950-0072	4	NUT-HEX-DBL CHAM 1/4-32-THD .062-THK	82389	P-1975
H34	2200-0103	3	SCREW-MACH 4-40 .25-IN-LG PAN HD	28480	2200-0103
H35	0520-0127	2	SCREW-MACH 2-56 .188-IN-LG PAN HD	28480	0520-0127
J1	1250-0118	7	CONNECTOR-BNC +Y	24931	28JR 128-1
J2	1250-0118		CONNECTOR-BNC -Y (OPTION 105 OR 106)	24931	28JR 128-1
J3	1250-0118		CONNECTOR-BNC +X	24931	28JR 128-1
J4	1250-0118		CONNECTOR-BNC -X (OPTION 105 OR 106)	24931	28JR 128-1
J5	1250-0118		CONNECTOR-BNC Z	24931	28JR 128-1
J6	1250-0118		CONNECTOR-BNC Z (OPTION 205 OR 206)	24931	28JR 128-1
J7	1250-0118		CONNECTOR-BNC Z (OPTION 216)	24931	28JR 128-1
J8	1251-0218	1	CONNECTOR; REMOTE PROGRAM (OPTION 324)	28480	1251-0218
L1	01332-66001	1	COIL, TRACT ALIGN	28480	01332-66001
L2	01701-66001	1	COIL, ORTHO	28480	01701-66001
MP1	0370-1121	4	KNOB; CONC, RND; 0.5-IN; JGK, SGI DECAL	28480	0370-1121
MP2	01332-02706	1	FILTER, BLUE	28480	01332-02706
MP2	01332-02707	1	FILTER, CLEAR (OPTION 561)	28480	01332-02707
MP2	01332-02708	1	FILTER, AMBER (OPTION 007, 325, 607)	28480	01332-02708
MP3	01332-60601	1	SHIELD, CRT	28480	01332-60601
MP3	1220-0203	1	SHIELD, CRT (OPTION 563)	28480	1220-0203
MP4	1460-1345	2	SPRING WFRM 3-LG SST (OPTION 315, 330, 580)	28480	1460-1345
MP5	1490-0841	4	DRIVE; SFT CPLR .127 ID .281 OD .375 L	28480	1490-0841
MP6	5001-0439	2	TRIM, FRONT SIDE (OPTION 315, 330, 580)	28480	5001-0439
MP7	5020-8815	1	CASTING, FRONT FRAME	28480	5020-8815
MP8	5020-8816	1	CASTING, REAR FRAME	28480	5020-8816
MP9	5020-8882	2	CASTING, COR	28480	5020-8882
MP10	5040-7201	4	FOOT (OPTION 315, 330, 580)	28480	5040-7201
MP11	5040-7203	1	TRIM; TOP 1/2 (OPTION 315, 330, 580)	28480	5040-7203
MP12	6960-0002	4	PLUG, HOLE, STANDARD HD, .5 DIA STEEL	57771	D-2733-LCS
MP13	01335-04102	1	COVER-HV	28480	01335-04102
MP14	5061-1931	1	COVER, TOP (OPTION 315, 580)	28480	5061-1931
MP15	5061-1922	1	COVER, BOTTOM (OPTION 315, 330, 580)	28480	5061-1922
MP16	01332-07204	1	INSERT, LEFT (OPTION 323)	28480	01332-07204
MP16	01332-07201	1	INSERT, LEFT	28480	01332-07201
MP17	01332-07205	1	INSERT, RIGHT	28480	01332-07205
MP17	01332-07206	1	INSERT, RIGHT (OPTION 325)	28480	01332-07206
MP18	01335-23703	1	SHAFT-Y GAIN	28480	01335-23703
MP19	01335-23702	1	SHAFT-X GAIN	28480	01335-23702
MP20	01335-23701	1	SHAFT-TA/AST	28480	01335-23701
MP21	01335-60102	1	CHASSIS ASSY	28480	01335-60102
MP22	01332-60201	1	PANEL ASSY, REAR	28480	01332-60201
MP23	0340-0450	3	INSULATOR: XSTR	91500	1485B52600F13
MP24	0340-0451	1	INSULATOR: XSTR	34344	14852600F03
MP25	01332-02201	1	BEZEL, CRT	28480	01332-02201
MP26	5001-1035		COVER-INPUT	28480	5001-1035
MP27	1250-0774	2	SHORTING CAP BNC	28480	1250-0774
MP28	5040-8118	1	PANEL ASSY FRONT	28480	5040-8118
MP28	5040-0526	1	PANEL ASSY FRONT (OPTION 562)	28480	5040-0526
MP29	5040-7620	1	COVER-PANEL	28480	5040-7620

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
MP30	01332-01209	1	BRACKET, CRT SHIELD	28480	01332-01209
P1	1251-2357	1	CONN AC POWER H-9 MALE FLANGE (P/O MP22)	28480	1251-2357
Q1	1854-0433	3	TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0433
Q2	1854-0433		TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0433
Q3	1854-0433		TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0433
Q4	1854-0330	1	TRANSISTOR NPN SI PD=90W FT=2MHZ	28480	1854-0330
S1	3101-0056	1	SWITCH; TGL; DPDT 10A/250V AC ON-NONE	27191	8926R316
S2	3101-1609	1	SWITCH; DUAL DPDT	28480	3101-1609
T1	9100-0676	1	TRANSFORMER; POWER; 4 SECTION	28480	9100-0676
T1	9100-0677	1	TRANSFORMER; POWER (OPTION 310)	28480	9100-0677
V1	5083-4152	1	CRT, P31 AL STANDARD	28480	5083-4152
V1	5083-4132	1	CRT, P7 ALUMINIZED WITH GRATICULE AND FILTER (OPTION 007)	28480	5083-4132
V1	5083-4142	1	CRT, P11 ALUMINIZED WITH GRATICULE (OPTION 011) EXCEPT WITH OPTION 570	28480	5083-4142
V1	5083-4151	1	CRT, P31 ALUMINIZED NO GRATICULE (OPTION 631) EXCEPT WITH OPTION 570	28480	5083-4151
V1	5083-4131	1	CRT, P7 ALUMINIZED WITH FILTER NO GRATICULE (OPTION 607)	28480	5083-4131
V1	5083-4141	1	CRT, P11 ALUMINIZED, NO GRATICULE (OPTION 611)	28480	5083-4141
V1	5083-4170	1	CRT, P39 ALUMINIZED, NO GRATICULE (OPTION 639)	28480	5083-4170
V1	5083-4171	1	CRT, P39 ALUMINIZED WITH GRATICULE (OPTION 039)	28480	5083-4171
V1	5083-4173	1	CRT, P31 ALUMINIZED, NO GRATICULE (OPTION 570)	28480	5083-4173
V1	5083-4174	1	CRT, P11 ALUMINIZED, NO GRATICULE (OPTION 570)	28480	5083-4174
V1	5083-4176	1	CRT, P31 ALUMINIZED INTERNAL GRATICULE (OPTION 325)	28480	5083-4176
W1	01332-61604	1	CABLE ASSY, INPUT Y (OPTION 106-2 REQ'D)	28480	01332-61604
W2	01332-61601	1	CABLE ASSY, Y OUTPUT	28480	01332-61601
W3	01332-61603	1	CABLE ASSY, INPUT X (OPTION 106-2 REQ'D)	28480	01332-61603
W4	01332-61602	1	CABLE ASSY, X OUTPUT	28480	01332-61602
W5	01332-61605	1	CABLE ASSY, INPUT Z (OPTION 206-2 REQ'D)	28480	01332-61605
W6	8120-1538	1	CABLE, UNSHLF 3-CON 18 AWG (AC INPUT)	28480	8120-1538
W7	01334-61601	1	CABLE ASSY, CRT	28480	01334-61601
W8	01332-61614	1	CABLE ASSY, REMOTE INPUT (OPTION 324)	28480	01332-61614
W9	01332-61608	1	CABLE ASSY, LOGIC BLANKING (OPTION 216)	28480	01332-61608
XQ1	01332-61102	3	CONN AND CABLE, TSTR	28480	01332-61102
XQ2	01332-61102		CONN AND CABLE, TSTR	28480	01332-61102
XQ3	01332-61102		CONN AND CABLE, TSTR	28480	01332-61102
XQ4	01332-61101	1	CONN AND CABLE, TSTR	28480	01332-61101
A1	01332-66509	1	BOARD ASSY, MAIN	28480	01332-66509
A1C5	0160-3451	57	CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C6	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C7	0160-2308	3	CAPACITOR-FXD 36PF +-5% 300WVDC	28480	0160-2308
A1C8	0121-0474	9	CAPACITOR; VAR; TRMR; PSTN; .3/1.5PF	28480	0121-0474
A1C9	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C10	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C11	0160-3622	9	CAPACITOR-FXD .1UF +80-20% 100WVDC	28480	0160-3622
A1C13	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C14	0180-0470	2	CAPACITOR-FXD 1100UF +100-10% 40VDC AL	90201	20-36238
A1C15	0160-3448	3	CAPACITOR-FXD .001UF +-10% 1000WVDC	28480	0160-3448
A1C16	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C17	0180-0470		CAPACITOR-FXD 1100UF +100-10% 40VDC AL	90201	20-36238
A1C18	0160-3443		CAPACITOR-FXD .001UF +-10% 1000WVDC	28480	0160-3443
A1C19	0160-3665	10	CAPACITOR-FXD .01UF +80-20% 500WVDC	28480	0160-3665
A1C20	0180-0471	1	CAPACITOR-FXD 200UF +75-10% 200VDC AL	28480	0180-0471
A1C21	0160-3448		CAPACITOR-FXD .001UF +-10% 1000WVDC	28480	0160-3448
A1C22	0180-0141	1	CAPACITOR-FXD 50UF +75-10% 50VDC AL	56289	30D506G050DD2
A1C23	0160-0164	1	CAPACITOR-FXD .039UF +-10% 200WVDC	56289	292P39392
A1C24	0160-3558	1	CAPACITOR-FXD .1UF +80-20% 25WVDC	28480	0160-3558
A1C25	0180-0269	1	CAPACITOR-FXD 1UF +75-10% 150VDC AL	56289	30D105G15CBA2
A1C26	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C27	0180-1746	10	CAPACITOR-FXD 15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A1C28	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC	28480	0160-3665
A1C29	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C30	0180-1746		CAPACITOR-FXD 15UF +-10% 20VDC TA	56289	150D225X902CB2
A1C31	0180-0197	2	CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A1C32	0180-0197		CAPACITOR-FXD 2.2UF +-10% 20VDC TA	56289	150D225X9020A2
A1C33	0160-0166	1	CAPACITOR-FXD .068UF +80-20% 200WVDC	28480	0160-0166
A1C34	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C35	0160-3449	1	CAPACITOR-FXD .002UF +-10% 250WVDC	28480	0160-3449
A1C36	0160-3670		CAPACITOR-FXD 0.1UF +-20% 200WVDC	72982	8131-M200-651-104M
A1C37	0160-3670		CAPACITOR-FXD 0.1UF +-20% 200WVDC	72982	8131-M200-651-104M
A1C38	0160-3670		CAPACITOR-FXD 0.1UF +-20% 200WVDC	72982	8131-M200-651-104M
A1C151	0180-1780	1	CAPACITOR-FXD 500UF +75-10% 10VDC TA-SOLID (OPTION 325)	28480	0180-1780
A1CR1	1901-0376	10	DIODE-GEN PRP 35V 50MA	28480	1901-0376
A1CR2	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A1CR3	1901-0040	13	DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A1CR4	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A1CR8	1901-0028	18	DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR9	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR10	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR11	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR12	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9

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
A1CR13	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR14	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR15	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR16	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR17	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR18	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR19	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR20	1901-0040		DIODE SWITCHING 2NS 30V 50MA	28480	1901-0040
A1CR22	1901-0040		DIODE SWITCHING 2NS 30V 50MA	28480	1901-0040
A1CR23	1901-0040		DIODE SWITCHING 2NS 30V 50MA	28480	1901-0040
A1CR24	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR25	1901-0045	1	DIODE-PWR RECT 100V 750MA	28480	1901-0045
A1CR26	1901-0040		DIODE SWITCHING 2NS 30V 50MA (OPTION 216)	28480	1901-0040
A1CR27	1901-0040		DIODE SWITCHING 2NS 30V 50MA	28480	1901-0040
A1CR28	1901-0040		DIODE SWITCHING 2NS 30V 50MA	28480	1901-0040
A1CR29	1901-0096		DIODE SWITCHING 100NS 120V 50MA	28480	1901-0096
A1CR30	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR31	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A1CR151	1901-0028		DIODE-PWR RECT 400V 750MA (OPTION 325)	04713	SR1358-9
A1F1	2110-0004	3	FUSE .25A 250V	71400	AGC-1.4
A1F2	2110-0004		FUSE .25A 250V	71400	AGC-1/4
A1F3	2110-0004		FUSE .25A 250V	71400	AGC-1/4
A1F4	2110-0007	1	FUSE 1A 250V SLO-BLO	71400	MDL-1
A1L1	9140-0171	1	COIL, FXD, MOLDED RF CHOKE, 40UH, 10%	06560	10608-1
A1L2	9100-1641	1	COIL, FXD, MOLDED RF CHOKE, 240UH 5%	24226	15/243
A1MP1	1205-0073	1	HEAT-DISSIPATOR; SGL; T0-5 PKG	28480	1205-0073
A1MP2	1205-0095	9	HEAT-DISSIPATOR; SGL; T0-5 PKG	28480	1205-0095
A1MP3	1205-0226	9	HEAT-DISSIPATOR; SGL; T0-5 PKG	28480	1205-0226
A1MP4	2110-0269	8	FUSEHOLDER	28480	2110-0269
A1Q1	1855-0202	5	TRANSISTOR; JFET; DUAL; N-CHAN D-MODE SI	17856	E421
A1Q2	1853-0036	29	TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q3	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q4	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q5	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q6	1854-0215	21	TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A1Q7	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A1Q8	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A1Q9	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A1Q10	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A1Q11	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A1Q12	1853-0232	9	TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1853-0232
A1Q13	1854-0419	5	TRANSISTOR NPN SI T0-39 PD=1W FT=200MHZ	28480	1854-0419
A1Q14	1854-0234	1	TRANSISTOR NPN 2N3440 SI PD=1W	02735	2N3440
A1R7	0684-3901	11	RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A1R8	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A1R9	0757-0290	10	RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A1R10	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A1R11	2100-3252	2	RESISTOR; VAR; TRMR; 5K OHM 10% C	32997	3389P-1-502
A1R12	0757-0420	1	RESISTOR 750 OHM 1% .125W	28480	0757-0420
A1R13	0757-0442	20	RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A1R14	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A1R15	0757-0767	9	RESISTOR 43.2K 1% .25W F TUBULAR	24546	C5-1/4-T0-4322-F
A1R16	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C-1/8-T0-6191-F
A1R17	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C-1/8-T0-6191-F
A1R18	0757-0283	21	RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A1R19	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A1R20	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A1R21	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A1R22	0698-3155	5	RESISTOR 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A1R23	0757-0427	6	RESISTOR 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A1R24	0698-0083	6	RESISTOR 1.96K 1% .125W F TUBULAR	16299	C4-1/8-T0-1961-F
A1R25	0698-0083		RESISTOR 1.96K 1% .125W F TUBULAR	16299	C4-1/8-T0-1961-F
A1R27	0757-0457	5	RESISTOR 47.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-4752-F
A1R31	0757-0444	1	RESISTOR 12.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1212-F
A1R33	0757-0430		RESISTOR 2.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-2211-F
A1R34	2100-3252		RESISTOR; VAR; TRMR 5K OHM 10% C	32997	3389P-1-502
A1R35	0757-0434	5	RESISTOR 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A1R36	0757-0839	5	RESISTOR 10K 1% .5W F TUBULAR	30983	MF7C1/2-GO-1002-F
A1R37	0757-0846	5	RESISTOR 22.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2212-F
A1R38	0757-0281	5	RESISTOR 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A1R39	0684-1001	39	RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A1R40	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A1R41	0757-0730	5	RESISTOR 750 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-751-F
A1R43	0687-3921	2	RESISTOR 3.9K 10% .5W CC TUBULAR	01121	EB3921
A1R44	0757-0435	6	RESISTOR 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A1R45	0757-0418	2	RESISTOR 619 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-619R-F
A1R46	0757-0446	2	RESISTOR 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F
A1R47	0699-0003	2	RESISTOR 8.2 OHM 10% .5W CC TUBULAR	01121	EB82G1
A1R48	0757-0440	2	RESISTOR 7.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-7501-F
A1R49	0757-0441	3	RESISTOR 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F

See introduction to this section for ordering information

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number	
A1R50	0687-3921	4	RESISTOR 3.9K 10% .5W CC TUBULAR	01121	EB3921	
A1R51	0757-0435		RESISTOR 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F	
A1R52	0757-0290		RESISTOR 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F	
A1R53	0757-0446		RESISTOR 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F	
A1R54	0699-0003		RESISTOR 8.2 OHM 10% .5W CC TUBULAR	01121	EB82G1	
A1R55	0757-0440	1	RESISTOR 7.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-7501-F	
A1R56	0757-0441		RESISTOR 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F	
A1R57	0687-1041		RESISTOR 100K 10% .5W CC TUBULAR	01121	EB1041	
A1R58	0764-0005		RESISTOR 10K 5% 2W MO TUBULAR	24546	FP42-2-T00-1002-J	
A1R59	0757-1093		RESISTOR 3K 1% .125W F TUBULAR	24546	C4-1/8-T0-3001-F	
A1R60	0757-1093	14	RESISTOR 3K 1% .125W F TUBULAR	24546	C4-1/8-T0-3001-F	
A1R61	0698-3152		RESISTOR 3.25K 1% .125W F TUBULAR	16299	C4-1/8-T0-3481-F	
A1R62	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F	
A1R63	0757-0418		RESISTOR 619 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-619R-F	
A1R64	0757-1093		RESISTOR 3K 1% .125W F TUBULAR	24546	C4-1/8-T0-3001-F	
A1R65	0757-0342	1	RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F	
A1R66	0686-3005		RESISTOR 30 OHM 5% .5W CC TUBULAR	01121	EB3005	
A1R67	0757-0485		RESISTOR 681K 1% .125W F TUBULAR	19701	MFF-1/8, T-1	
A1R68	0757-0465		RESISTOR 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F	
A1R69	0757-0465		RESISTOR 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F	
A1R70	0684-1211	1	RESISTOR 120 OHM 10% .25W CC TUBULAR	01121	CB1211	
A1R71	0683-2265		RESISTOR 22M 5% .25W CC TUBULAR	01121	CB2265	
A1R72	0684-3941		RESISTOR 390K 10% .25W CC TUBULAR	01121	CB3941	
A1R73	0687-3911		RESISTOR 390 OHM 10% .5W CC TUBULAR	01121	EB3911	
A1R74	0684-1021		RESISTOR 1K 10% .25W CC TUBULAR	01121	CB1021	
A1R75	0757-0280	2	RESISTOR 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F	
A1R76	2100-3253		RESISTOR; VAR; TRMR; 50K OHM 10% C	32997	3389P-1-503	
A1R77	2100-0558		RESISTOR; VAR; TRMR; 20K OHM 10% C	73138	72P	
A1R78	0757-0451		RESISTOR 24.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-2432-F	
A1R79	2100-3253		RESISTOR; VAR; TRMR; 50K OHM 10% C	32997	3389P-1-503	
A1R80	0684-1001	1	RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001	
A1R81	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001	
A1R82	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001	
A1R83	0684-1011		RESISTOR 100 OHM 10% .25W CC TUBULAR	01121	CB1011	
A1R84	2100-3213		RESISTOR 200K OHM 10% .5W CM TUBULAR	28480	2100-3213	
A1R150	0684-2221	1	RESISTOR 2.2K OHM 10% .25W CC	01121	CB2221	
A1R151	0757-0280		RESISTOR 1K 1% .125W F TUBULAR (OPTION 325)	24546	C4-1/8-T0-1001-F	
A1R152	0757-0280		RESISTOR 1K 1% .125W F TUBULAR (OPTION 325)	24546	C4-1/8-T0-1001-F	
A1R153	0683-0475		RESISTOR 4.7 OHM 5% .25W CC (OPTION 325)	01121	CB47G5	
A1R154	2100-3253		RESISTOR; VAR; TRMR; 50K OHM 10% C TOP ADJ (OPTION 325)	73138	72PR50K	
A1R155	0684-2221	3	RESISTOR 2.2K OHM 10% .25W CC	01121	CB2221	
A1U1	1820-0196		IC; LIN; VOLTAGE REGULATOR	07263	723HC	
A1U2	1820-0196		IC; LIN; VOLTAGE REGULATOR	07263	723HC	
A1U3	1820-0196		IC; LIN; VOLTAGE REGULATOR	07263	723HC	
A1U4	1826-0167		IC; LIN; MISCELLANEOUS (LINEAR)	02735	CA3094AT	
A1VR1	1902-3104	5	DIODE-ZNR 5.62V 5% D0-7 PD=4W	04713	SZ 10939-110	
A1VR2	1902-0049		DIODE-ZNR 6.19V 5% D0-7 PD=4W	28480	1902-0049	
A1VR3	1902-3354		DIODE-ZNR 54.9V 5% D0-7 PD=4W	04713	SZ 10939-395	
A1VR4	1902-3357		DIODE-ZNR 56.2V 5% D0-7 PD=4W	04713	SZ 10939-398	
A1VR5	1902-0594		DIODE-ZNR 18.2V VZ 1W MAX PD	04713	SZ 11213-215	
A1VR6	1902-3357	1	DIODE-ZNR 56.2V 5% D0-7 PD=4W	04713	SZ 10939-398	
A1VR7	1902-0594		DIODE-ZNR 18.2V VZ; 1W MAX PD	04713	SZ 11213-215	
A1VR8	1902-319C		DIODE-ZNR 13.3V 5% D0-7 PD=4W	04713	SZ 10939-218	
A1VR9	1902-3070		DIODE-ZNR 4.22V 5% D0-7 PD=4W	15818	CD35598	
A1VR10	1902-0038		DIODE-ZNR 45.3V 5% D0-7 PD=4W	04713	SZ 10939-371	
A1XA1	1251-1968	1	CONNECTOR: PC 10 TUNING FORK TYPE CONT	02660	143-010-07-1158	
A1XA2	1251-1968		CONNECTOR: PC 10 TUNING FORK TYPE CONT	02660	143-010-07-1158	
A1XA4	1251-1968		CONNECTOR: PC 10 TUNING FORK TYPE CONT	02660	143-010-07-1158	
			A1 MISCELLANEOUS PARTS			
	0360-1653		34	TERMINAL; SLDR STUD	28480	0360-1653
	0360-1788	31	TERMINAL; SLDR STUD; .045 SHK DIA	28480	0360-1788	
	1200-0763	1	SOCKET; ELEC; IC 8-CONT DIP SLDR TERM	71785	133-98-92-061	
A2	01335-66512	1	BOARD ASSY, X-Y	28480	01335-66512	
A2C5	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451	
A2C6	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451	
A2C9	0140-0198		CAPACITOR-FXD 200PF +-5% 300WVDC	72136	DM15F201J0300WV1CR	
A2C10	0121-0474		CAPACITOR; VAR; TRMR; PSTN; .3/1.5PF	28480	0121-0474	
A2C11	0121-0474	2	CAPACITOR; VAR; TRMR; PSTN; .3/1.5PF	28480	0121-0474	
A2C12	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665	
A2C13	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665	
A2C14	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665	
A2C15	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665	
A2C16	0160-3670	2	CAPACITOR-FXD .1UF +80-20% 200WVDC	28480	0160-3670	
A2C17	0160-3670		CAPACITOR-FXD .1UF +80-20% 200WVDC	28480	0160-3670	
A2C22	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451	
A2C23	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451	
A2C25	0140-0198		CAPACITOR-FXD 200PF +-5% 300WVDC	28480	DM15F201J0300WV1CR	
A2C26	0140-0198		CAPACITOR-FXD 200PF +-5% 300WVDC	72136	DM15F201J0300WV1CR	

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
A2C27	0121-0474		CAPACITOR; VAR; TRMR; PSTN; /3/1.5PF	28480	0121-0474
A2C28	0121-0474		CAPACITOR; VAR; TRMR; PSTN; /3/1.5PF	28480	0121-0474
A2C29	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C30	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C31	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C32	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C33	0160-3670		CAPACITOR-FXD .1UF +80-20% 200WVDC	28480	0160-3670
A2C34	0160-3670		CAPACITOR-FXD .1UF +80-20% 200WVDC	28480	0160-3670
A2C36	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C37	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C38	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C39	0180-1746		CAPACITOR-FXD .15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A2C40	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C42	0180-1746		CAPACITOR-FXD .15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A2C43	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C44	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C45	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C47	0180-1746		CAPACITOR-FXD .15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A2C48	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C49	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C50	0180-1746		CAPACITOR-FXD .15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A2C51	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2CR1	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A2CR2	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A2CR3	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A2CR4	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A2CR5	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A2CR6	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A2CR7	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A2CR8	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A2MP1	1205-0095		HEAT-DISSIPATOR; SGL; T0-5 PKG	28480	1205-0095
A2MP2	1205-0226		HEAT-DISSIPATOR; SGL; T0-5 PKG	28480	1205-0226
A2MP3	1200-0185	16	INSULATOR; XSTR; T0-5, .075 THK	13103	7717-22 N RED
A2MP4	1600-0441	2	SHIELD, AMPLIFIER	28480	1600-0441
A2MP5	01332-01203	2	BRACKET-X GAIN	28480	01332-01203
A2MP6	01332-01204	2	BRACKET-Y GAIN	28480	01332-01204
A2MP7	01332-01205	2	BRACKET-TA & AST	28480	01332-01205
A2Q1	1855-0202		TRANSISTOR; JFET; DUAL; N-CHAN D-MODE SI	17856	F421
A2Q2	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q3	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q4	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q5	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q6	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q7	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q8	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q9	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q10	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q11	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q12	1853-0232		TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1853-0232
A2Q13	1854-0523	4	TRANSISTOR NPN SI T0-39 PD=1W FT=150MHZ	28480	1854-0523
A2Q14	1854-0523		TRANSISTOR NPN SI T0-35 PD=1W FT=150MHZ	28480	1854-0523
A2Q15	1853-0232		TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1853-0232
A2Q16	1855-0202		TRANSISTOR; JFET; DUAL; N-CHAN D-MODE ST	17856	E421
A2Q17	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q18	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q19	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q20	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q21	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q22	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q23	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q24	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q25	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q26	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS 3611
A2Q27	1853-0232		TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1853-0232
A2Q28	1854-0523		TRANSISTOR NPN SI T0-39 PD=1W FT=150MHZ	28480	1854-0523
A2Q29	1854-0523		TRANSISTOR NPN SI T0-39 PD=1W FT=150MHZ	28480	1854-0523
A2Q30	1853-0232		TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1853-0232
A2R7	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A2R8	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A2R9	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A2R10	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A2R11	2100-0646	4	RESISTOR; VAR; CONT; 5K 10% CC	01121	70M4N056R502U
A2R12	0757-0424		RESISTOR 1.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1101-F
A2R13	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R14	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R15	0757-0851	6	RESISTOR 43.2K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-4322-F
A2R16	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R17	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R18	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R19	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F

See introduction to this section for ordering information

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2R20	0698-3155	8	RESISTOR 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A2R21	0757-0427		RESISTOR 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A2R22	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R23	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R24	2100-3211		RESISTOR; VAR; TRMR; 1K OHM 10% C	32997	3389P-1-102
A2R25	0757-0419	4	RESISTOR 681 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-681R-F
A2R26	0757-0435		RESISTOR 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A2R27	0757-0435		RESISTOR 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A2R28	0757-0460		RESISTOR 61.9K 1% .125W F TUBULAR	24546	C4-1/8-T0-6192-F
A2R29	0757-0460		RESISTOR 61.9K 1% .125W F TUBULAR	24546	C4-1/8-T0-6192-F
A2R30	2100-3211	4	RESISTOR; VAR; TRMR; 1K OHM 10% C	32997	3389P-1-102
A2R31	0761-0004		RESISTOR 20K 5% 1W MO TC=0+-200	24546	FP32-1-2002-J
A2R32	0761-0004		RESISTOR 20K 5% 1W MO TC=0+-200	24546	FP32-1-2002-J
A2R33	0684-6821		RESISTOR 6.8K 10% .25W FC TC=-400/+700	01121	CB6821
A2R34	0684-6821		RESISTOR 6.8K 10% .25W FC TC=-400/+700	01121	CB6821
A2R35	0757-0851	8	RESISTOR 43.2K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-4322-F
A2R36	0757-0851		RESISTOR 43.2K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-4322-F
A2R37	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R38	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R39	0698-7096		RESISTOR 10 OHM 10% .125W CC TUBULAR	01121	BB1001
A2R40	0698-7096		RESISTOR 10 OHM 10% .125W CC TUBULAR	01121	BB1001
A2R41	0757-0438		RESISTOR 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A2R42	0757-0438		RESISTOR 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A2R43	0757-0736	4	RESISTOR 1.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-1501-F
A2R44	0757-0736		RESISTOR 1.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-1501-F
A2R51	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A2R52	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A2R53	0757-0290	8	RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A2R54	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A2R56	0757-0424		RESISTOR 1.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1101-F
A2R57	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R58	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R59	0757-0851	4	RESISTOR 43.2K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-4322-F
A2R60	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R61	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R62	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R63	0757-0283	4	RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R64	0698-3155		RESISTOR 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A2R65	0757-0427		RESISTOR 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A2R66	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R67	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R68	2100-3211		RESISTOR; VAR; TRMR; 1K OHM 10% C	32997	3389P-1-102
A2R69	0757-0419	4	RESISTOR 681 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-681R-F
A2R70	0757-0435		RESISTOR 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A2R71	0757-0435		RESISTOR 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A2R72	0757-0460		RESISTOR 61.9K 1% .125W F TUBULAR	24546	C4-1/8-T0-6192-F
A2R73	0757-0460		RESISTOR 61.9K 1% .125W F TUBULAR	24546	C4-1/8-T0-6192-F
A2R74	2100-3211	4	RESISTOR; VAR; TRMR; 1K OHM 10% C	32997	3389P-1-102
A2R75	0761-0004		RESISTOR 20K 5% 1W MO TC=0+-200	24546	FP32-1-2002-J
A2R76	0761-0004		RESISTOR 20K 5% 1W MO TC=0+-200	24546	FP32-1-2002-J
A2R77	0684-6821		RESISTOR 6.8K 10% .25W FC TC=-400/+700	01121	CB6821
A2R78	0684-6821		RESISTOR 6.8K 10% .25W FC TC=-400/+700	01121	CB6821
A2R79	0757-0851	4	RESISTOR 43.2K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-4322-F
A2R80	0757-0851		RESISTOR 43.2K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-4322-F
A2R81	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R82	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R83	0698-7096	4	RESISTOR 10 OHM 10% .125W CC TUBULAR	01121	BB1001
A2R84	0698-7096		RESISTOR 10 OHM 10% .125W CC TUBULAR	01121	BB1001
A2R85	0757-0438		RESISTOR 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A2R86	0757-0438		RESISTOR 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A2R87	0757-0736		RESISTOR 1.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-1501-F
A2R88	0757-0736	4	RESISTOR 1.5K 1% .25W F TUBULAR	24546	C5-1/4-T0-1501-F
A2R89	2100-0645		RESISTOR; VAR; CONT; 50K 10% CC	01121	70M4N056R503U
A2R90	2100-0645		RESISTOR; VAR; CONT; 50K 10% CC	01121	70M4N056R503U
A2R91	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R92	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R93	0684-1001	4	RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R94	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R95	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R96	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R97	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R98	0684-1001	4	RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R99	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R100	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R101	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R102	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R103	0684-1001	4	RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2VR1	1902-3104		DIODE-ZNR 5.62V 5% D0-7 PD=.4W	04713	SZ 10939-110
A2VR2	1902-3104		DIODE-ZNR 5.62V 5% D0-7 PD=.4W	04713	SZ 10939-110
A2VR3	1902-3070		DIODE-ZNR 4.22V 5% PD=.4W	15818	CD35598
A2VR4	1902-3070		DIODE-ZNR 4.22V 5% PD=.4W	15818	CD35598

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
A2 MISCELLANEOUS PARTS					
	0360-1653		TERMINAL; SLDR STUD	28480	0360-1653
	2190-0007	6	WASHER-LK INTL T NO. / .141 IN D .288	78189	1906-00
	2360-0193	6	SCREW-MACH 6-32 PAN HO POZI REC SST-300	28480	2360-0193
	2420-0003	6	NUT; HEX 6-32 .094 X .25; SST; PSVT	28480	2420-0003
A3	01332-66508		BOARD ASSY, HIGH VOLTAGE	28480	01332-66508
A3C1	0160-4148	2	CAPACITOR-FXD .033UF +-20% 6000WVDC	56289	430P333060
A3C2	0160-4148		CAPACITOR-FXD .033UF +-20% 6000WVDC	56289	430P333060
A3C3	0160-3960	2	CAPACITOR-FXD .001UF +-20% 8000WVDC	84411	HEW337
A3C4	0160-2264	1	CAPACITOR-FXD 20PF +-5% 500WVDC	28480	0160-2264
A3C5	0160-3960		CAPACITOR-FXD .001UF +-20% 8000WVDC	84411	HEW337
A3C6	0160-0678	2	CAPACITOR-FXD .01UF +-20% 6000WVDC	84411	HEW337
A3C7	0160-0678		CAPACITOR-FXD .01UF +-20% 6000WVDC	84411	HEW337
A3C8	0160-0543	1	CAPACITOR-FXD .0047UF +-20% 4000WVDC	84411	HEW337
A3CR1	1901-0683	1	DIODE-HV RECT 250NS 10KV 5MA	28480	1901-0683
A3CR2	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A3CR3	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A3CR4	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A3CR5	1901-0028		DIODE-PWR RECT 400V 750MA	04713	SR1358-9
A3J1	1251-0206	1	CONNECTOR; 1-CONT SKT .04 DIA; WHT TFE	98291	SKT-400
A3MP1	0340-0007	2	STANDOFF-RND-FEM .5-LG 6-THD .5-OD CER	28480	0340-0007
A3MP2	01332-01201	1	BRACKET, HIGH VOLTAGE BOARD	28480	01332-01201
A3R1	0684-1041	1	RESISTOR 100K 10% .25W CC TUBULAR	01121	CB1041
A3R2	0687-4721		RESISTOR 4.7K 10% .5W CC TUBULAR	01121	EB4721
A3R3	0687-3941	1	RESISTOR 390K 10% .5W CC TUBULAR	01121	BB3941
A3R4	0698-8018	1	RESISTOR 30M +-1-19% 3W CP TUBULAR	03888	PVC175-3-T0-3004-F
A3R5	0684-1021		RESISTOR 1K 10% .25W CC TUBULAR	01121	CB1021
A3R6	0684-1021		RESISTOR 1K 10% .25W CC TUBULAR	01121	CB1021
A3R7	0684-1061	1	RESISTOR 10M 10% .25W CC	01121	CB1061
A3R8	0684-1021		RESISTOR 1K 10% .25W CC	01121	CB1021
A3R9	0684-1051	1	RESISTOR 1M 10% .25W CC	01121	CB1051
A3R10	0687-2221		RESISTOR 2.2K OHM 10% .5W CC TUBULAR	01121	EB2221
A3R11	0687-1001		RESISTOR 10 OHM 10% .5W CC	01121	EB1001
A3R12	0698-5353	1	RESISTOR 8.25M 5% 1W CF TUBULAR	28480	0698-5353
A3R13	2100-3148	1	RESISTOR; VAR; TRMR; 2M OHM 20% MG	84048	150-4
A3R14	0698-6442	1	RESISTOR 13M 5% 1W CF TUBULAR	28480	0698-6442
A3R15	0684-1021		RESISTOR 1K 10% .25W CC TUBULAR	01121	CB1021
A3R16	0687-1011		RESISTOR 100 OHM 10% .5W CC	01121	EB1011
A3T1	01332-61103	1	TRANSFORMER	28480	01332-61103
A3V1	2140-0018		LAMP, GLOW, BULB T-2, 58V	08806	A9A (NE-2E1)
A3V2	2140-0018		LAMP, GLOW, BULB T-2, 56V	08806	A9A (NE-2E1)
A3VR1	1902-0182	1	DIODE-ZNR 20.5V 5% PD=.4W	28480	1902-0182
A3 MISCELLANEOUS PARTS					
	0360-0535	1	TERMINAL, TEST POINT	4G819	OBD
	0360-1653		TERMINAL, SLDR STUD	28480	0360-1653
	2360-0275	4	SCREW-MACH 6-32 BDG HD SLT REC NYL-BLK	73734	102222
A4			NOT ASSIGNED		
A5	01332-66505		BOARD ASSY, CONTROL	28480	01332-66505
A5MP1	8120-1999	1	HARNESS, CONTROL BOARD	28480	8120-1999
A5R1	2100-0649		RESISTOR-VAR CONT 20K 10% CC	28480	2100-0649
A5R2	2100-0649		RESISTOR-VAR CONT 20K 10% CC	28480	2100-0649
A5R3	2100-0649		RESISTOR-VAR CONT 20K 10% CC	28480	2100-0649
A5R3	2100-3401		RESISTOR-VAR PREC 20K 5% WW 10 TURN (OPTION 322)	28480	2100-3401
A5R3MP1	1140-0062		DIAL, TURNS COUNTING (OPTION 322)	28480	1140-0062
A5R4	2100-0650		RESISTOR-VAR CONT 2.5M 10% CC	28480	2100-0650
A5R5	2100-0648		RESISTOR-VAR CONT 100 OHM 10% C (OPTION 325)	28480	2100-0648
A6	0960-0383		HIGH VOLTAGE MULTIPLIER ASSY	28480	0960-0383

See introduction to this section for ordering information

Table 6-3. Replaceable Parts for Available Kits

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
KIT, STANDARD "Z" AMPLIFIER					
A1	01332-88709	1	KIT, STANDARD "Z" AMPLIFIER	28480	01332-88709
A1C1	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C2	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1R3	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
A1R4	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
KIT, OPTION 200					
A1	01332-88710	1	KIT, OPTION 200	28480	01332-88710
A1C1	0121-0451	4	CAPACITOR; VAR; TRMR; AIR; 1.7/11PF	74970	187-0106-005
A1C2	0121-0451	4	CAPACITOR; VAR; TRMR; AIR; 1.7/11PF	74970	187-0106-005
A1C3	0160-2198	4	CAPACITOR-FXD 20PF +-5% 300WVDC	28480	0160-2198
A1C4	0160-2198	4	CAPACITOR-FXD 20PF +-5% 300WVDC	28480	0160-2198
A1R3	0698-6654	6	RESISTOR 800K 1% .25W F TUBULAR	19701	MF4C1/8-T0-8003-F
A1R4	0698-6654	6	RESISTOR 800K 1% .25W F TUBULAR	19701	MF4C1/8-T0-8003-F
A1R5	0757-0782	6	RESISTOR 200K 1% .25W F TUBULAR	24546	C5-1/4-T0-2003-F
A1R6	0757-0782	6	RESISTOR 200K 1% .25W F TUBULAR	24546	C5-1/4-T0-2003-F
KIT, OPTION 201					
A1	01332-88711	1	KIT, OPTION 201	28480	01332-88711
A1C1	0121-0451		CAPACITOR; VAR; TRMR; AIR; 1.7/11PF	74970	187-0106-005
A1C2	0121-0451		CAPACITOR; VAR; TRMR; AIR; 1.7/11PF	74970	187-0106-005
A1C3	0160-2198		CAPACITOR-FXD 20PF +-5% 300WVDC	28480	0160-2198
A1C4	0160-2198		CAPACITOR-FXD 20PF +-5% 300WVDC	28480	0160-2198
A1R3	0698-6400	6	RESISTOR 900K 1% .25W F TUBULAR	19701	MF52C1/4-T0-9003-F
A1R4	0698-6400	6	RESISTOR 900K 1% .25W F TUBULAR	19701	MF52C1/4-T0-9003-F
A1R5	0757-0342	6	RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
A1R6	0757-0342	6	RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
KIT, STANDARD, NO TTL					
A1	01332-88712	1	KIT, STANDARD, NO TTL	28480	01332-88712
A1R32	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
KIT, OPTION 216					
A1	01332-88713	1	KIT, OPTION 216	28480	01332-88713
A1C41	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1C42	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A1CR26	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A1R85	0684-2231	1	RESISTOR 22K 10% .25W CC TUBULAR	01121	CB2231
A1R86	0757-0454		RESISTOR 33.2K 1% .125W F TUBULAR	28480	0757-0454
A1R87	0757-0441		RESISTOR 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F
A1U5	1820-1144	2	IC; DCTL; GATE	01295	SN74LS02N
A1VR7	1902-0025	1	DIODE-ZNR 10V 5% D0-7 PD=.4W TC=+.06%	04713	SZ10939-182
A1XU5	1200-0441	1	SOCKET ELECT, IC 14-CONT DIP SLDR TERM	24995	583527-1
KIT, STANDARD 1M INPUT					
A1	01332-88714	1	KIT, STANDARD, 1M INPUT	28480	01332-88714
A1R1	0757-0344	6	RESISTOR 1M 1% .25W F TUBULAR	24546	C5-1/4-T0-1004-F
A1R2	0757-0344	6	RESISTOR 1M 1% .25W F TUBULAR	24546	C5-1/4-T0-1004-F
KIT, OPTION 210					
A1	01332-88715	1	KIT, OPTION 210	28480	01332-88715
A1R1	0698-7648	6	RESISTOR 50 OHM 1% .25W MO	24546	C-5
A1R2	0698-7648	6	RESISTOR 50 OHM 1% .25W MO	24546	C-5
KIT, OPTION 211					
A1	01332-88716	1	KIT, OPTION 211	28480	01332-88716
A1R1	0757-0710	2	RESISTOR 75 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-75R0-F
A1R2	0757-0710	2	RESISTOR 75 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-75R0-F
KIT, STANDARD, LINEAR AMPLIFIER					
A1	01332-88717	1	KIT, STANDARD, LINEAR AMPLIFIER	28480	01332-88717
A1R26	0757-0418	1	RESISTOR 619 OHMS 1% .125W	28480	0757-0418
KIT, OPTION 215					
A1	01332-88718	1	KIT, OPTION 215	28480	01332-88718
A1CR5	1901-0535	1	DIODE-SI .5VOLT 20MA	28480	1901-0535
A1R26	0757-0424		RESISTOR 1.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1101-F
A1R28	0757-0422		RESISTOR 909 OHMS 1% .25W	28480	0757-0422
BOARD ASSY: X-Y 25NS (OPTION 120)					
A2	01335-66513		BOARD ASSY: X-Y 25NS (OPTION 120)	28480	01335-66513
A2C5	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C6	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C9	0160-2308		CAPACITOR-FXD 36PF +-5% 300WVDC	28480	0160-2308
A2C10	0121-0474		CAPACITOR; VAR; TRMR; PSTN; .3/1.5PF	28480	0121-0474
A2C11	0121-0474		CAPACITOR; VAR; TRMR; PSTN; .3/1.5PF	28480	0121-0474
A2C12	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C13	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C14	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C15	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C16	0160-3670		CAPACITOR-FXD 0.1UF +80-20% 200WVDC	28480	0160-3670

See introduction to this section for ordering information

Table 6-3. Replaceable Parts for Available Kits (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
BOARD ASSY: X-Y 25NS (OPTION 120) (CONT'D)					
A2C17	0160-3670		CAPACITOR-FXD .1UF +80 -20% 200WVDC	28480	0160-3670
A2C22	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C23	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C26	0160-2308		CAPACITOR-FXD 36PF +-5% 300WVDC	28480	0160-2308
A2C27	0121-0474		CAPACITOR; VAR; TRMR; PSTN; .3/1.5PF	28480	0121-0474
A2C28	0121-0474		CAPACITOR; VAR; TRMR; PSTN; .3/1.5PF	28480	0121-0474
A2C29	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C30	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C31	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C32	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C33	0160-3670		CAPACITOR-FXD .1UF +80-20% 200WVDC	28480	0160-3670
A2C34	0160-3670		CAPACITOR-FXD .1UF +80-20% 200WVDC	28480	0160-3670
A2C36	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC	28480	0160-3665
A2C37	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC	28480	0160-3665
A2C38	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C39	0180-1746		CAPACITOR-FXD 15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A2C40	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C42	0180-1746		CAPACITOR-FXD 15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A2C43	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C44	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C45	0160-3665		CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-3665
A2C47	0180-1746		CAPACITOR-FXD 15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A2C48	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C49	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C50	0180-1746		CAPACITOR-FXD 15UF +-10% 20VDC TA-SOLID	56289	150D156X9020B2
A2C51	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2CR1	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A2CR2	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A2CR3	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A2CR4	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A2CR5	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A2CR6	1901-0376		DIODE-GEN PRP 35V 50MA	28480	1901-0376
A2CR7	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A2CR8	1901-0040		DIODE-SWITCHING 2NS 30V 50MA	28480	1901-0040
A2MP1	1205-0095		HEAT-DISSIPATOR; SGL; T0-5 PKG	28480	1205-0095
A2MP2	1205-0226		HEAT-DISSIPATOR; SGL; T0-5 PKG	28480	1205-0226
A2MP3	1200-0185		INSULATOR, XSTR, T0-5 .075 THK	13103	7717-22 N RED
A2MP4	1600-0441		SHIELD, AMPLIFIER	28480	1600-0441
A2MP5	01332-01203		BRACKET-X GAIN	28480	01332-01203
A2MP6	01332-01204		BRACKET-Y GAIN	28480	01332-01204
A2MP7	01332-01205		BRACKET-TA & AST	28480	01332-01205
A2Q1	1855-0202		TRANSISTOR; JFET; DUAL; N-CHAN D-MODE SI	17856	B421
A2Q2	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q3	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q4	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q5	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q6	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A2Q7	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A2Q8	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A2Q9	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q10	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q11	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A2Q12	1853-0232		TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1853-0232
A2Q13	1854-0419		TRANSISTOR NPN SI T0-39 PD=1W FT=200MHZ	28480	1854-0419
A2Q14	1854-0419		TRANSISTOR NPN SI T0-39 PD=1W FT=200MHZ	28480	1854-0419
A2Q15	1854-0232		TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1854-0232
A2Q16	1855-0202		TRANSISTOR; JFET; DUAL; N-CHAN D-MODE SI	17856	E421
A2Q17	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q18	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q19	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q20	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q21	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A2Q22	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A2Q23	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A2Q24	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q25	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A2Q26	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A2Q27	1853-0232		TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1853-0232
A2Q28	1854-0419		TRANSISTOR NPN SI T0-39 PD=1W FT=200MHZ	28480	1854-0419
A2Q29	1854-0419		TRANSISTOR NPN SI T0-39 PD=1W FT=200MHZ	28480	1854-0419
A2Q30	1853-0232		TRANSISTOR PNP SI CHIP T0-39 PD=1W	28480	1853-0232
A2R7	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A2R8	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A2R9	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A2R10	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F

See introduction to this section for ordering information

Table 6-3. Replaceable Parts for Available Kits (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
BOARD ASSY: X-Y 25NS (OPTION 120) (CONT'D)					
A2R11	2100-0646		RESISTOR; VAR; CONT; 5K 10% CC	01121	70M4N056R502U
A2R12	0757-0424		RESISTOR 1.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1101-F
A2R13	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R14	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R15	0757-0767		RESISTOR 43.2K 1% .25W F TUBULAR	24546	C5-1/4-T0-4322-F
A2R16	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R17	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R18	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R19	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R20	0698-3155		RESISTOR 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A2R21	0757-0427		RESISTOR 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A2R22	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R23	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R24	2100-3211		RESISTOR; VAR; TRMR; 1K OHM 10% C	32997	3389P-1-102
A2R25	0698-3446		RESISTOR 383 OHM 1% .125W F TC=0+-100	16299	C4-1/8-T0-383R-F
A2R26	0698-0083		RESISTOR 1.96K 1% .125W F TUBULAR	16299	C4-1/8-T0-1961-F
A2R27	0698-0083		RESISTOR 1.96K 1% .125W F TUBULAR	16299	C4-1/8-T0-1961-F
A2R28	0757-0457		RESISTOR 47.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-4752-F
A2R29	0757-0457		RESISTOR 47.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-4752-F
A2R30	2100-3211		RESISTOR; VAR; TRMR; 1K OHM 10% C	32997	3389P-1-102
A2R31	0761-0006	4	RESISTOR 10K 5% 1W MO TC=0+-200	24546	FP32-1-1002-J
A2R32	0761-0006		RESISTOR 10K 5% 1W MO TC=0+-200	24546	FP32-1-1002-J
A2R33	0757-0434		RESISTOR 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A2R34	0757-0434		RESISTOR 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A2R35	0757-0846		RESISTOR 22.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2212-F
A2R36	0757-0846		RESISTOR 22.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2212-F
A2R37	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R38	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R39	0698-7096		RESISTOR 10 OHM 10% .125W CC TUBULAR	01121	BB1001
A2R40	0684-1001		RESISTOR 10 OHM 10% .25W FC TC=-400/+500	01121	CB1001
A2R41	0757-0281		RESISTOR 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A2R42	0757-0281		RESISTOR 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A2R43	0757-0730		RESISTOR 750 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-751-F
A2R44	0757-0730		RESISTOR 750 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-751-F
A2R51	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A2R52	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A2R53	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A2R54	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	30983	MF4C1/8-T0-6191-F
A2R56	0757-0424		RESISTOR 1.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1101-F
A2R57	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R58	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R59	0757-0767		RESISTOR 43.2K 1% .25W F TUBULAR	24546	C5-1/4-T0-4322-F
A2R60	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R61	0757-0442		RESISTOR 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A2R62	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R63	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R64	0698-3155		RESISTOR 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A2R65	0757-0427		RESISTOR 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A2R66	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R67	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A2R68	2100-3211		RESISTOR; VAR; TRMR; 1K OHM 10% C	32997	3389P-1-102
A2R69	0698-3446		RESISTOR 383 OHM 1% .125W F TC=0+-100	16299	C4-1/8-T0-383R-F
A2R70	0698-0083		RESISTOR 1.96K 1% .125W F TUBULAR	16299	C4-1/8-T0-1961-F
A2R71	0698-0083		RESISTOR 1.96K 1% .125W F TUBULAR	16299	C4-1/8-T0-1961-F
A2R72	0757-0457		RESISTOR 47.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-4752-F
A2R73	0757-0457		RESISTOR 47.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-4752-F
A2R74	2100-3211		RESISTOR; VAR; TRMR; 1K OHM 10% C	32997	3389P-1-102
A2R75	0761-0006		RESISTOR 10K 5% 1W MO TC=0+-200	24546	FP32-1-1002-J
A2R76	0761-0006		RESISTOR 10K 5% 1W MO TC=0+-200	24546	FP32-1-1002-J
A2R77	0757-0434		RESISTOR 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A2R78	0757-0434		RESISTOR 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A2R79	0757-0846		RESISTOR 22.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2212-F
A2R80	0757-0846		RESISTOR 22.1K 1% .5W F TUBULAR	30983	MF7C1/2-T0-2212-F
A2R81	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R82	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R83	0698-7096		RESISTOR 10 OHM 10% .125W CC TUBULAR	01121	BB1001
A2R84	0684-1001		RESISTOR 10 OHM 10% .25 FC TC=-400/+500	01121	CB1001
A2R85	0757-0281		RESISTOR 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A2R86	0757-0281		RESISTOR 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A2R87	0757-0730		RESISTOR 750 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-751-F
A2R88	0757-0730		RESISTOR 750 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-751-F
A2R89	2100-0645		RESISTOR; VAR; CONT; 50K 10% CC	01121	70M4N056R503U
A2R90	2100-0645		RESISTOR; VAR; CONT; 50K 10% CC	01121	70M4N056R503U
A2R91	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R92	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R93	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R94	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R95	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R96	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R97	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001

See introduction to this section for ordering information

Table 6-3. Replaceable Parts for Available Kits (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
BOARD ASSY: X-Y 25NS (OPTION 120) (CONT'D)					
A2R98	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R99	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R100	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R101	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R102	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2R103	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A2VR1	1902-3104		DIODE-ZNR 5.62V 5% D0-7 PD=.4W	04713	SZ10939-110
A2VR2	1902-3104		DIODE-ZNR 5.62V 5% D0-7 PD=.4W	04713	SZ10939-110
A2VR3	1902-3070		DIODE-ZNR 4.22V 5% PD=.4W	15818	CD35598
A2VR4	1902-3070		DIODE-ZNR 4.22V 5% PD=.4W	15818	CD35598
A2 MISCELLANEOUS PARTS					
	0360-1653		TERMINAL; SLDR STUD	28480	0360-1653
	2190-0007		WASHER-LK INTL T NO. 6 .141 IN D .288	78189	1906-00
	2360-0193		SCREW-MACH 6-32 PAN HD POZI REC SST-300	28480	2360-0193
	2420-0003		NUT; HEX 6-32 .094 X .25; SST; PSVT	28480	2420-0003
KIT, STANDARD DEFLECTION					
A2	01332-88701	1	KIT, STANDARD DEFLECTION	28480	01332-88701
A2C1	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C2	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C18	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2C19	0160-3451		CAPACITOR-FXD .01UF +80-20% 100WVDC	28480	0160-3451
A2R3	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
A2R4	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
A2R47	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
A2R48	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
KIT, OPTION 100					
A2	01332-88702	1	KIT, OPTION 100	28480	01332-88702
A2C1	0121-0455	8	CAPACITOR; VAR; TRMR; AIR; 1.9/15.7PF	74970	187-0109-005
A2C2	0121-0455		CAPACITOR; VAR; TRMR; AIR; 1.9/15.7PF	74970	187-0109-005
A2C3	0160-2200	8	CAPACITOR-FXD 43PF +-5% 300WVDC	28480	0160-2200
A2C4	0160-2200		CAPACITOR-FXD 43PF +-5% 300WVDC	28480	0160-2200
A2C18	0121-0455		CAPACITOR; VAR; TRMR; AIR; 1.9/15.7PF	74970	187-0109-005
A2C19	0121-0455		CAPACITOR; VAR; TRMR; AIR; 1.9/15.7PF	74970	187-0109-005
A2C20	0160-2200		CAPACITOR-FXD 43PF +-5% 300WVDC	28480	0160-2200
A2C21	0160-2200		CAPACITOR-FXD 43PF +-5% 300WVDC	28480	0160-2200
A2R3	0698-6654		RESISTOR 800K 1% .25W F TUBULAR	19701	MF4C1/8-T0-8003-F
A2R4	0698-6654		RESISTOR 800K 1% .25W F TUBULAR	19701	MF4C1/8-T0-8003-F
A2R5	0757-0782		RESISTOR 200K 1% .25W F TUBULAR	24546	C5-1/4-T0-2003-F
A2R6	0757-0782		RESISTOR 200K 1% .25W F TUBULAR	24546	C5-1/4-T0-2003-F
A2R47	0698-6654		RESISTOR 800K 1% .25W F TUBULAR	19701	MF4C1/8-T0-8003-F
A2R48	0698-6654		RESISTOR 800K 1% .25W F TUBULAR	19701	MF4C1/8-T0-8003-F
A2R49	0757-0782		RESISTOR 200K 1% .25W F TUBULAR	24546	C5-1/4-T0-2003-F
A2R50	0757-0782		RESISTOR 200K 1% .25W F TUBULAR	24546	C5-1/4-T0-2003-F
KIT, OPTION 101					
A2	01332-88703	1	KIT, OPTION 101	28480	01332-88703
A2C1	0121-0455		CAPACITOR; VAR; TRMR; AIR; 1.9/15.7PF	74970	187-0109-005
A2C2	0121-0455		CAPACITOR; VAR; TRMR; AIR; 1.9/15.7PF	74970	187-0109-005
A2C3	0160-2200		CAPACITOR-FXD 43PF +-5% 300WVDC	28480	0160-2200
A2C4	0160-2200		CAPACITOR-FXD 43PF +-5% 300WVDC	28480	0160-2200
A2C18	0121-0455		CAPACITOR; VAR; TRMR; AIR; 1.9/15.7PF	74970	187-0109-005
A2C19	0121-0455		CAPACITOR; VAR; TRMR; AIR; 1.9/15.7PF	74970	187-0109-005
A2C20	0160-2200		CAPACITOR-FXD 43PF +-5% 300WVDC	28480	0160-2200
A2C21	0160-2200		CAPACITOR-FXD 43PF +-5% 300WVDC	28480	0160-2200
A2R3	0698-6400		RESISTOR 900K 1% .25W F TUBULAR	19701	MF52C1/4-T0-9003-F
A2R4	0698-6400		RESISTOR 900K 1% .25W F TUBULAR	19701	MF52C1/4-T0-9003-F
A2R5	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
A2R6	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
A2R47	0698-6400		RESISTOR 900K 1% .25W F TUBULAR	19701	MF52C1/4-T0-9003-F
A2R48	0698-6400		RESISTOR 900K 1% .25W F TUBULAR	19701	MF52C1/4-T0-9003-F
A2R49	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
A2R50	0757-0342		RESISTOR 100K 1% .25W F TUBULAR	24546	C5-1/4-T0-1003-F
KIT, STANDARD INPUT X-Y					
A2	01332-88704	1	KIT, STANDARD INPUT X-Y	28480	01332-88704
A2R1	0757-0344		RESISTOR 1M 1% .25W F TUBULAR	24546	C5-1/4-T0-1004-F
A2R2	0757-0344		RESISTOR 1M 1% .25W F TUBULAR	24546	C5-1/4-T0-1004-F
A2R45	0757-0344		RESISTOR 1M 1% .25W F TUBULAR	24546	C5-1/4-T0-1004-F
A2R46	0757-0344		RESISTOR 1M 1% .25W F TUBULAR	24546	C5-1/4-T0-1004-F
KIT, OPTION 110					
A2	01332-88705	1	KIT, OPTION 110	28480	01332-88705
A2R1	0698-7648		RESISTOR 50 OHM 1% .25W MO	24546	C-5
A2R2	0698-7648		RESISTOR 50 OHM 1% .25W MO	24546	C-5
A2R45	0698-7648		RESISTOR 50 OHM 1% .25W MO	24546	C-5
A2R46	0698-7648		RESISTOR 50 OHM 1% .25W MO	24546	C-5

See introduction to this section for ordering information

Table 6-3. Replaceable Parts for Available Kits (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2	01332-88706	1	KIT, OPTION 121	28480	01332-88706
A2C7	0140-0218	4	KIT, OPTION 121	72136	DM15F161G0300WV1CR
A2C8	0140-0218		CAPACITOR-FXD 160PF +-2% 300WVDC	72136	DM15F161G0300WV1CR
A2C24	0140-0218		CAPACITOR-FXD 160PF +-2% 300WVDC	72136	DM15F161G0300WV1CR
A2C25	0140-0218		CAPACITOR-FXD 160PF +-2% 300WVDC	72136	DM15F161G0300WV1CR

Table 6-4. List of Manufacturers' Codes

Mfr No.	Manufacturer Name	Address	Zip Code
00000	U.S.A. COMMON	ANY SUPPLIER OF THE U.S.	
01121	ALLEN BRADLEY CO	MILWAUKEE WI	53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75231
01538	SMALL PARTS INC	COSTA MESA CA	92626
02660	AMPHENOL CONNECTOR DIV	BROADVIEW IL	60153
02735	RCA CORP SOLID STATE DIV	SOMMERSVILLE NJ	08876
03888	PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
04866	NYLOK-DETROIT CORP	TROY MI	48084
06560	AIRCO SPEER ELECTRONICS DIV OF AIR REDUCTION CO, INC	NOGALES AZ	85621
06915	RICHCO PLASTIC CO	CHICAGO IL	60646
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94040
08806	GE CO MINIATURE LAMP PROD DEPT	CLEVELAND OH	44112
13103	THERMALLOY CO	DALLAS TX	75247
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW CA	94040
16299	CORNING GL WK ELEC CMPNT DIV	RALEIGH NC	27604
17856	SILICONIX INC	SANTA CLARA CA	95050
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	76067
24226	GOWANDA ELECTRONICS CORP	GOWANDA NY	14070
24546	CORNING GLASS WORKS	BRADFORD PA	16701
24931	SPECIALTY CONNECTOR CO, INC	INDIANAPOLIS IN	46227
24995	ENVIRONMENTAL CONTAINER SYSTEMS INC	PALO ALTO CA	94304
26365	GRIBS REPRODUCTR CORP	NEW ROCHELLE NY	10802
26742	METHODE ELECTRONICS INC	CHICAGO IL	60856
27191	CUTLER-HAMMER INC POWER DISTR CONT	MILWAUKEE WI	53216
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
30983	MEPCO/ELECTRA CORP	SAN DIEGO CA	92121
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	92507
34344	MOTOROLA INC	FRANKLIN PARK IL	60131
4G819	OVERLAND PRODUCTS CO	FREMONT NE	68025
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
57771	STIMPSON EDWIN B CO, INC	BROOKLYN NY	11205
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS MO	63017
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE IL	60007
72136	ELECTRO MOTIVE MFG CO, INC	WILLIMANTIC CT	06226
72982	ERIE TECHNOLOGICAL PRODUCTS, INC	ERIE PA	16512
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
73183	FERRY E W SCREW PRODUCTS INC	CLEVELAND OH	44142
73734	FEDERAL SCREW PRODUCTS CO	CHICAGO IL	60618
74970	JOHNSON E F CO	WASECA MN	56093
75915	LITTLIFUSE INC	DES PLAINES IL	60016
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN IL	60126
78452	EVERLOCK CHICAGO INC	CHICAGO IL	60622
82389	HEPWORTH MACHINE CO INC	PORT WASHINGTON NY	11050
84048	TRW INC ST PETERSBURG DIV	ST PETERSBURG FL	33702
84411	TRW CAPACITOR DIV	OGALLALA NE	69153
90201	MALLORY CAPACITOR CO	INDIANAPOLIS IN	46206
91500	ASHEVILLE-SCHOONMAKER MICA CO	NEWPORT NEWS MD	23607
98291	SEAELECTRO CORP	MAMARONECK NY	10544

See introduction to this section for ordering information

SECTION VII MANUAL CHANGES

7-1. INTRODUCTION.

7-2. This section contains information required to backdate this manual for a specific instrument.

7-3. MANUAL CHANGES.

7-4. This manual applies directly to the instrument having the same serial prefix shown on the manual title page. If the serial prefix of 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. Refer to paragraph 7-5 for changes. 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 on the title page or in table 7-1, refer to the enclosed MANUAL CHANGES sheet for updating information. Also if a MANUAL CHANGES sheet is supplied, make all indicated ERRATA corrections.

Table 7-1. Manual Changes

Serial Prefix	Make Changes
1414A	1, 2, 3, 4
1519A	2, 3, 4
1540A	3, 4
1615A	4

7-5. MANUAL CHANGES LISTING.

CHANGE 1

Table 6-2,

- A1: Change HP Part No. and Mfr Part No. to 01332-66507.
- A3: Change HP Part No. and Mfr Part No. to 01332-66503.
- Delete: A1C36, A1C37, A1C38, A1CR29, A1CR30, and A1CR31.
- A1VR9: Change to HP Part No. 1902-3139, DIODE-ZNR 8.25V 5% D0-7 PD=.4W; Mfr Code 04713, Mfr Part No. SZ 10939-158.
- A3R7: Change to HP Part No. 0687-1061, RESISTOR 10M 10% .5W CC TUBULAR; Mfr Code 01121, Mfr Part No. EB1061.
- A3R9: Change to HP Part No. 0687-1051, RESISTOR 1M 10% .5W CC TUBULAR; Mfr Code 01121, Mfr Part No. EB1051.

A3R11: Change to HP Part No. 0687-6801, RESISTOR 68 OHM 10% .5W CC TUBULAR; Mfr Code 01121, Mfr Part No. EB6801.

Delete: A3R16.

Schematic 3,

Delete: A1C36, A1C37, and A1C38.

Delete: A1CR29, A1CR30, and A1CR31.

A1VR9: Change value to 8.25V.

Schematic 5,

Delete: A3R16 - make straight-thru connection.

CHANGE 2

Table 1-3,

Delete: Option 550. (This option not available for instruments with serial prefix numbers below 1540A.)

CHANGE 3

Table 6-2,

- A2: Change HP Part No. and Mfr Part No. to 01332-66502.
- MP3: Change HP Part No. and Mfr Part No. to 1220-0203.
- MP13: Change HP Part No. and Mfr Part No. to 01332-04101.
- MP18: Change HP Part No. and Mfr Part No. to 01332-23701.
- MP19: Change HP Part No. and Mfr Part No. to 01332-23702.
- MP20: Change HP Part No. and Mfr Part No. to 01332-23703.
- MP21: Change HP Part No. and Mfr Part No. to 01332-60101.
- W7: Change HP Part No. and Mfr Part No. to 01332-61613.
- A2C12 thru A2C15: Change to HP Part No. 0160-3451, CAPACITOR-FXD .01UF +80—20% 100 WVDC; Mfr Code 28480, Mfr Part No. 0160-3451.
- A2C29 thru A2C32: Change to HP Part No. 0160-3451, CAPACITOR-FXD .01UF +80—20% 100 WVDC; Mfr Code 28480, Mfr Part No. 0160-3451.
- A2R15: Change to HP Part No. 0757-0767, RESISTOR 43.2K 1% .25W F TUBULAR; Mfr Code 24546, Mfr Part No. C5-1/4-TO-4322-F.
- A2R31: Change to HP Part No. 0757-0190, RESISTOR 20K 1% .5W F TUBULAR; Mfr Code 30983, Mfr Part No. MF7C1/2-TO-2002-F.
- A2R32: Change to HP Part No. 0757-0190, RESISTOR 20K 1% .5W F TUBULAR; Mfr Code 30983, Mfr Part No. MF7C1/2-TO-2002-F.

Table 6-2 (Cont'd),

- A2R33: Change to HP Part No. 0684-6821, RESISTOR 6.8K 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB6821.
- A2R34: Change to HP Part No. 0684-6821, RESISTOR 6.8K 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB6821.
- A2R35: Change to HP Part No. 0757-0767, RESISTOR 43.2K 1% .25W F TUBULAR; Mfr Code 24546, Mfr Part No. C5-1/4-TO-4322-F.
- A2R36: Change to HP Part No. 0757-0767, RESISTOR 43.2K 1% .25W F TUBULAR; Mfr Code 24546, Mfr Part No. C5-1/4-TO-4322-F.
- A2R59: Change to HP Part No. 0757-0767, RESISTOR 43.2K 1% .25W F TUBULAR; Mfr Code 24546, Mfr Part No. C5-1/4-TO-4322-F.
- A2R75: Change to HP Part No. 0757-0190, RESISTOR 20K 1% .5W F TUBULAR; Mfr Code 30983, Mfr Part No. MF7C1/2-TO-2002-F.
- A2R76: Change to HP Part No. 0757-0190, RESISTOR 20K 1% .5W F TUBULAR; Mfr Code 30983, Mfr Part No. MF7C1/2-TO-2002-F.
- A2R77: Change to HP Part No. 0684-6821, RESISTOR 6.8K 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB6821.
- A2R78: Change to HP Part No. 0684-6821, RESISTOR 6.8K 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB6821.
- A2R79: Change to HP Part No. 0757-0767, RESISTOR 43.2K 1% .25W F TUBULAR; Mfr Code 24546, Mfr Part No. C5-1/4-TO-4322-F.
- A2R80: Change to HP Part No. 0757-0767, RESISTOR 43.2K 1% .25W F TUBULAR; Mfr Code 24546, Mfr Part No. C5-1/4-TO-4322-F.

Table 6-3,

- A2C12 thru A2C15: Change to HP Part No. 0160-3451, CAPACITOR-FXD .01UF +80-20% 100 WVDC; Mfr Code 28480, Mfr Part No. 0160-3451.
- A2C29 thru A2C32: Change to HP Part No. 0160-3451, CAPACITOR-FXD .01UF +80-20% 100 WVDC; Mfr Code 28480, Mfr Part No. 0160-3451.
- A2R31: Change to HP Part No. 0757-0839, RESISTOR 10K 1% .5W F TUBULAR; Mfr Code 30983, Mfr Part No. MF7C1/2-TO-1002-F.
- A2R32: Change to HP Part No. 0757-0839, RESISTOR 10K 1% .5W F TUBULAR; Mfr Code 30983, Mfr Part No. MF7C1/2-TO-1002-F.
- A2R40: Change to HP Part No. 0698-7096, RESISTOR 10 OHM 10% .125W CC TUBULAR; Mfr Code 01121, Mfr Part No. BB1001.
- A2R75: Change to HP Part No. 0757-0839, RESISTOR 10K 1% .5W F TUBULAR; Mfr Code 30983, Mfr Part No. MF7C1/2-TO-1002-F.
- A2R76: Change to HP Part No. 0757-0839, RESISTOR 10K 1% .5W F TUBULAR; Mfr Code 30983, Mfr Part No. MF7C1/2-TO-1002-F.
- A2R84: Change to HP Part No. 0698-7096, RESISTOR 10 OHM 10% .125W CC TUBULAR; Mfr Code 01121, Mfr Part No. BB1001.

CHANGE 4

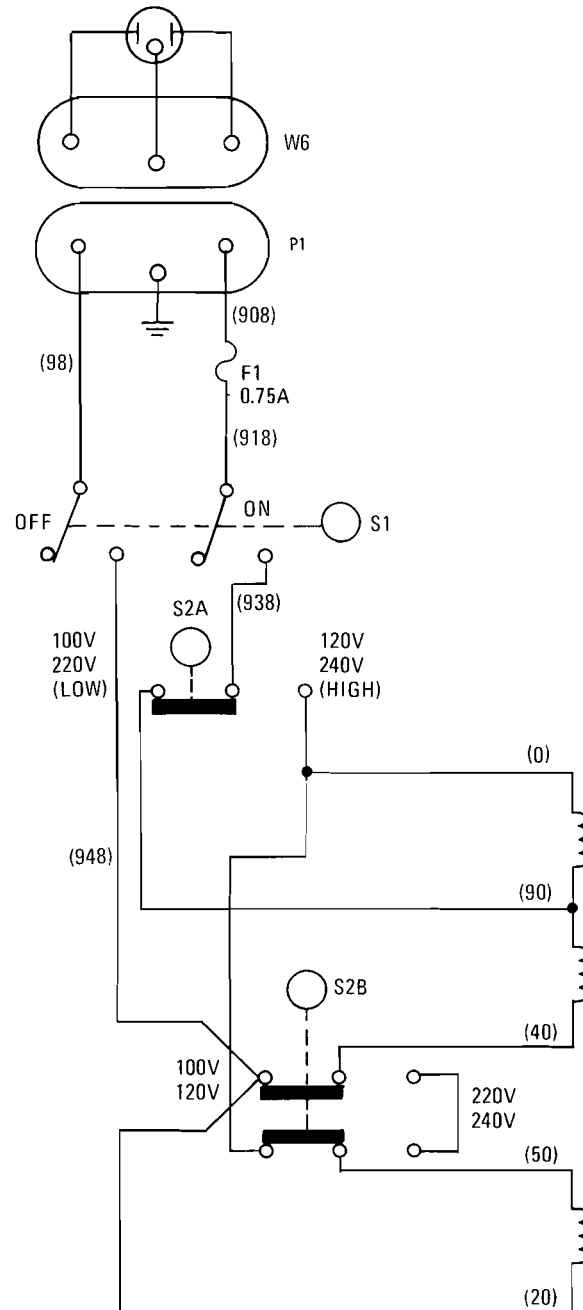
Table 6-2,

T1 standard: Change to HP Part No. and Mfr Part No. 9100-3510.

T1 option 310: Change to HP Part No. and Mfr Part No. 9100-3443.

Schematic 4,

Replace input power portion of schematic with figure shown below.



SECTION VIII

SCHEMATICS AND TROUBLESHOOTING

8-1. INTRODUCTION.

8-2. This section contains schematics, repair and replacement information, component-identification illustrations, and troubleshooting information.

8-3. SCHEMATICS.

8-4. Schematics are printed 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.

8-5. COMPONENT LOCATIONS.

8-6. Locations of components on assemblies and sub-assemblies are illustrated adjacent to the schematics. Since the schematics are drawn to show function, portions of a particular assembly may appear on several different schematics. The component-location illustration is printed next to the schematic that shows most of the circuitry on the assembly. Components located on the chassis are identified in figure 8-2. The locations of all adjustments are shown in Section V. An exploded-view drawing that shows mechanical (and some electrical) parts is located in Section VI.

8-7. PREVENTIVE MAINTENANCE.

8-8. Preventive maintenance consists of periodic performance checks, calibration, mechanical inspection, lubrication, 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.

8-9. MECHANICAL INSPECTION. 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.

8-10. Refer to the paragraphs in this section on repair and replacement for instructions on replacing damaged components.

8-11. CLEANING. Painted, glass, and plastic surfaces can be cleaned with a commercial, 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 by Miller-Stevenson Company.

8-12. Corroded spots are best removed with soap and water. Stubborn residues can be removed with a fine abrasive. When using abrasives, be careful that fine particles do not fall into the instrument. Such areas should be protected from further corrosion by an application of a silicone resin such as GE DRIFILM 88.

8-13. REPAIR AND REPLACEMENT.

8-14. The following paragraphs provide procedures for replacement of assemblies, subassemblies, and components. Special servicing instructions for the etched circuit boards are also provided. Section VI provides a detailed parts lists for use in ordering replacement parts.

8-15. CRT REMOVAL AND INSTALLATION.

WARNING

To prevent personal injury, wear a face mask or goggles when handling the CRT. Wear protective gloves and handle the CRT carefully.

8-16. To remove the CRT, proceed as follows:

- a. Disconnect cables from control board assy A5 to main board assy A1 and high voltage board assy A3.
- b. Remove screws (two on each side) holding side rails to front panel assembly.
- c. Lower front panel assembly.

CAUTION

Attempting to remove the CRT socket at an angle can break the CRT base and key-way.

- d. Disconnect all wires from CRT.
- e. Loosen base clamp.
- f. Lift CRT and shield from instrument.
- g. To install CRT, reverse removal procedure.

8-17. SEMICONDUCTOR REMOVAL AND REPLACEMENT. Figure 8-1 is included to help identify the leads on the common shapes and sizes of semiconductor devices. When removing a semiconductor, use long-nosed pliers as a heat sink between the device and the soldering iron. When replacing 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.

8-18. CIRCUIT BOARDS.

8-19. The following paragraphs provide information regarding servicing procedures for etched circuit boards.

8-20. BOARD CONNECTIONS. Square-pin connectors are identified on circuit boards by the color code of the connecting wire. Connector pins on plugs and jacks are identified by either a numeral or a letter. The letters G, I, O, and Q have been omitted. Table 8-1 shows the types of board connections used in the instrument.

8-21. SERVICING ETCHED CIRCUIT BOARDS. This instrument uses etched circuit boards with plated-through component holes. This allows components to be removed or replaced 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 the part to lift it from the board. HP Service Note M-20E contains additional information on repair of etched circuit boards.

8-22. HEAT SINKS. The heat sinks used on this instrument are all of the friction type. They can be removed by carefully pulling them off. When reinstalling, support the bottom of the transistor before pushing the heat sink on. Transistor damage may result if the transistor leads are bent.

8-23. TROUBLESHOOTING.

WARNING

Read the Safety Summary at the front of this manual before troubleshooting the instrument.

8-24. 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.

8-25. 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.

8-26. TROUBLESHOOTING THE LOW-VOLTAGE POWER SUPPLY. 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 lit. Check input voltage source for proper voltage.

8-27. The voltage from each secondary winding of input transformer T1 is rectified by a full-wave bridge rectifier and filtered by a capacitor (the +100 V 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.

8-28. Fuses and adjustments for the dc voltages are located on the mother board, A1. The fuses are connected in series with the regulator transistors. In case a fuse is open, check the series regulator and driver transistors.

8-29. No output voltage may be the result of an open fuse open series regulator transistor, or loss of the +100 V reference voltage. When all supplies are inoperative, check the +100 V power supply first.

8-30. Too high a voltage may be caused by a shorted series regulator transistor, shorted driver transistor, +100 V reference voltage out of regulation, or a defective sensor amplifier. If the ±15 V supplies are low, check the output of the +100 V supply.

8-31. If the +100-volt supply exceeds the acceptable range (+100 +5 V —0 V), check the resistor divider network A1R61 and A1R62 for proper values. Check for low input line voltage.

WARNING

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

8-32. TROUBLESHOOTING THE HIGH-VOLTAGE POWER SUPPLY. 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 A1F4. If fuse is all right, check —15 V supply. Failure of the

—15 V supply will turn off high-voltage oscillator Q4. In the event of octupler failure, replace the assembly.

8-33. DC VOLTAGES. On some of the schematics, dc voltages are indicated for active components (transis-

tors, etc.). Conditions for making these voltage measurements are listed adjacent to the schematics. Since the conditions for making the measurements may differ from one circuit to another, always check the specific condition listed adjacent to the schematic.

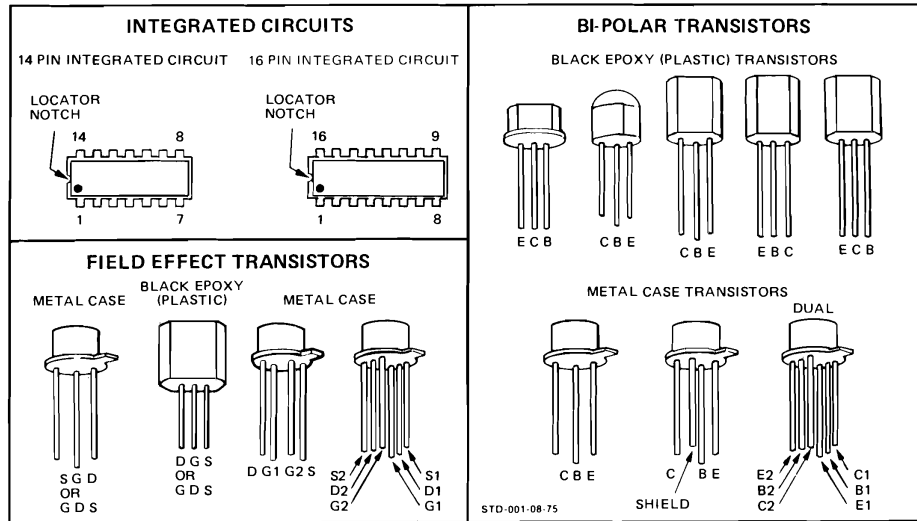


Figure 8-1. Semiconductor Terminal Identification

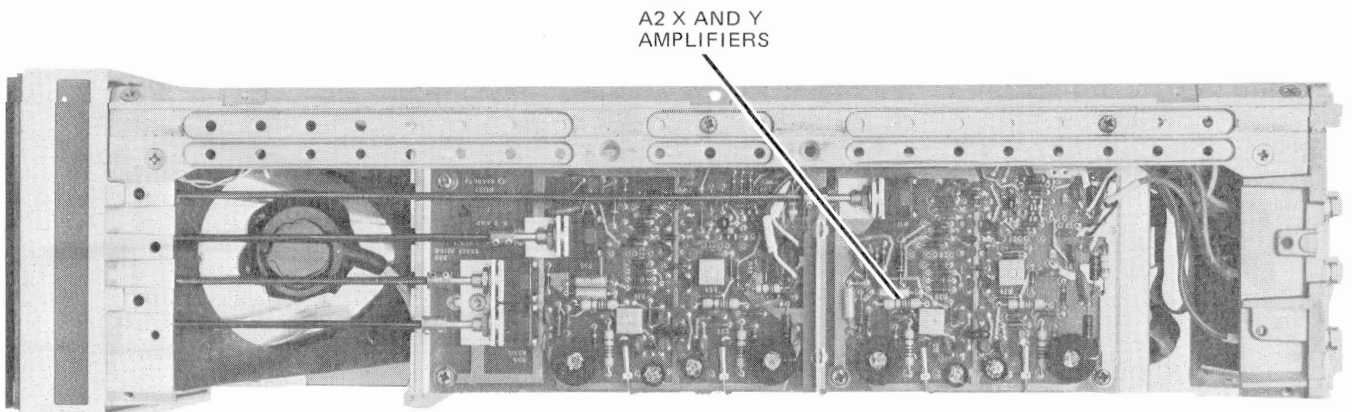
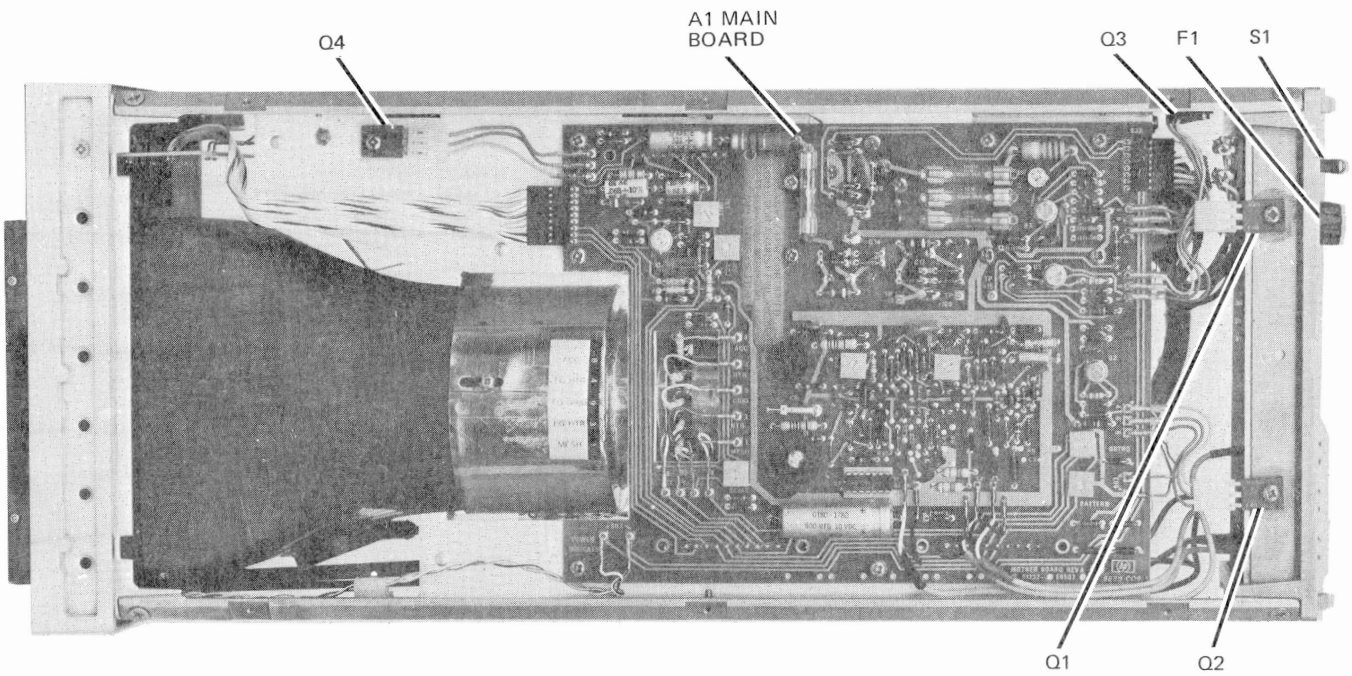
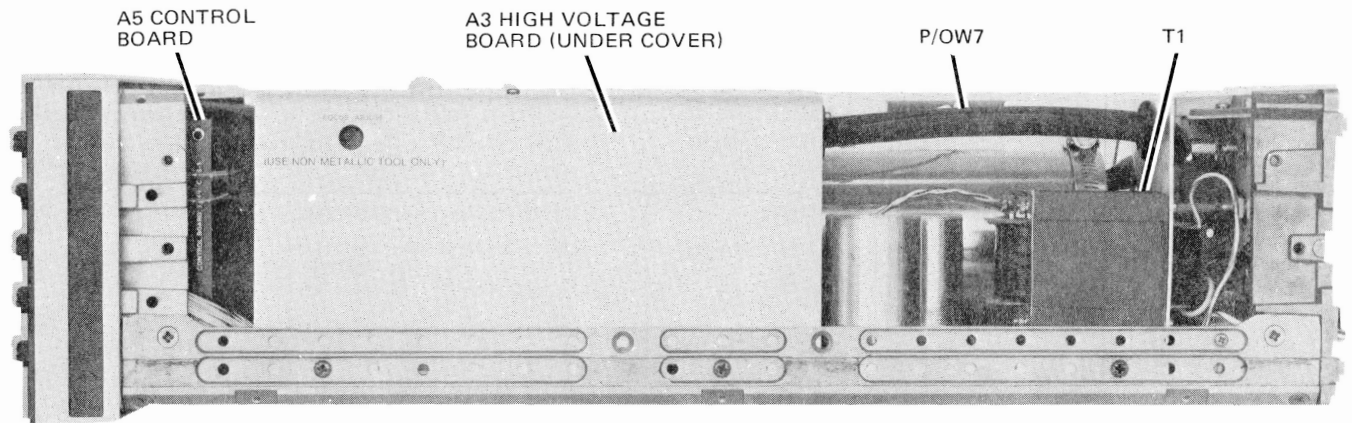
Table 8-1. Schematic Notes

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

	ETCHED CIRCUIT BOARD		FIELD-EFFECT TRANSISTOR (P-TYPE BASE)		MAIN SIGNAL PATH
	FRONT-PANEL MARKING		FIELD-EFFECT TRANSISTOR (N-TYPE BASE)		PRIMARY FEEDBACK PATH
	REAR-PANEL MARKING		BREAKDOWN DIODE (VOLTAGE REGULATOR)		SECONDARY FEEDBACK PATH
	FRONT-PANEL CONTROL		TUNNEL DIODE		PART OF
	SCREWDRIVER ADJUSTMENT		STEP-RECOVERY DIODE		NO CONNECTION
	ELECTRICAL TEST POINT TP (WITH NUMBER)		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.		CLOCKWISE END OF VARIABLE RESISTOR
	WAVEFORM TEST POINT (WITH NUMBER)		SIGNAL REFERENCE		OPTIMUM VALUE SELECTED AT FACTORY. TYPICAL VALUE SHOWN; PART MAY HAVE BEEN OMITTED.
	SINGLE-PIN CONNECTOR ON BOARD		SCHEMATIC REFERENCE		UNLESS OTHERWISE INDICATED: RESISTANCE IN OHMS CAPACITANCE IN PICO FARADS INDUCTANCE IN MICROHENRIES
	PIN OF A PLUG-IN BOARD (WITH LETTER OR NUMBER)		WIRE COLORS ARE GIVEN BY NUMBERS IN PARENTHESIS USING THE RESISTOR COLOR CODE		
	COAXIAL CABLE CONNECTED TO SNAP-ON JACK				
	COAXIAL CABLE CONNECTED DIRECTLY TO BOARD				

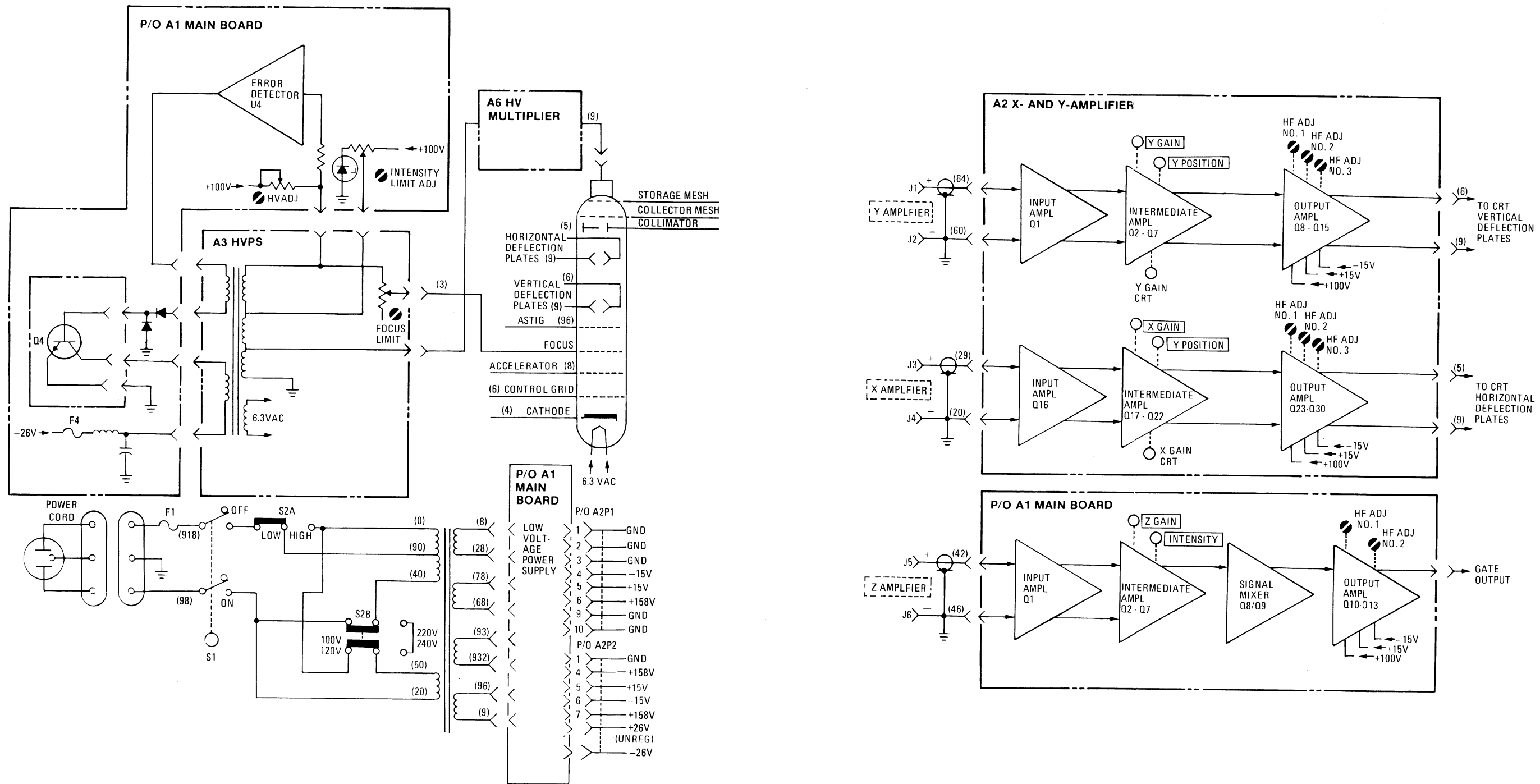
[(925) IS WHT-RED-GRN]

0 - BLACK	5 - GREEN
1 - BROWN	6 - BLUE
2 - RED	7 - VIOLET
3 - ORANGE	8 - GRAY
4 - YELLOW	9 - WHITE



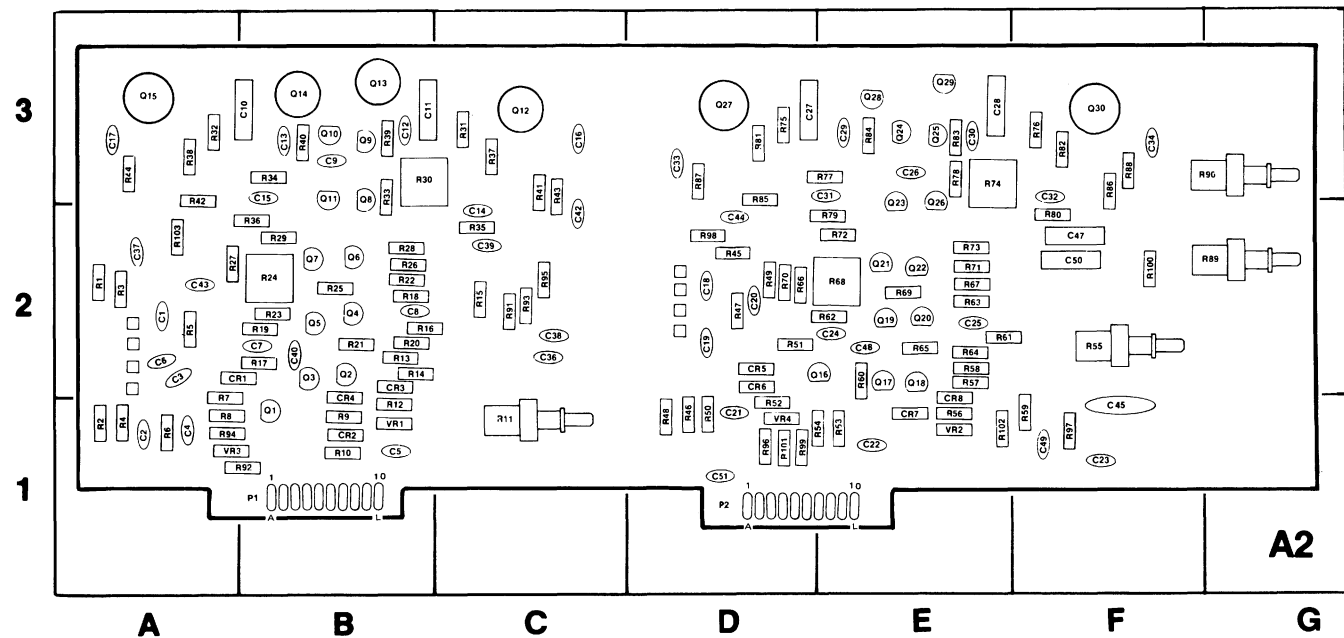
1332A-014-04-76

Figure 8-2. Assembly and Chassis Parts Locator



1332A-015-04-76

Figure 8-3. Overall Block Diagram 8-5



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	A-2	C26	E-3	CR3	B-2	Q18	E-2	R12	B-1	R36	B-2	R60	E-2	R84	E-3
C2	A-1	C27	D-3	CR4	B-1	Q19	E-2	R13	B-2	R37	C-3	R61	E-2	R85	D-3
C3	A-2	C28	E-3	CR5	D-2	Q20	E-2	R14	B-2	R38	A-3	R62	E-2	R86	F-3
C4	A-1	C29	E-3	CR6	D-2	Q21	E-2	R15	B-2	R39	B-3	R63	E-2	R87	D-3
C5	B-1	C30	E-3	CR7	A-2	Q22	E-2	R16	B-2	R40	B-3	R64	E-2	R88	F-3
C6	A-2	C31	E-3	CR8	E-1	Q23	E-2	R17	B-2	R41	C-3	R65	E-2	R89	G-2
C7	B-2	C32	F-3	P1	B-1	Q24	E-3	R18	B-2	R42	A-3	R66	D-2	R90	G-3
C8	B-2	C33	D-3	P2	D-1	Q25	E-3	R19	B-2	R43	C-3	R67	E-2	R91	C-2
C9	B-3	C34	F-3	Q1	B-1	Q26	E-2	R20	B-2	R44	A-3	R68	E-2	R92	B-1
C10	B-3	C36	C-2	Q2	B-2	Q27	D-3	R21	B-2	R45	D-2	R69	E-2	R93	C-2
C11	B-3	C37	A-2	Q3	B-2	Q28	E-3	R22	B-2	R46	D-1	R70	D-2	R94	A-1
C12	B-3	C38	C-2	Q4	B-2	Q29	F-3	R23	B-2	R47	D-2	R71	E-2	R95	C-2
C13	B-3	C39	C-2	Q5	B-2	Q30	E-3	R24	B-2	R48	D-1	R72	E-2	R96	D-1
C14	C-2	C40	B-2	Q6	B-2	R1	A-2	R25	B-2	R49	D-2	R73	E-2	R97	F-1
C15	B-3	C42	C-2	Q7	B-2	R2	A-1	R26	B-2	R50	D-1	R74	E-3	R98	D-2
C16	C-3	C43	A-2	Q8	B-3	R3	A-2	R27	A-2	R51	D-2	R75	D-3	R99	D-1
C17	A-3	C44	D-3	Q9	B-3	R4	A-1	R28	B-2	R52	D-1	R76	F-3	R100	F-2
C18	D-2	C45	F-1	Q10	B-3	R5	A-2	R29	B-2	R53	E-1	R77	E-3	R101	D-1
C19	D-2	C47	F-2	Q11	B-3	R6	A-1	R30	B-3	R54	D-1	R78	E-3	R102	E-1
C20	D-2	C48	E-2	Q12	C-3	R7	A-2	R31	C-3	R55	F-2	R79	E-2	R103	A-2
C21	D-1	C49	F-1	Q13	B-3	R8	A-1	R32	A-3	R56	E-1	R80	F-2	VR1	B-1
C22	E-1	C50	F-2	Q14	B-3	R9	B-1	R33	B-3	R57	E-2	R81	D-3	VR2	E-1
C23	F-1	C51	D-1	Q15	A-3	R10	B-1	R34	B-3	R58	E-2	R82	F-3	VR3	A-1
C24	E-2	CR1	B-2	Q16	E-2	R11	C-1	R35	C-2	R59	F-1	R83	E-3	VR4	D-1
C25	E-2	CR2	B-1	Q17	E-2										

Figure 8-4. A2 Y-axis Amplifier Component Locator

1332A-016-04-76

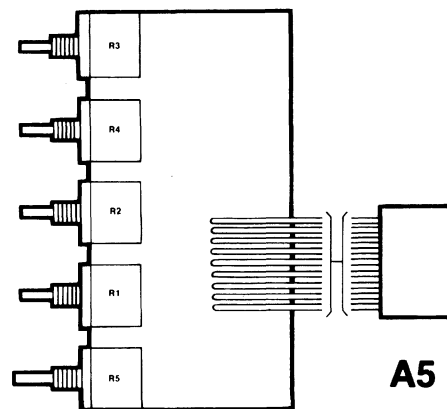
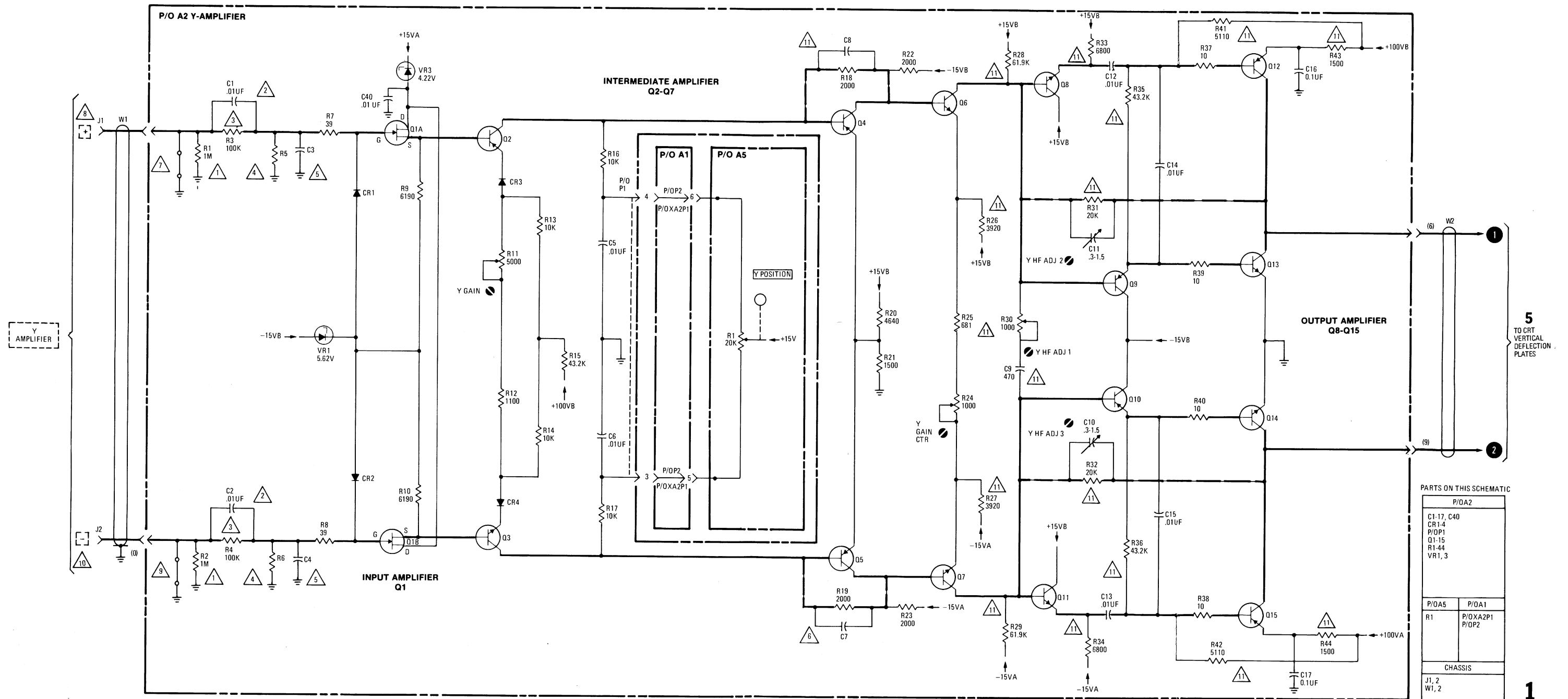


Figure 8-5. A5 Control Board Component Locator

1332A-017-04-76

SCHMATIC NOTES

1	Standard – 1M Option 110 – 50	9	Standard – Jumper USED
2	Standard – .01UF Option 100 – 1.9 – 15.5 Option 101 – 1.9 – 15.5	10	Standard – J2 NOT USED Option 106 – J2 USED
3	Standard – 100K Option 100 – 800K Option 101 – 900K	11	Option 120 ONLY
4	Standard – NOT USED Option 100 – 200K Option 101 – 100K		COMP. VALUE
5	Standard – NOT USED Option 100 – 43 Option 101 – 43		C9 36
6	Standard – NOT USED Option 121 – 160		R25 383
7	Standard – Jumper NOT USED Option 105 – Jumper USED		R26 1960
8	Standard – J1 USED Option 105 – J1 NOT USED Option 106 – J1 USED		R27 1960
		R28 47.5K	
		R29 47.5K	
		R31 10K	
		R32 10K	
		R33 3650	
		R34 3650	
		R35 22.1K	
		R36 22.1K	
		R41 2740	
		R42 2740	
		R43 750	
		R44 750	

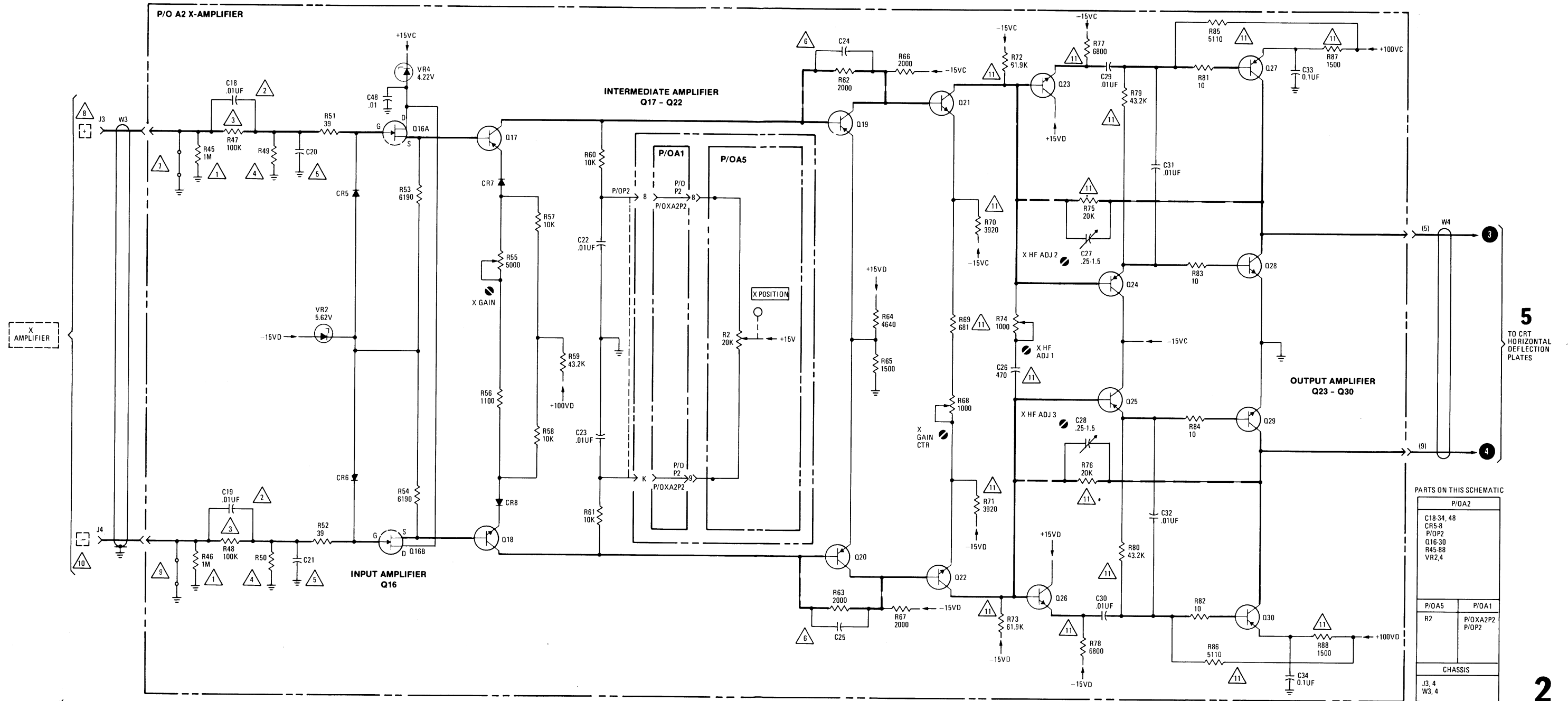


1332A-018-04-76

Figure 8-6.
Y-axis Amplifier
8-7

SCHEMATIC NOTES

1	Standard – 1M Option 110 – 50	9	Standard – Jumper USED																																		
2	Standard – .01UF Option 100 – 1.9 – 15.5 VAR Option 101 – 1.9 – 15.5 VAR	10	Standard – J4 NOT USED Option 106 – J4 USED																																		
3	Standard – 100K Option 100 – 800K Option 101 – 900K	11	Option 120 ONLY <table border="1"> <thead> <tr> <th>COMP.</th> <th>VALUE</th> </tr> </thead> <tbody> <tr><td>C26</td><td>36</td></tr> <tr><td>R69</td><td>383</td></tr> <tr><td>R70</td><td>1960</td></tr> <tr><td>R71</td><td>1960</td></tr> <tr><td>R72</td><td>47.5K</td></tr> <tr><td>R73</td><td>47.5K</td></tr> <tr><td>R75</td><td>10K</td></tr> <tr><td>R76</td><td>10K</td></tr> <tr><td>R77</td><td>3650</td></tr> <tr><td>R78</td><td>3650</td></tr> <tr><td>R79</td><td>22.1K</td></tr> <tr><td>R80</td><td>22.1K</td></tr> <tr><td>R85</td><td>2740</td></tr> <tr><td>R86</td><td>2740</td></tr> <tr><td>R87</td><td>750</td></tr> <tr><td>R88</td><td>750</td></tr> </tbody> </table>	COMP.	VALUE	C26	36	R69	383	R70	1960	R71	1960	R72	47.5K	R73	47.5K	R75	10K	R76	10K	R77	3650	R78	3650	R79	22.1K	R80	22.1K	R85	2740	R86	2740	R87	750	R88	750
COMP.	VALUE																																				
C26	36																																				
R69	383																																				
R70	1960																																				
R71	1960																																				
R72	47.5K																																				
R73	47.5K																																				
R75	10K																																				
R76	10K																																				
R77	3650																																				
R78	3650																																				
R79	22.1K																																				
R80	22.1K																																				
R85	2740																																				
R86	2740																																				
R87	750																																				
R88	750																																				
4	Standard – NOT USED Option 100 – 200K Option 101 – 100K																																				
5	Standard – NOT USED Option 100 – 43 Option 101 – 43																																				
6	Standard – NOT USED Option 121 – 160																																				
7	Standard – Jumper NOT USED Option 105 – Jumper USED																																				
8	Standard – J3 USED Option 105 – J3 NOT USED Option 106 – J3 USED																																				

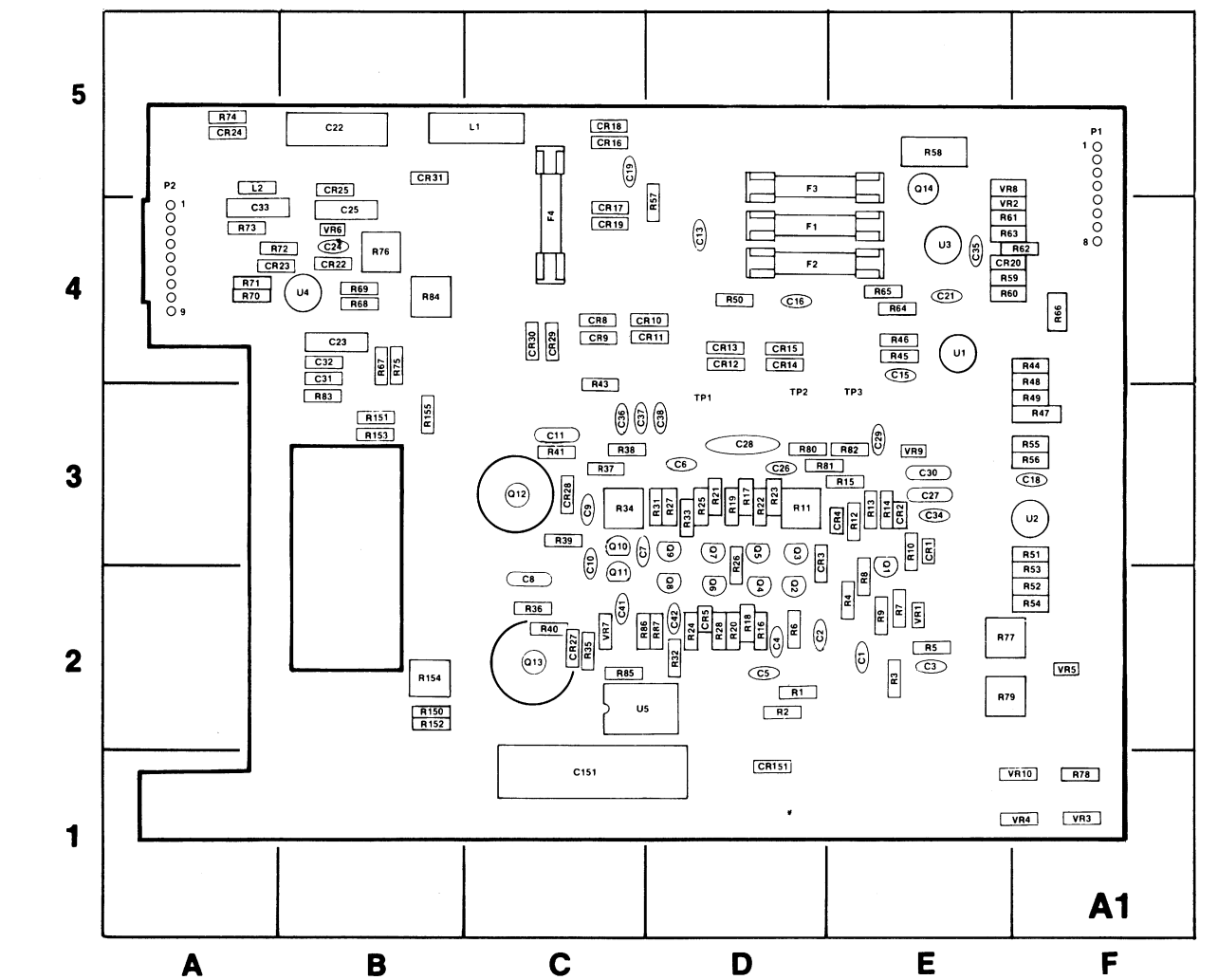


5

TO CRT HORIZONTAL DEFLECTION PLATES

2

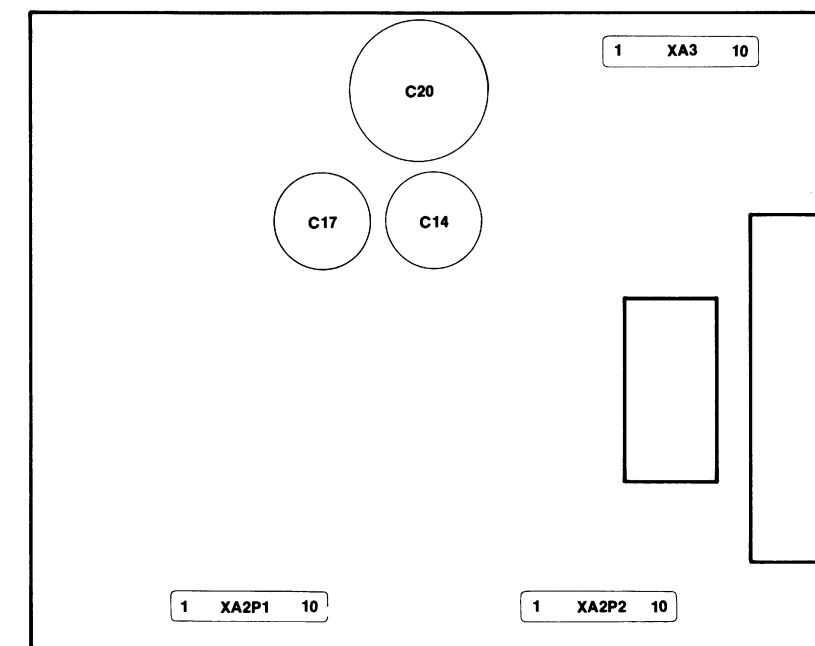
Figure 8-7.
X-axis Amplifier
8-9



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	E-2	C30	E-3	CR17	C-4	Q3	D-3	R13	F-3	R39	C-3	R64	E-4	R150	B-2
C2	D-2	C31	B-4	CR18	C-5	Q4	D-2	R14	F-3	R40	C-2	R65	E-4	R151	B-3
C3	E-2	C32	B-4	CR19	C-4	Q5	D-3	R15	F-3	R41	C-3	R66	F-4	R152	B-2
C4	D-2	C33	A-4	CR20	F-4	Q6	D-2	R16	D-2	R43	C-4	R67	B-4	R153	B-3
C5	D-2	C34	E-3	CR22	B-4	Q7	D-3	R17	D-3	R44	F-4	R68	B-4	R154	B-2
C6	D-3	C35	E-4	CR23	A-4	Q8	D-2	R18	D-2	R45	E-4	R69	B-4	R155	B-3
C7	D-3	C36	C-3	CR24	B-4	Q9	D-3	R19	D-3	R46	E-4	R70	A-4	TP1	D-3
C8	C-2	C37	D-3	CR25	A-5	Q10	C-3	R20	D-2	R47	F-3	R71	A-4	TP2	D-3
C9	C-3	C38	D-3	CR27	C-2	Q11	C-2	R21	D-3	R48	F-4	R72	A-4	TP3	E-4
C10	C-3	C41	C-2	CR28	C-3	Q12	C-3	R22	D-3	R49	F-3	R73	A-4	U1	E-4
C11	C-3	C42	D-2	CR29	C-4	Q13	C-2	R23	B-4	R50	D-4	R74	A-5	U2	F-3
C13	D-4	C151	D-1	CR30	C-4	Q14	E-5	R24	D-2	R51	F-3	R75	B-4	U3	E-4
C15	E-4	CR1	F-3	CR31	B-5	R1	D-2	R25	D-3	R52	F-2	R76	C-4	U4	B-4
C16	D-4	CR2	F-3	CR151	D-1	R2	D-2	R26	D-3	R53	F-2	R77	F-2	U5	C-2
C18	F-3	CR4	E-3	F1	D-4	R3	E-2	R27	D-3	R54	F-2	R78	F-1	VR1	E-2
C19	C-5	CR5	D-2	F2	D-4	R4	E-2	R28	C-2	R55	F-3	R79	F-2	VR2	F-4
C21	E-4	CR8	C-4	F3	C-5	R5	E-2	R31	D-3	R56	F-3	R80	D-3	VR3	F-1
C22	B-5	CR9	C-4	F4	C-4	R6	D-2	R32	C-2	R57	C-5	R81	F-3	VR4	F-1
C23	B-4	CR10	C-4	L1	C-5	R7	E-2	R33	D-3	R58	E-5	R82	E-3	VR5	F-2
C24	B-4	CR11	C-4	L2	A-5	R8	E-2	R34	C-3	R59	E-4	R83	B-3	VR6	B-4
C25	B-4	CR12	D-4	P1	F-5	R9	E-2	R35	C-2	R60	F-4	R84	B-4	VR7	C-2
C26	D-3	CR13	D-4	P2	A-5	R10	F-3	R36	C-2	R61	F-4	R85	C-2	VR8	E-5
C27	E-3	CR14	D-4	Q1	F-3	R11	D-3	R37	C-3	R62	F-4	R86	D-2	VR9	F-3
C28	D-3	CR15	D-4	Q2	D-2	R12	F-3	R38	C-3	R63	F-4	R87	D-2	VR10	F-1
C29	E-3	CR16	C-5												

1332A-020-04-76

Figure 8-8. A1 Main Board Component Locator (front)

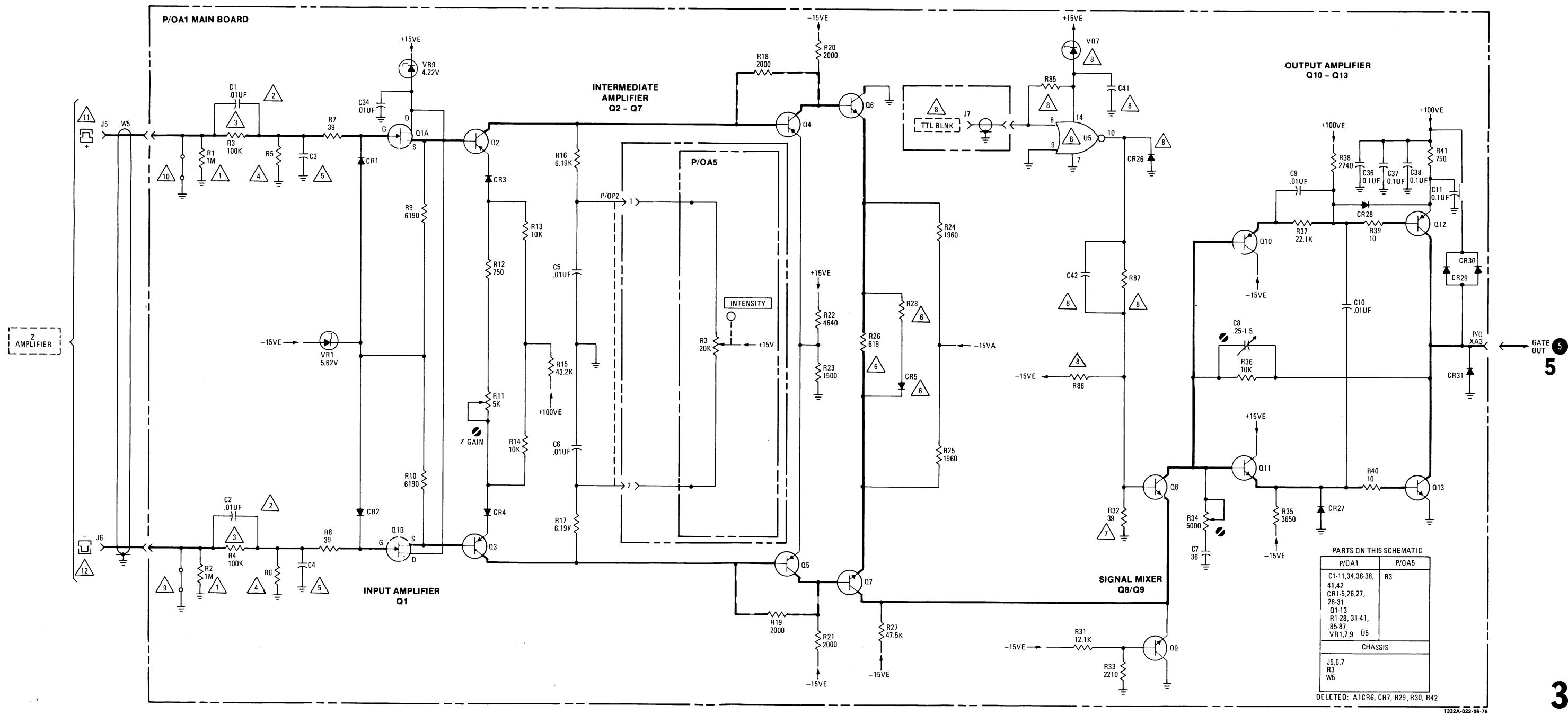


1332A-021-04-76

Figure 8-9. A1 Main Board Component Locator (back)

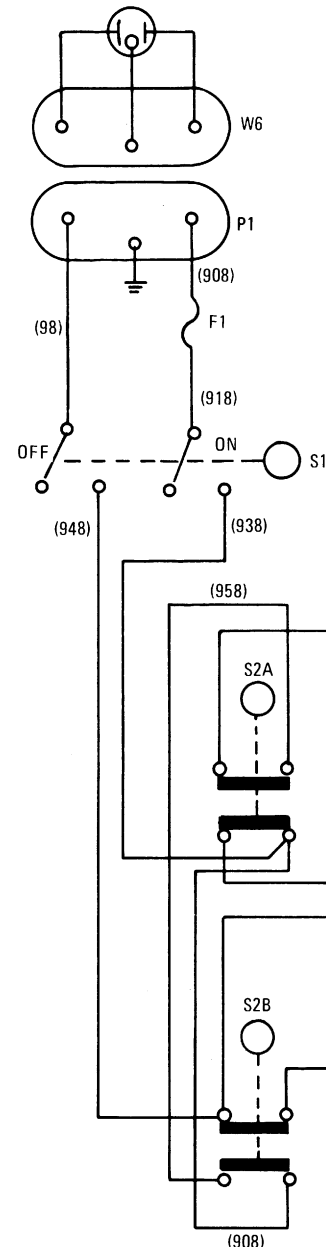
SCHMATIC NOTES

1	Standard – 1M Option 210 – 50 Option 211 – 75	7	Standard – USED Option 216 – NOT USED																				
2	Standard – .01UF Option 200 – 1.7 – 11 VAR Option 201 – 1.7 – 11 VAR	8	Option 216 ONLY <table border="1"> <thead> <tr> <th>COMP</th> <th>VALUE</th> </tr> </thead> <tbody> <tr><td>C41</td><td>.01UF</td></tr> <tr><td>C42</td><td>.01UF</td></tr> <tr><td>CR26</td><td></td></tr> <tr><td>R85</td><td>22K</td></tr> <tr><td>R87</td><td>8.25K</td></tr> <tr><td>R86</td><td>33.2K</td></tr> <tr><td>VR7</td><td>10V 400 MW</td></tr> <tr><td>U5</td><td>1820-1144</td></tr> <tr><td>J7</td><td></td></tr> </tbody> </table>	COMP	VALUE	C41	.01UF	C42	.01UF	CR26		R85	22K	R87	8.25K	R86	33.2K	VR7	10V 400 MW	U5	1820-1144	J7	
COMP	VALUE																						
C41	.01UF																						
C42	.01UF																						
CR26																							
R85	22K																						
R87	8.25K																						
R86	33.2K																						
VR7	10V 400 MW																						
U5	1820-1144																						
J7																							
3	Standard – 100K Option 200 – 800K Option 201 – 900K																						
4	Standard – NOT USED Option 200 – 200K Option 201 – 100K																						
5	Standard – NOT USED Option 200 – 39 Option 201 – 39	9	Standard – Jumper USED																				
6	Standard – <table border="1"> <thead> <tr> <th>COMP</th> <th>VALUE</th> </tr> </thead> <tbody> <tr><td>R26</td><td>619</td></tr> <tr><td>R28</td><td>909</td></tr> <tr><td>CR5</td><td>NOT USED</td></tr> </tbody> </table> Option – 215 <table border="1"> <thead> <tr> <th>COMP</th> <th>VALUE</th> </tr> </thead> <tbody> <tr><td>R26</td><td>1100</td></tr> <tr><td>R28</td><td>909</td></tr> <tr><td>CR5</td><td>USED (1901-0535)</td></tr> </tbody> </table>	COMP	VALUE	R26	619	R28	909	CR5	NOT USED	COMP	VALUE	R26	1100	R28	909	CR5	USED (1901-0535)	10	Standard – Jumper NOT USED Option 205 – Jumper USED				
COMP	VALUE																						
R26	619																						
R28	909																						
CR5	NOT USED																						
COMP	VALUE																						
R26	1100																						
R28	909																						
CR5	USED (1901-0535)																						
		11	Standard – J5 USED Option 205 – J5 NOT USED Option 206 – J5 USED																				
		12	Standard – J6 NOT USED Option 206 – J6 USED																				



3

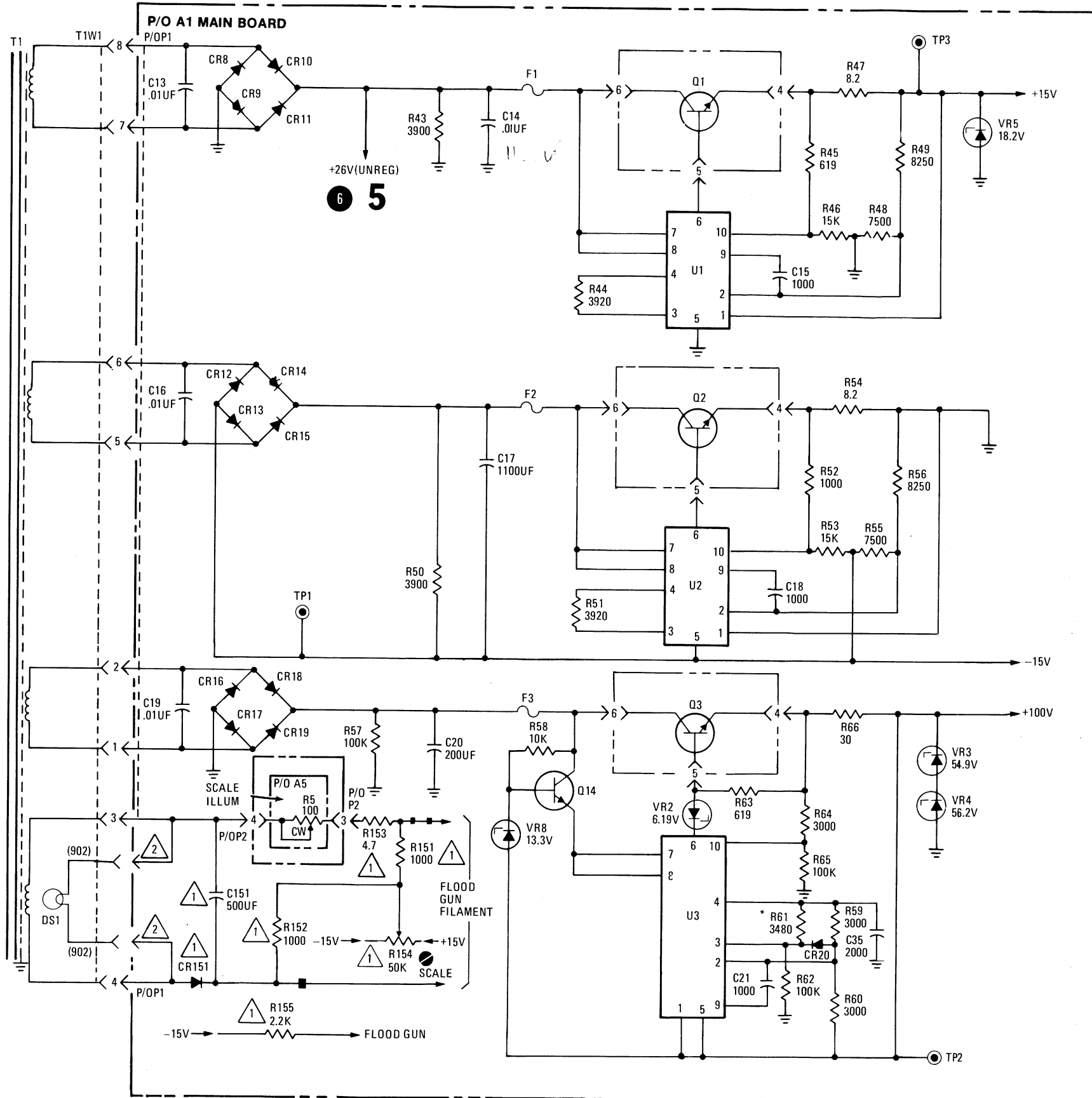
Figure 8-10.
Z-axis Amplifier
8-11/(8-12 blank)



NOTE: SEE SECTION VII FOR OPTION 310 POWER INPUT SCHEMATIC.

SCHEMATIC NOTES

- 1 STANDARD - NOT USED OPTION 325 - ONLY
- 2 STANDARD - ONLY OPTION 325 - NOT USED



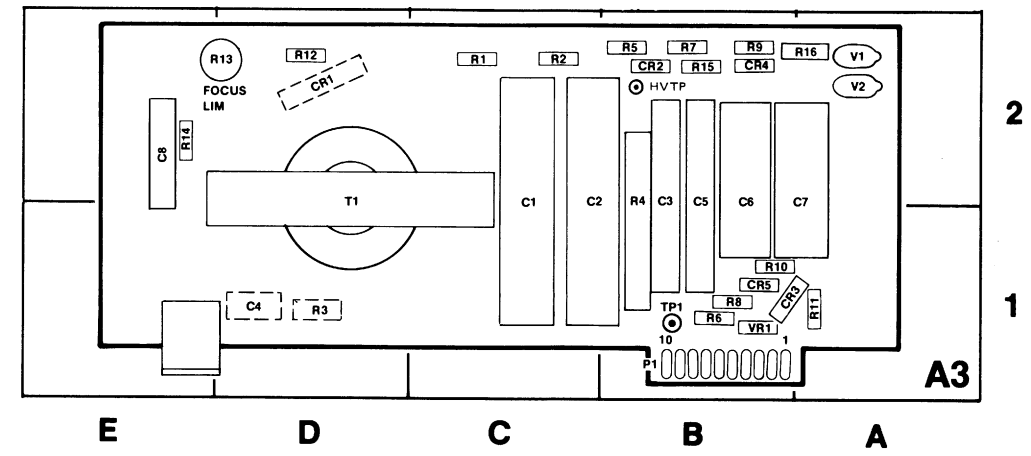
PARTS ON THIS SCHEMATIC

A1
C13-21, 35, 151 CR8-20, 151 F1-3 P2 Q14 R43-66, 151-155 U1-3 TP1, 2, 3 VR2-5, 8
CHASSIS
DS1 F1 J8 Q1-3 S1, 2 T1 W6
A5
R5

4

1332A-023-06-76

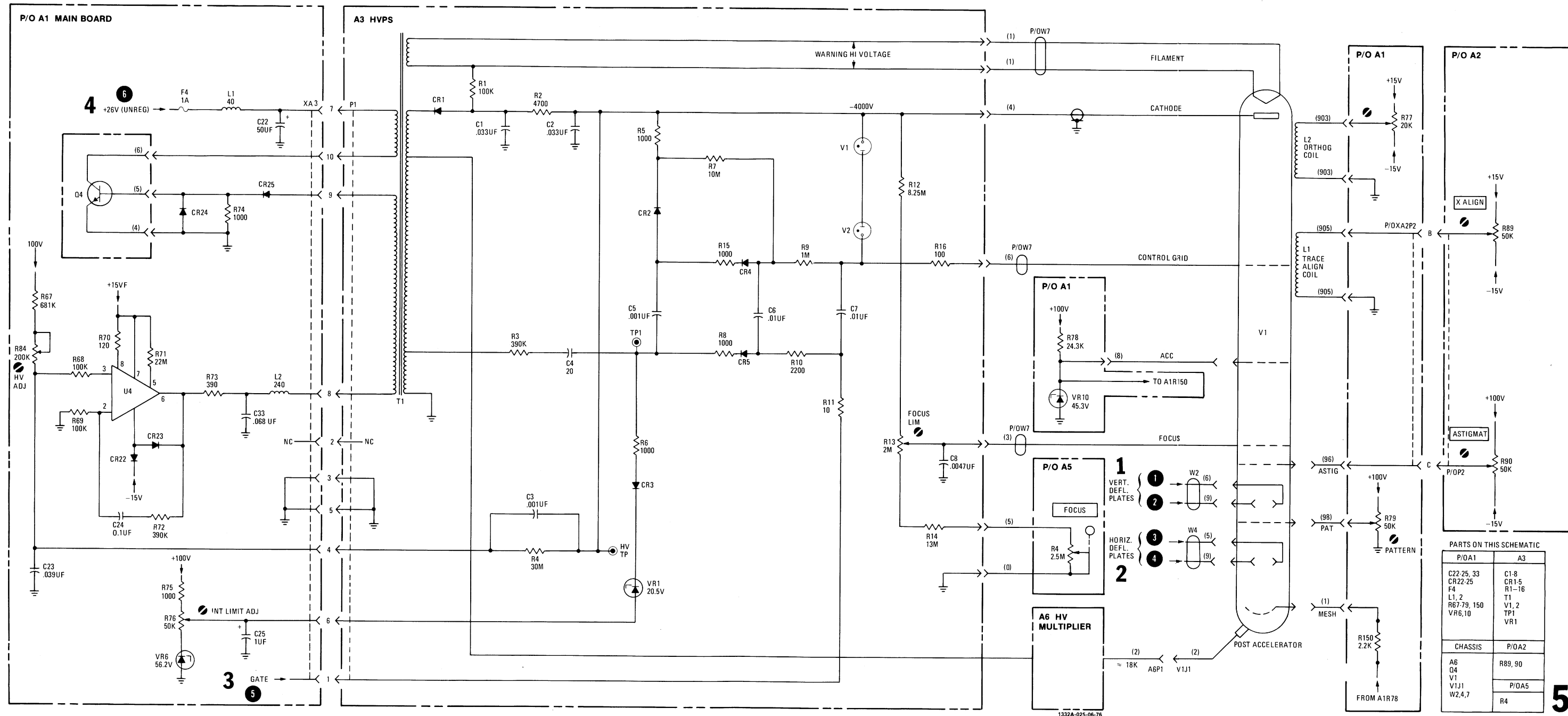
Figure 8-11.
Low-voltage Power Supply
8-13

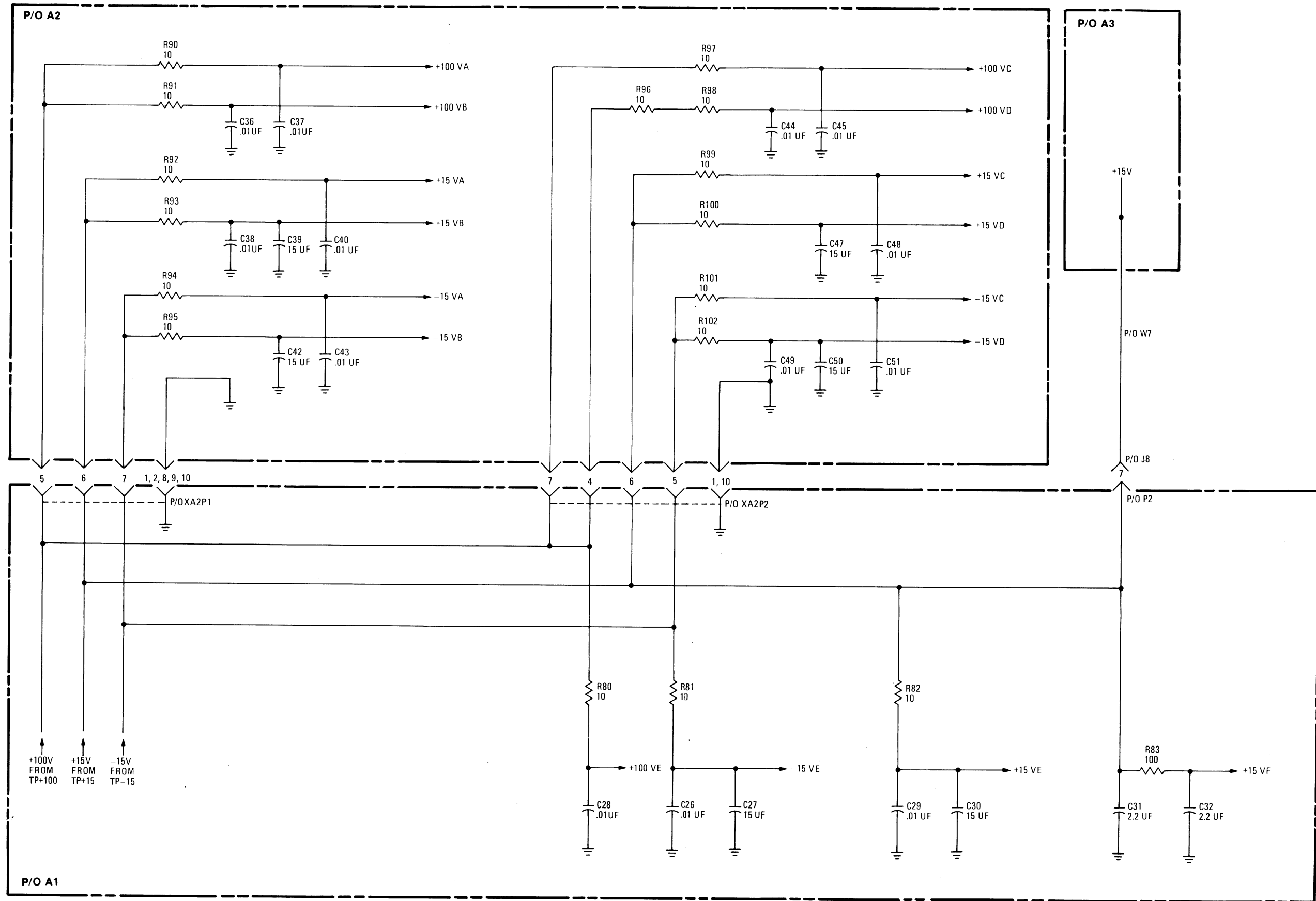


REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-2	C8	E-2	R1	C-2	R8	B-1	R15	B-2
C2	C-2	CR1	D-2	R2	C-2	R9	B-2	R16	A-2
C3	B-2	CR2	B-2	R3	D-1	R10	B-1	T1	D-2
C4	D-1	CR3	B-1	R4	B-2	R11	B-1	TP1	B-1
C5	B-2	CR4	B-2	R5	B-2	R12	D-2	V1	A-2
C6	B-2	CR5	B-1	R6	B-1	R13	D-2	V2	A-2
C7	A-2	P1	B-1	R7	B-2	R14	D-2	VR1	B-1

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Figure 8-12. A3 High-voltage Power Supply Component Locator





PARTS ON THIS SCHEMATIC

A1
C26-32 R80-83 XA2A, XA2B, XA4
A2
C35-40, 42-45, 47-51 R90-102
CHASSIS
J8 W7

Figure 8-14. DC Voltage Distribution