Errata

Title & Document Type: **1201A/B Dual Trace Oscilloscope Operating and Service Manual**

Manual Part Number: **01201-90905**

Revision Date: **February 1977**

About this Manual

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

HP References in this Manual

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

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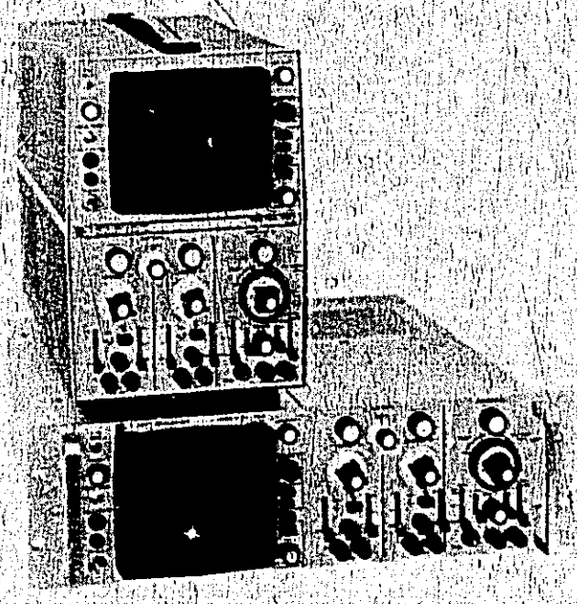
OPERATING AND SERVICE MANUAL

1201A/B DUAL TRACE OSCILLOSCOPE



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HP 1201A/B

CERTIFICATION

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

WARRANTY AND ASSISTANCE

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

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

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OPERATING AND SERVICE MANUAL

MODEL 1201A/B
DUAL TRACE OSCILLOSCOPE

(Including Options 001, 006, 009, 580, and 631)

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed **1631A.**

With changes described in Section VII this manual also applies to instruments with serial numbers prefixed **901** through **1331A.**

For additional important information about serial numbers, see INSTRUMENTS COVERED BY MANUAL in Section I.

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

Manual Part Number 01201-90905
Microfiche Part Number 01201-90805

PRINTED: FEBRUARY 1977

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.

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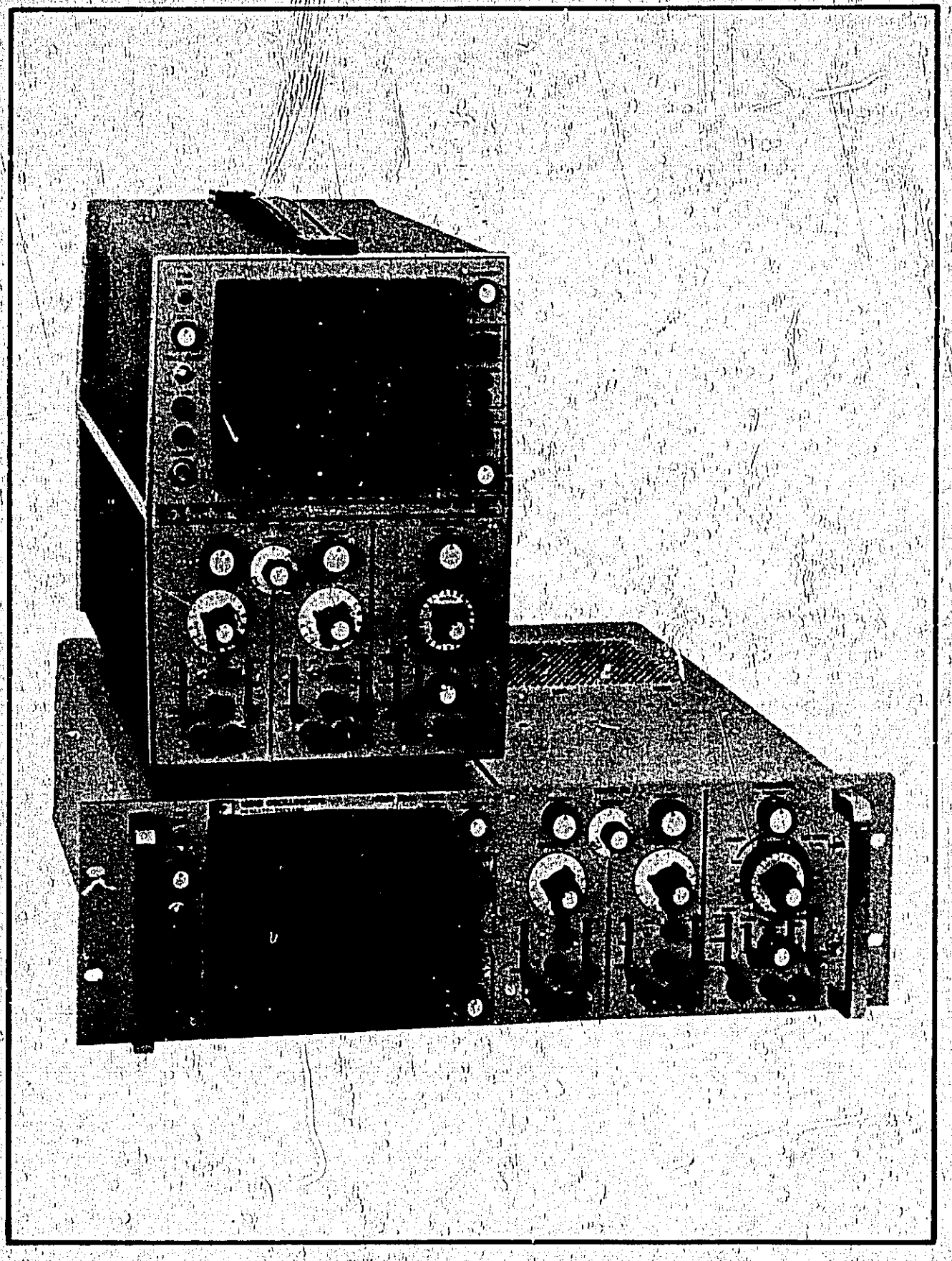


Figure 1-1. Model 1201A/B Dual Trace Oscilloscope

SECTION I

GENERAL INFORMATION

1-1. DESCRIPTION.

1-2. GENERAL.

1-3. Hewlett-Packard Models 1201A and 1201B Dual Trace Oscilloscopes, (figure 1-1) are general purpose dual channel instruments with bandwidths from dc to 500 kHz. The two instruments are electrically identical, having variable persistence and storage capabilities.

1-4. Model 1201A Oscilloscope is a cabinet model with built-in tilt stand and carrying handle. Four legs mounted on the rear permit the instrument to be used in an upright position. Model 1201B is primarily intended for use as a rack-mounted instrument and requires no conversion to adapt it for use in a standard rack.

1-5. All active components in Models 1201A and 1201B Oscilloscopes are solid state devices except for the cathode-ray tube (CRT). Specifications for Model 1201A/B are listed in table 1-1.

1-6. The variable persistence capability is especially useful for viewing slow speed signals. Adjustment of persistence time can provide viewing of a complete display with fading sufficient to prevent interference with the next display. The display persistence can readily be adjusted to eliminate flicker and still provide high resolution.

1-7. The storage feature of Model 1201A/B can be used to store single-shot phenomena for later viewing or photographing. Comparison of waveforms can be accomplished by storing several separate phenomena and later viewing them simultaneously.

1-8. VERTICAL DEFLECTION.

1-9. Model 1201A/B contains two identical vertical amplifier channels for single or dual channel operation. Each channel accepts single-ended or differential input signals, either dc or ac coupled. Common mode rejection ratio (CMRR) for differential input signals ranges from at least 100 db at 0.1 MV/DIV (one division equals 0.95 centimeter) to 30 dB at 20 V/DIV.

1-10. Maximum vertical input signal voltage (dc + peak ac) is 400 Volts. A COUPLING switch is functionally located between each INPUT jack (+ or –) and its associated preamplifier circuit. In the OFF position, this switch disconnects the INPUT jack from the circuit making it unnecessary to disconnect the signal applied to the Oscilloscope. At the same time, it grounds the associated preamplifier input circuit to provide a zero-voltage reference level. In dc, the input signal is connected directly to the preamplifier circuit, while in ac it is capacitively coupled. When ac-coupled, the lower frequency cutoff of the input signal is less than 2 Hz.

1-11. The vertical amplifiers each have a minimum deflection factor of 100 μV/DIV. Calibrated switch positions provide a deflection factor range from 100 μV/DIV to 20 V/DIV in a 1, 2, 5 sequence. A vertical VERNIER permits continuous adjustment between calibrated steps and extends the maximum deflection factor to 50 V/DIV.

1-12. The dual channel configuration allows a display of either Channel A or Channel B input signal, or two input signals simultaneously in a chopped or alternate mode, or two signals in an X-Y function. In the X-Y function, the signal connected to Channel A is applied to the Vertical deflection plates, and the Channel B signal is applied to the Horizontal deflection plates. Since the phase shift between Channels A and B in this mode is less than 1° up to 100 kHz, phase differences between two signals can be accurately mensured.

1-13. When using an internal trigger source, the sweep is triggered by the Channel A signal in the A, ALT, and CHOP modes and by the Channel B signal in the B mode. In the CHOP mode, display switching occurs at a 100 kHz rate.

1-14. HORIZONTAL DEFLECTION.

1-15. Model 1201A/B can display vertical input signals versus time, or one or two vertical signals versus an external horizontal signal.

1-16. The maximum input voltage (dc + peak ac) to the horizontal amplifier is ±350 volts. The amplifier bandwidth is dc to 300 kHz. When the signal is capacitively coupled, the lower frequency cut-off is less than 2 Hz. Four calibrated horizontal sensitivity ranges provide deflection factors of 0.1 V/DIV, 0.2 V/DIV, 0.5 V/DIV, and 1 V/DIV. (One division equals 0.95 centimeter). A horizontal VERNIER provides continuously variable adjustment between calibrated steps and extends the 1 V/DIV Range to at least 2.5 V/DIV.

1-17. The Sweep Generator may be triggered by an internal signal from the vertical amplifier, a line signal

at the frequency of the power line, or an external trigger signal. Front panel controls allow selection of desired trigger source, slope, level, coupling, mode, and sweep. Twenty-four calibrated steps provide sweep ranges from 0.1 μSEC/DIV to 5 SEC/DIV in a 1, 2, 5 sequence. A sweep vernier provides continuously variable adjustment between steps and extends the 5 SEC/DIV range to a minimum of 12.5 SEC/DIV. A magnifier magnifies all ranges by ten and reads direct without calculation.

1-18. Single sweep operation may be used with any sweep to facilitate more accurate measurement of transient waveforms. In this mode, the sweep is immediately reset when the RESET pushbutton is pressed regardless of the location of the sweep on the screen. This eliminates waiting for normal termination of slow sweeps.

1-19. OPTIONS.

1-20. Options are modifications installed on HP instruments at the factory and are available on request. The replaceable parts for the options described in this manual are listed at the end of Section VI. The following options extend the usefulness of the 1201A and 1201B:

OPTION C20 (not covered in this manual). Special CRT provides reduced store time specifications.

OPTION 001. Operates from a 230-volt ac power source.

OPTION 006 (1201B only). Provides three rear panel connectors in parallel with Channel A INPUT, Channel B INPUT, and TRIG & HORIZ INPUT front panel connectors. Refer to Section VIII for schematic connections.

OPTION 009. Provides for remote erase through a rear panel binding post connector. Refer to pulse circuit schematic in Section VIII for circuit modifications.

OPTION 015 (not covered in this manual). Vertical channel outputs through rear panel connectors.

OPTION 580. The standard 1201A and 1201B meet requirements of CSA standards. This option adds two labels to the unit to acknowledge this fact.

OPTION 631. CRT has P31 phosphor and no graticule.

1-21. INSTRUMENTS COVERED BY MANUAL.

1-22. Attached to the instrument is a serial number plate. The serial number is in the form: 0000A00000. It is in two parts; the first four digits and the letter are the serial prefix and the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The suffix however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

1-23. An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates the instrument is different from those described in this manual. The manual for this newer instrument is accompanied by a yellow Manual Changes supplement. This supplement contains "change information" that explains how to adapt the manual to the newer instrument.

1-24. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified with the manual print date and part number, both of which appear on the manual title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-25. An instrument manufactured before the printing of this manual will have a serial prefix number lower than 1631A. If your instrument has such a serial prefix number, refer to Section VII.

1-26. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

Table 1-1. Specifications

VERTICAL AMPLIFIERS:

DEFLECTION FACTOR:

Ranges: From 0.1 MV/DIV to 20 V/DIV (17 positions) in 1, 2, 5 sequence ±3% accuracy with Vernier in Calibrate position.

Vernier: Continuously variable between all ranges; extends maximum deflection factor to at least 50 V/DIV.

BANDWIDTH: DC to 500 kHz with a maximum risetime of 0.7 usec. 2 Hz to 500 kHz when AC coupled. Front panel control provided to reduce upper frequency limit to 50 kHz.

NOISE: Less than 50 uV pk-pk at full bandwidth.

INPUT: Differential or single-ended on all ranges selectable by front panel control.

COMMON MODE:

Frequency: dc to 10 kHz on all ranges.

Rejection Ratio: Greater than 100 dB (100,000 to 1) on 0.1 MV/DIV range, decreasing by less than 20 dB per decade of deflection factor to at least 40 dB on the 0.2 V/DIV range; CMRR is at least 30 dB on the 0.5 V/DIV to 20 V/DIV ranges.

Voltage: Common mode signal up to ±10 Volts (dc + pk ac) on 0.1 MV/DIV to 0.2 V/DIV ranges: ±400 V (dc + pk ac) on all other ranges.

INPUT COUPLING: Front panel selection of AC, DC, or OFF for both + and - inputs.

INPUT RC: 1 megohm shunted by 45 pF (100 pF for units with Option 006); constant on all ranges.

MAXIMUM INPUT: ±400 Volts (dc + pk ac).

DISPLAY: Channel A; Channel B; Channels A and B (either CHOP or ALT); Channels A and B vs. horizontal input (CHOP only); Channel A vs. B (A vertical, B horizontal). Chop frequency is approximately 100 kHz.

INTERNAL TRIGGER: By Channel A signal for A, CHOP, and ALTERNATE displays. By Channel B signal for B display.

ISOLATION: Greater than 80 dB between channels at 500 kHz with input connectors shielded.

PHASE SHIFT: (For Channel A vs. B) Less than 1° to 100 kHz with Verniers in calibrate position.

TIME BASE:

SWEEP RANGES: From 1 USEC/DIV to 5 SEC/DIV (21 positions) in 1, 2, 5 sequence. ±3% accuracy with Vernier in CAL position.

VERNIER: Continuously variable between ranges; extends slowest sweep speed to at least 12.5 SEC/DIV.

X10 MAGNIFIER: Indicates magnified sweep speed directly with ±5% accuracy.

AUTOMATIC TRIGGERING: Baseline displayed in absence of input signal.

Internal: 50 Hz to above 500 kHz on most signals causing 0.5 division or more of vertical deflection. Triggering on line frequency signal also selectable.

External: 50 Hz to above 1 MHz on most signals at least 0.2 volts peak-to-peak.

Trigger Slope: Positive or negative slope on internal, external, or line frequency signals.

AMPLITUDE SELECTION TRIGGERING:

Internal: DC to above 500 kHz on signals causing 0.5 division or more vertical deflection.

External: DC to 1 MHz on signals of at least 0.2 volts pk-pk. Input impedance is 1 megohm shunted by approximately 20 pF.

Trigger Level and Slope: Internal, at any point on vertical waveform displayed; or continuously variable from +100 volts to -100 volts on either slope of the external trigger signal.

Trigger Coupling: DC or AC for external, internal or line triggering. Lower AC cut-off is 1.6 Hz for external, 5 Hz for internal.

SINGLE SWEEP: Selectable by front panel switch. Reset pushbutton with an "armed" signal light.

FREE RUN: Selectable by front panel switch.

MAXIMUM INPUT: ±350 volts (dc + pk ac).

Table 1-1. Specifications (Cont'd)

HORIZONTAL AMPLIFIER:

BANDWIDTH: DC to 300 kHz. With input AC coupled, low frequency cutoff is less than 2 Hz.

DEFLECTION FACTOR:

Ranges: 0.1 V/DIV, 0.2 V/DIV, 0.5 V/DIV and 1 V/DIV.

Vernier: Continuously variable between ranges; extends maximum deflection factor to at least 2.5 V/DIV.

INPUT: Single-ended.

INPUT RC: 1 megohm shunted by approximately 20 pF (75 pF for units with Option 006).

MAXIMUM INPUT: ±350 Volts (dc + peak ac).

GENERAL:

CATHODE-RAY TUBE AND CONTROLS:

Type: Post accelerator storage tube, 10.5 kV accelerating potential, aluminized P31 phosphor.

Graticule: 8 x 10 division parallax-free internal graticule marked in 0.95 cm squares. Subdivisions of 0.2 div. on major axes. Front panel TRACE ALIGN aligns trace with horizontal graticule line.

Writing Rate: STD write mode 20 DIV/MSEC. FAST write mode 0.5 DIV/USEC.

Erase: Pushbutton erasure takes approximately 1.2 sec and resets the sweep. Write gun is blanked and sweep reset until erasure is completed.

Brightness: Greater than 100 foot/lamberts with entire screen faded positive.

Persistence: CONV mode, natural persistence of P31 phosphor; STD mode, continuously variable from less than 0.2 seconds to 1 minute or longer; FAST mode, continuously variable from 0.2 seconds to 15 seconds.

Storage Time: STD writing rate; continuously variable from 1 minute to more than 2 hours. FAST writing rate; continuously variable from 15 seconds to more than 15 minutes.

Beam Finder: Pressing FIND BEAM control when operating in any mode (except STORE), positions the beam on screen but does not intensify the beam.

Intensity Modulation: +2 volt signal blanks trace of normal intensity; +8 volt signal blanks any intensity. DC-coupled input on rear panel; amplifier risetime approximately 200 nsec; input resistance is approximately 5100 ohms.

CALIBRATOR:

Type: Line frequency square wave.

Output: 1 volt, ±1.5%; front panel connector.

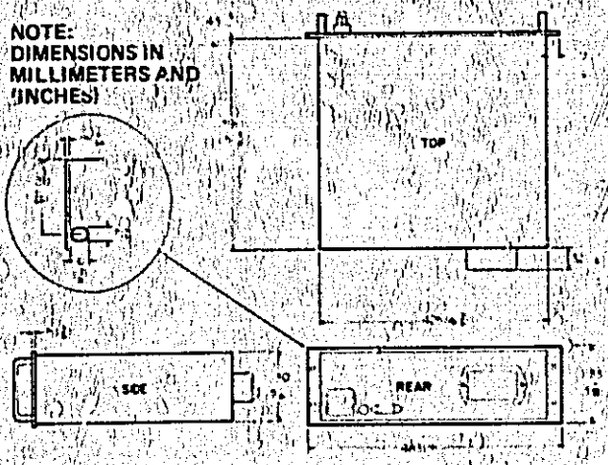
POWER: 115 or 230 volts AC ±10%; 47-440 Hz; approximately 65 watts at 115 Volts, 60 Hz.

DIMENSIONS:

Cabinet: 211.1 mm wide x 298.5 mm high x 474.4 mm deep (8-5/16 in. wide x 11-3/4 in. high x 18-11/16 in. deep).

Rack: Refer to outline drawing.

NOTE:
DIMENSIONS IN MILLIMETERS AND (INCHES)



WEIGHT:

Cabinet: Net, 13.6 kg (30 lb); shipping, 17.9 kg (39-1/2 lb).

Rack: Net, 12.5 kg (27-1/2 lb); shipping, 18.2 kg (40 lb).

ACCESSORIES:

An instrument front cover with storage space for cables, probes, etc. is available. Order HP Part No. 10169A.

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information and instructions necessary for installing and interfacing the Model 1201A or 1201B Dual Trace Oscilloscope. Included are initial inspection procedures, power and grounding requirements, installation instructions, and procedures for repacking the instrument for shipment.

2-3. INITIAL INSPECTION.

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

WARNING

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

2-5. POWER CORDS AND RECEPTACLES.

2-6. Figures 2-1 and 2-2 illustrate standard configurations used for HP power cords. The number directly above each drawing is the HP part number for a 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 and Service Office and a replacement cord will be provided.

HP POWER CABLE PART NUMBERS		
8120 - 1692	8120 - 0696	
		
8120 - 1703	8120 - 2296	8120 - 1521
		
INPUT POWER RECEPTACLE TYPES		

Figure 2-1. Model 1201A Power Cable Configurations

HP POWER CABLE PART NUMBERS		
8120 - 1689	8120 - 0698	8120 - 1369
		
8120 - 1351	8120 - 2104	8120 - 1378
		
INPUT POWER RECEPTACLE TYPES		

Figure 2-2. Model 1201B Power Cable Configurations

2-7. POWER REQUIREMENTS.

2-8. Model 1201A or 1201B can be operated from any power source supplying 115 V or 230 V, ±10%, 47 to 440 Hz. Power dissipation is approximately 65 VA.

CAUTION

Instrument damage may result if the line voltage selection switch is not correctly set for the proper input power source.

2-9. The instrument is normally set at the factory for 115-volt operation. To operate the instrument from any other ac power source, proceed as follows:

a. Verify that power cable is not connected to any input power source.

b. Set line voltage SELECTOR switch on rear panel to 230 V.

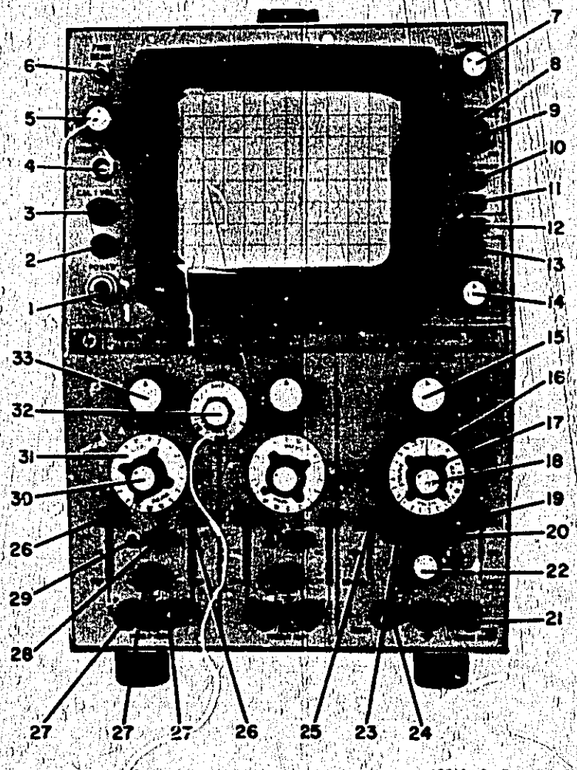
c. Replace 1.5-ampere line FUSE (F1) with 0.8-ampere fuse (HP Part No. listed in Section VI).

d. Connect input power cable to 230 Vac source.

2-10. REPACKING FOR SHIPMENT.

2-11. 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.

2-12. 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.



1. POWER. Applies primary power to instrument.
2. INDICATOR. Lights when power is applied.
3. CAL. Provides 1 volt, line frequency, square-wave signal.
4. TRACE ALIGN. Aligns trace with horizontal graticule.
5. FOCUS. Adjusts sharpness of CRT beam.
6. FIND BEAM. Press to return beam to screen.
7. INTENSITY. Adjusts brightness of CRT beam.
8. PERSISTENCE. Decreases (ccw) or increases (cw) duration of trace.
9. ERASE. Removes stored or written displays.
10. FAST. Operates CRT at fast writing rate (up to 1/2 DIV/US) with variable persistence.
11. STD. Operates CRT at normal writing rate with variable persistence.
12. CONV. Selects operation as conventional oscilloscope.
13. STORE. Retains written signal for viewing at later time.
14. STORAGE TIME. Increases or decreases length of time display is stored.
15. POSITION. Adjusts horizontal position of display.
16. SWEEP/EXT HORIZ. In SWEEP, turns on sweep generator and allows magnification of sweep. In EXT HORIZ, selects deflection factor of horizontal input signal.
17. TIME/DIVISION. Selects sweep time/division.
18. HORIZONTAL VERNIER. Provides continuous adjustment of horizontal deflection factor (EXT HORIZ) or of sweep time/division (SWEEP).
19. SOURCE. Selects trigger source that starts sweep.
20. COUPLING. In AC, capacitively couples horizontal input signal. In DC couples horizontal input signal directly.
21. TRIG AND HORIZ INPUT. Applies trigger signals to sweep generator, or horizontal signal to horizontal amplifier.
22. TRIGGER LEVEL. Selects point on trigger waveform that starts sweep. In AUTO (ccw) automatic triggers generated at approximately 40 Hz rate.
23. SLOPE. Selects positive-going or negative going slope of trigger signal to start sweep.
24. RESET. In SINGLE mode, pressing pushbutton resets sweep to zero; releasing rearms circuit. Lamp glows when circuit is armed.
25. MODE. In NORM, sweep periodically initiated by trigger signal; SINGLE, sweep triggered only once, must be reset manually; FREE RUN, sweep cycles continuously.
26. COUPLING (VERTICAL). Selects capacitive (ac) or direct (dc) coupling of vertical input signals. In OFF, jacks are disconnected and vertical input circuit is grounded.
27. INPUT. Connects either single-ended or differential input signals to vertical amplifiers.
28. BW LIMIT. Pressing pushbutton reduces upper bandwidth limit. Pressing again restores bandwidth limit.
29. BAL. Adjustment to minimize trace shift when changing Volts/Division ranges.
30. VERTICAL VERNIER. Provides continuous deflection factor adjustment between calibrated steps. In CAL, deflection factor selected by Volts/Div. switch.
31. VOLTS/DIVISION. Selects deflection factor of vertical amplifiers.
32. DISPLAY. Selects single channel, chop, alternate or A vs. B CRT display.
33. POSITION. Adjusts vertical position of trace.

Figure 3-1. Front Panel Controls and Connectors

SECTION III

OPERATION

3-1. INTRODUCTION.

3-2. This section contains operating instructions for Models 1201A and 1201B Dual Trace Oscilloscopes. Even though the vertical and horizontal amplifiers of Model 1201B have been positioned to the side of the CRT instead of below it as in Model 1201A, the controls and connectors are identical in both instruments. Therefore, only Model 1201A will be discussed in this section.

3-3. DEFINITIONS.

3-4. Several words and phrases whose definitions may vary slightly from common usage, are used to describe the operation of the Model 1201A. The definitions of these words and phrases which apply to this instrument are:

a. WRITE - To transform an INPUT signal into a visual display on the CRT screen.

b. PERSISTENCE - The length of time a single sweep-written display remains visible on the CRT screen with intensity and Sweep Speed remaining constant.

c. STORE - To retain, at normal or reduced INTENSITY, a display which has been written on the CRT screen.

d. ERASE - To remove all displays and blooms which have been stored, or written in a variable PERSISTENCE mode on the CRT.

e. INTENSITY - The brightness of a display as it is written on the CRT screen with PERSISTENCE and Sweep Speed remaining constant.

f. BLOOM - Visible, non-symmetrical expansion and distortion of a display written on the CRT screen.

g. FADE POSITIVE - The process whereby the storage mesh gradually charges more positive and allows flood-gun electrons to penetrate to the face-plate phosphors, obscuring or obliterating a stored display. A more detailed description of this condition is in Section IV, Principles of Operation.

h. BACKGROUND ILLUMINATION - A flood of light-green illumination covering the entire CRT viewing area. Visible in this illumination is a darker-colored screen-like pattern when the instrument is used in the FAST mode.

i. SWEEP TIME - The time, in seconds, milliseconds, or microseconds, required for the beam to move one division of distance across the CRT screen when writing a display.

3-5. CONTROLS AND CONNECTORS.

3-6. Control and connector locations for the Model 1201A Oscilloscope are shown in Figure 3-1 along with a brief description of their functions. Paragraphs 3-8 through 3-29 explain the functions in greater detail.

3-7. FRONT PANEL.

3-8. CALIBRATOR. The CAL jack provides a one volt negative-going square wave output signal at the power line frequency. This square wave is used for vertical and horizontal deflection factor calibration and divider-probe compensation. The signal amplitude is accurate to ±1.5%.

3-9. TRACE ALIGN ADJUSTMENT. The Trace Align adjustment rotates the trace to align it with the horizontal graticule. Because external magnetic fields may shift the trace with respect to the CRT graticule, check trace alignment each time the instrument is moved to a new location and readjust as necessary.

3-10. FIND BEAM. Pressing the FIND BEAM pushbutton returns the trace to the CRT screen regardless of front panel control settings, with the exception of INTENSITY control setting. Returning the beam to the screen enables the operator to locate the beam by gradually increasing the intensity to determine the proper action to take to center the display (e.g., reduce input signal, change coupling, adjust deflection factor, trigger level, dc balance, position controls, or intensity). When centered properly, the beam will remain on screen when the FIND BEAM pushbutton is released and INTENSITY adjusted to obtain a display.

CAUTION

A high intensity display over an extended period of time may cause burn damage to storage mesh or phosphors.

3-11. INTENSITY. The INTENSITY control decreases (ccw) or increases (cw) the brightness of the CRT display. To avoid damage, it is recommended that the Preoperational Procedures in Figure 3-2 be followed before applying power to the instrument. Increase INTENSITY slowly until the display is at a level that permits comfortable viewing and easy measurement without causing blooming of the display.

3-12. PERSISTENCE. The PERSISTENCE control sets the length of time a written display remains visible on the

CRT screen when INTENSITY and sweep time remain constant. With a given PERSISTENCE setting, the actual duration time of display afterglow may be increased by increasing the INTENSITY. Since the PERSISTENCE control sets the rate of erasing a written display, it follows that a long duration time will require longer erasing time. Conversely, a short duration time requires only short erasure time.

3-13. ERASE. Pressing the ERASE pushbutton removes stored displays from the CRT when either STD or FAST write modes are being used. A display that has been stored or written at a high level of INTENSITY or PERSISTENCE may remain partially visible when the ERASE pushbutton is released when in MAX PERSISTENCE and FAST mode. It may be necessary, in this case, to press and release the ERASE pushbutton more than once to complete erasure of these displays.

3-14. PRESENTATION SELECTION. Pushbutton controls select the mode in which the CRT functions. With ERASE pushbutton pressed, all stored and/or persisting displays are removed from the CRT. The STD and FAST modes are the only conditions in which a variable persistence display may be written on the CRT screen. The STORE mode disconnects the variable persistence and CONV. functions and retains written displays at reduced intensity on the CRT. INTENSITY, PERSISTENCE, and ERASE do not function in the STORE mode.

3-15. STD MODE. Pressing the STD pushbutton establishes the CRT in a condition for variable persistence display of a signal which can later be stored. Use minimum INTENSITY and maximum PERSISTENCE required to obtain the desired display.

3-16. FAST WRITE. When the FAST pushbutton is pressed, the storage surface is primed (or prefogged) to allow much faster writing on the storage surface. The display, however, has reduced contrast and fades positive more rapidly. Contrast and storage time are also reduced in this mode.

3-17. CONV. When the CONV pushbutton is pressed, the variable persistence and storage features of the instrument are disabled. It will now operate as a conventional, general-purpose oscilloscope. The PERSISTENCE control does not function in this mode. Always adjust INTENSITY in STD mode with minumum PERSISTENCE, so the display does not bloom, then switch to CONV.

3-18. STORAGE. Pressing the STORE pushbutton permits a written display to be retained in the oscilloscope for comparison, measurement, or photography at a later time. STORAGE TIME control varies the length of time a waveform or display can be retained. This time varies from: 15 seconds with a minimum STORAGE TIME setting, when writing in FAST mode and transferring to STORE mode; to over 2 hours with maximum STORAGE TIME setting and writing in STD mode and transferring to STORE mode. Light output is inversely proportional to STORAGE TIME.

3-19. SWEEP/HORIZ SWITCH. In the SWEEP X1 or MAG position, this switch turns on the sweep generator. Selection of the MAG position increases the gain of the horizontal amplifier, and therefore the amount of the horizontal deflection, by a factor of 10.

Note

In either the X1 or MAG position, the sweep time/division is read directly from the TIME/DIVISION dial, and no calculations are required.

3-20. In the EXT HORIZ position, this switch disables the sweep generator and connects any external input signal to the horizontal amplifier. The position of the EXT HORIZ switch determines the deflection factor of the horizontal display in Volts/Division. Four ranges provide calibrated steps from 0.1 V/DIV to 1 V/DIV when the Horizontal Vernier is in CAL detent.

3-21. HORIZONTAL VERNIER. This control performs dual functions in conjunction with the SWEEP/EXT HORIZ switch. In the SWEEP position, the Vernier provides continuous adjustment of sweep time/division between the calibrated positions of TIME/DIVISION switch and extends the 5 SEC/DIV to at least 12.5 SEC/DIV. In the EXT HORIZ position, it provides continuous adjustment of the horizontal deflection factor between calibrated steps of the EXT HORIZ switch and extends the 1 V/DIV deflection factor to at least 2.5 V/DIV. Rotating this control full clockwise into CAL detent provides the calibrated levels for the time/division of the EXT HORIZ switch positions.

3-22. SOURCE SWITCH. This control selects the origin of the trigger signal. In signal LINE Position, the power source signal is the trigger signal. In INT position, the Channel A vertical deflection signal is the trigger for the A, ALT, or CHOP display. The Channel B vertical deflection signal triggers the sweep for a Channel B display. With the SOURCE switch in the EXT position, an external trigger signal connected to the TRIG & EXT HORIZ INPUT jack is the trigger source.

3-23. TRIGGER LEVEL. This control determines the voltage level at which the trigger source initiates a trigger pulse. When this control is rotated full counterclockwise into AUTO detent, trigger pulses are automatically initiated at a rate of approximately 40 Hz to present a

baseline in the absence of a trigger signal. In the AUTO position, incoming trigger signals of the proper frequency and amplitude will override the automatic trigger pulses and initiate a sweep cycle. However, since the input signal is ac coupled, the voltage level at which the overriding trigger signal initiates a sweep cycle is the average value of the trigger signal and is not selectable.

3-24. MODE SWITCH. This switch selects the type of sweep operation to be used. In FREE RUN position, the sweep generator runs free at a rate controlled by the time/division switch. In NORM position, input trigger signals (internal, external, or line) produce a sweep on the CRT. In SINGLE position, an incoming trigger signal produces one horizontal sweep cycle. To reset and arm the sweep generator, press and release the RESET button. The indicator lamp will glow when the sweep generator is armed and extinguish at the end of the sweep cycle.

3-25. INPUT JACKS (CHANNEL A OR B). The + and - INPUT jacks apply an external signal to the Vertical deflection circuits. For a single-ended signal, use either connector, depending on direction of deflection desired. For a differential input signal, use both connectors. When applying a differential signal, the amplitudes of the two input signals are algebraically subtracted and the resultant becomes the deflection signal. Common Mode (in-phase) component of the incoming signals are rejected.

3-26. BW LIMIT. Pressing this locking pushbutton connects a capacitor across the output circuit of the vertical preamplifier. This action results in a reduction of the upper bandwidth frequency to approximately 50 kHz. This upper bandwidth frequency limit may be varied from approximately 400 Hz to 50 kHz by substituting other capacitor values for the factory selected value, as explained in Section V. The BW LIMIT switch must be pressed a second time to return the circuit to full bandwidth operation.

3-27. VERTICAL VERNIER (CHANNEL A OR B). This control provides continuously variable control of the vertical deflection factor between calibrated steps of the volts/division switch and extends the 20 V/DIV vertical deflection factor to at least 50 V/DIV. Rotating this control full clockwise into CAL detent provides calibrated levels for the volts/division switch positions.

3-28. VOLTS/DIVISION SWITCH (CHANNEL A OR B). Selection of the vertical deflection factor of the display in MV/DIV or V/DIV is controlled by this switch. Seventeen ranges provide calibrated steps from 0.1 MV/DIV to 20 V/DIV in a 1, 2, 5 sequence when the VERNIER is in CAL detent.

3-29. DISPLAY SWITCH. This five-position switch selects the type of display presented on the CRT. Input signals may be presented either singly or simultaneously as explained below:

a. Position A: presents a display of the vertical input signal applied to CHANNEL A INPUT jacks.

b. Position B: presents a display of the vertical input signal applied to CHANNEL B INPUT jacks.

c. Position A VS B: presents an X-Y display of input signals applied to INPUT jacks of both CHANNEL A and CHANNEL B. The CHANNEL A input signal is applied to the vertical deflection plates, and the CHANNEL B input signal is applied to the horizontal deflection plates.

d. Position ALT: presents a separate display of each input signal on alternate sweeps (CHANNEL A then CHANNEL B). In the INT position of the trigger SOURCE switch, the CHANNEL A signal is selected to trigger the sweep generator.

e. Position CHOP: presents separate displays of each channel input signal during every sweep cycle by switching between the two channels at a rate of approximately 100 kHz. In this mode, the sweep is triggered by the CHANNEL A signal when in the INT position of the trigger source switch.

3-30. REAR PANEL.

3-31. Z-AXIS INPUT terminals are normally grounded by a shorting link. Z-AXIS INPUT provides a method of applying an external intensity-modulation signal directly to the gate amplifier. A signal of approximately +2 volts will blank a trace of normal intensity, and a signal of approximately +8 volts will blank any trace intensity.

3-32. OPERATING INSTRUCTIONS.

3-33. To avoid possible damage to the CRT and resultant degrading of the Operation of Model 1201A, it is necessary to observe certain precautions when starting to use this instrument. It is suggested that these precautions be observed each time the Model 1201A is put into operation.

3-34. OPERATING CONSIDERATIONS.

3-35. APPLYING INPUT SIGNALS. For measurements requiring low amplifier deflection factors and high impedance levels, a shielded input connection to Model 1201A is desirable. An adapter is available that provides a shielded banana post-to-female BNC for this purpose. Two adapters can be used to provide shielded connections for differential input operation. Also available is a frequency-compensated divider probe to provide a higher input impedance and reduce circuit loading effects when measurements are made.

3-36. TRIGGER SIGNAL REQUIREMENTS. Sweep triggering in Model 1201A requires application of a signal that will start the sweep at the same point on the waveform for each recurrence of the sweep. Synchronous triggering is necessary to obtain a stable (jitter-free) display of a repetitive waveform. To observe two different

waveforms simultaneously, the signals must have time-related repetition rates, otherwise the waveform is not harmonically related to the trigger signal and is non-synchronous with the display.

3-37. Table 3-1 shows the frequency and amplitude requirements for a trigger signal depending upon the settings of the horizontal amplifier front panel controls.

3-38. OPERATING TIPS.

3-39. STORAGE AND PERSISTENCE OPERATION. This information is provided to aid the operator in becoming familiar with the Model 1201A control functions, and to serve as a guide for obtaining the desired CRT display.

a. For conventional oscilloscope operation, first obtain a non-blooming trace in STD mode then press the CONV pushbutton and use minimum intensity. A variable persistence mode may be used for convenience so the shifting from STD to CONV will not be necessary.

b. For variable persistence operation, press the STD pushbutton. Use minimum INTENSITY and maximum PERSISTENCE compatible with display.

c. Use FAST mode only for fast sweep time, single-shot display, or to improve the uniformity of trace intensity. The FAST mode causes more rapid positive fading on the CRT and persistence or storage time of the display is reduced.

d. To store a display, press the STD pushbutton, adjust the INTENSITY and PERSISTENCE for the desired display, and press the STORE pushbutton.

e. To view a stored display, it is only necessary to rotate STORAGE TIME control until stored display becomes visible.

f. To store more than one display, press the STD pushbutton, set PERSISTENCE full clockwise and INTENSITY as required; allow first display to be written on the CRT. Set INTENSITY full ccw and connect the second signal to be stored. Reset vertical POSITION if second display is not to be superimposed on first. Slowly rotate INTENSITY clockwise until second display appears. Press STORE pushbutton. More than two displays may be stored following this procedure.

g. A display which is stored when the Model 1201A power is turned off and horizontal and vertical POSITION

Table 3-1. Trigger Signal Requirements

Mode	Slope	Source	Trigger Level	Coupling	Required Signal	
					Frequency	Amplitude
NORM or SINGLE	+ or -	LINE	Selectable	DC or AC	Line Frequency	Internally Connected
			AUTO	AC		
		INT	Selectable (Any point that can be displayed.)	DC	DC to 500 kHz	At least 0.5 div of deflection
				AC	5 Hz to 500 kHz	
		EXT	Selectable +100 V to -100 V	DC	DC to 1 MHz	0.2 V to 350 V pk-pk (AC + DC)
				AC	1.6 Hz to 1 MHz	
			AUTO	AC	50 Hz to 1 MHz	
FREE RUN	Provide non-synchronous sweep.					

controls turned max cw, will remain stored for several days. To redisplay the stored waveforms, press the STORE pushbutton before turning power on. Allow 15 minutes to permit flood gun cathode to cool before again applying primary power to the instrument. Apply power to the instrument and use the STORAGE TIME control to bring the waveforms into view.

h. To erase all variable persistence or stored displays, set mode to STD, press the ERASE pushbutton for approximately 2 seconds and then release. This procedure may have to be repeated in the FAST mode in the case of waveforms written with high intensity.

j. If only a portion of a slow sweep display is desired, press the STORE pushbutton when the trace has been written to the desired point; the write gun is blanked and the written portion is stored.

3-40. SINGLE-SHOT OPERATION.

3-41. To write or store single-shot phenomena, a trial setting of INTENSITY is the best approach to ensure securing all the data carried by the waveform. Also amplitude and sweep time required to display the phenomena will affect the INTENSITY settings necessary to ensure sufficient trace afterglow for evaluation of the waveform. For example: with maximum PERSISTENCE and some setting of INTENSITY, a single-shot straight line display may bloom, while a single-shot display of a waveform may not. To determine the best INTENSITY setting, connect a signal approximating the amplitude and sweep time of the expected single-shot signal to be written. Set PERSISTENCE full cw and trigger a single sweep of the test signal. Set INTENSITY cw as far as possible without causing blooming. Repeat this procedure, varying the INTENSITY, until the proper display is achieved. This setting should give maximum persistence to the single-shot display. After the single-shot signal has been written, press the STORE pushbutton and position the STORAGE TIME control cw to retain the display.

3-42. Single-shot signals which require a sweep time of more than 20 microseconds per division can be written with more brightness by switching to the FAST mode. The screen will be unevenly illuminated after erasing in FAST mode and maximum persistence. However, INTENSITY can be set high enough to make the display visible through the illumination. A signal written in FAST mode will fade positive more rapidly than a signal written in STD mode.

3-43. OPERATIONAL PROCEDURES.

3-44. The following paragraphs contain operating instructions for the Model 1201A Oscilloscope. Refer to Figure 3-1 for the location of controls. The preoperational procedure in paragraph 3-45 should be used as a preliminary verification check each time the Model 1201A is operated.

CAUTION

This instrument is fitted with a plexiglass CRT safety faceplate (HP Part No. 5020-8728) for operator protection. To clean the CRT faceplate, use a soft cloth or tissue. Never use coarse or abrasive tissues because these will scratch the plexiglass.

3-45. PREOPERATIONAL PROCEDURE.

3-46. Before operating the Model 1201A proceed as follows:

CAUTION

Do not allow trace to bloom. Do not allow unattended instrument to operate in CONV for extended periods of time.

a. Set INTENSITY and PERSISTENCE full ccw.

b. Press STD pushbutton.

c. Switch POWER switch to "on" and observe that indicator lamp lights. (Allow time for green illumination to appear on viewing area.)

d. Adjust INTENSITY to a point where display is easily visible with minimum persistence.

e. If display does not appear, set INTENSITY to 10 o'clock position and press FIND BEAM pushbutton. Adjust controls as necessary to hold beam on CRT.

f. Adjust FOCUS for sharp, clear display.

g. Turn SWEEP/EXT HORIZ switch to X1 and TRIGGER LEVEL to AUTO.

h. Adjust TRACE ALIGN as necessary to align trace with horizontal graticule lines.

i. Center display using horizontal and vertical POSITION controls.

3-47. NORMAL AND FREE RUN OPERATION.

3-48. To operate the Model 1201A in the normal sweep trigger mode, proceed as follows:

a. Adjust vertical controls for desired display and connect vertical input signal.

b. Set MODE switch to NORM, PERSISTENCE maximum ccw.

c. Turn SWEEP/EXT HORIZ to SWEEP X1 or MAG.

d. Set SOURCE switch to desired trigger source. If EXT trigger is selected, connect trigger signal to TRIG & HORIZ jack.

e. Set COUPLING to desired position.

f. Set SLOPE to desired position.

g. Turn TIME/DIVISION switch to desired sweep speed.

h. Adjust TRIGGER LEVEL for stable display. For automatic sweep, turn to AUTO.

i. Set INTENSITY to desired level without blooming.

j. Set mode switch to CONV. Do not increase INTENSITY without checking for blooming in STD mode.

3-49. To operate the Model 1201A in the free run mode, proceed as follows:

a. Perform steps a, b, c, g, i and j for Normal Mode operation.

b. Set MODE switch to FREE RUN position.

c. In this mode trigger signals have no effect on the sweep.

3-50. SINGLE SWEEP AND EXTERNAL HORIZONTAL INPUT OPERATION.

3-51. To operate the Model 1201A in single sweep mode, proceed as follows:

a. Perform steps in paragraph 3-48 for Normal Sweep Trigger Mode operation and set MODE switch to SINGLE.

b. Press and release RESET pushbutton. RESET indicator lamp will light to indicate sweep circuit is armed.

Note

Pressing RESET immediately resets sweep without waiting for normal termination of sweep.

c. When sweep is armed, the first trigger signal initiates one sweep cycle. Lamp extinguishes at completion of cycle, and circuit must be re-armed for next cycle.

3-52. To operate the Model 1201A using the external horizontal input, proceed as follows:

a. Turn SWEEP/EXT switch to EXT HORIZ at desired sensitivity range.

b. Set COUPLING to desired position.

c. Connect input signal to TRIG & HORIZ INPUT jack.

3-53. SINGLE AND DUAL CHANNEL OPERATION.

3-54. To operate the Model 1201A using a single channel, proceed as follows:

a. Set DISPLAY to A or B.

b. Set COUPLING to AC or DC.

c. Set VOLTS/DIV switch to desired range.

d. Connect single-ended input signal between + or − INPUT JACK (depending on deflection direction desired) and GROUND. For differential input signals, connect between + and − input jacks.

e. Obtain a baseline.

f. Adjust POSITION for desired vertical position of display.

3-55. To operate the Model 1201A in chop, alternate, or dual channel proceed as follows:

a. Set DISPLAY to CHOP or ALT position. When using EXT HORIZ Input, set DISPLAY to CHOP.

b. Perform paragraph 3-56, steps b through f (A or B, Single Channel) for both Vertical Channels.

3-56. A VS B AND X-Y OPERATION.

3-57. To operate the Model 1201A in A vs B, proceed as follows:

a. Set DISPLAY to A vs B.

b. Set COUPLING to AC or DC.

c. Set VOLTS/DIV to desired range.

d. Connect desired vertical signal to CHANNEL A INPUT jacks.

e. Connect desired horizontal signal to CHANNEL B INPUT jacks.

f. Adjust CHANNEL A POSITION for desired vertical position of the display.

g. Adjust CHANNEL B POSITION for desired horizontal POSITION of display.

3-58. To operate the Model 1201A in X-Y, proceed as follows:

a. Perform paragraph 3-54, steps a through d and step f, connecting desired vertical signal to selected channel INPUT jacks.

b. Perform steps in paragraph 3-52 for Ext Horiz INPUT operation connecting desired horizontal signal to TRIG & HORIZ jack.

3-59. AMPLIFIER BALANCE.

3-60. To balance the amplifier, proceed as follows:

a. Set DISPLAY to A.

b. Set COUPLING to OFF.

c. Set VERNIER to CAL detent.

d. Obtain a baseline.

e. Adjust BAL until vertical trace does not shift when turning VOLTS/DIV switch from 20 V/DIV to 0.1 MV/DIV.

Note

If trace is not on CRT screen, Press FIND BEAM pushbutton and adjust dc BAL until trace remains on screen.

f. Repeat steps a through e for Channel B.

3-61. STORING AND VIEWING PROCEDURE.

3-62. To store a display, proceed as follows:

a. Press either STD or FAST mode pushbutton.

b. Adjust INTENSITY and PERSISTENCE controls for desired brightness and duration of displayed waveform.

c. Set STORAGE TIME control for more or less time of retention.

d. Apply INPUT signals.

e. Press STORE pushbutton.

3-63. To view a stored display proceed as follows:

a. Press STORE pushbutton.

b. Rotate STORAGE TIME control ccw as necessary to make stored trace visible. (The brighter the stored display, the shorter the storage time.)

Note

Excessive INTENSITY and PERSISTENCE when writing a display reduces the amount of time a display can be retained.

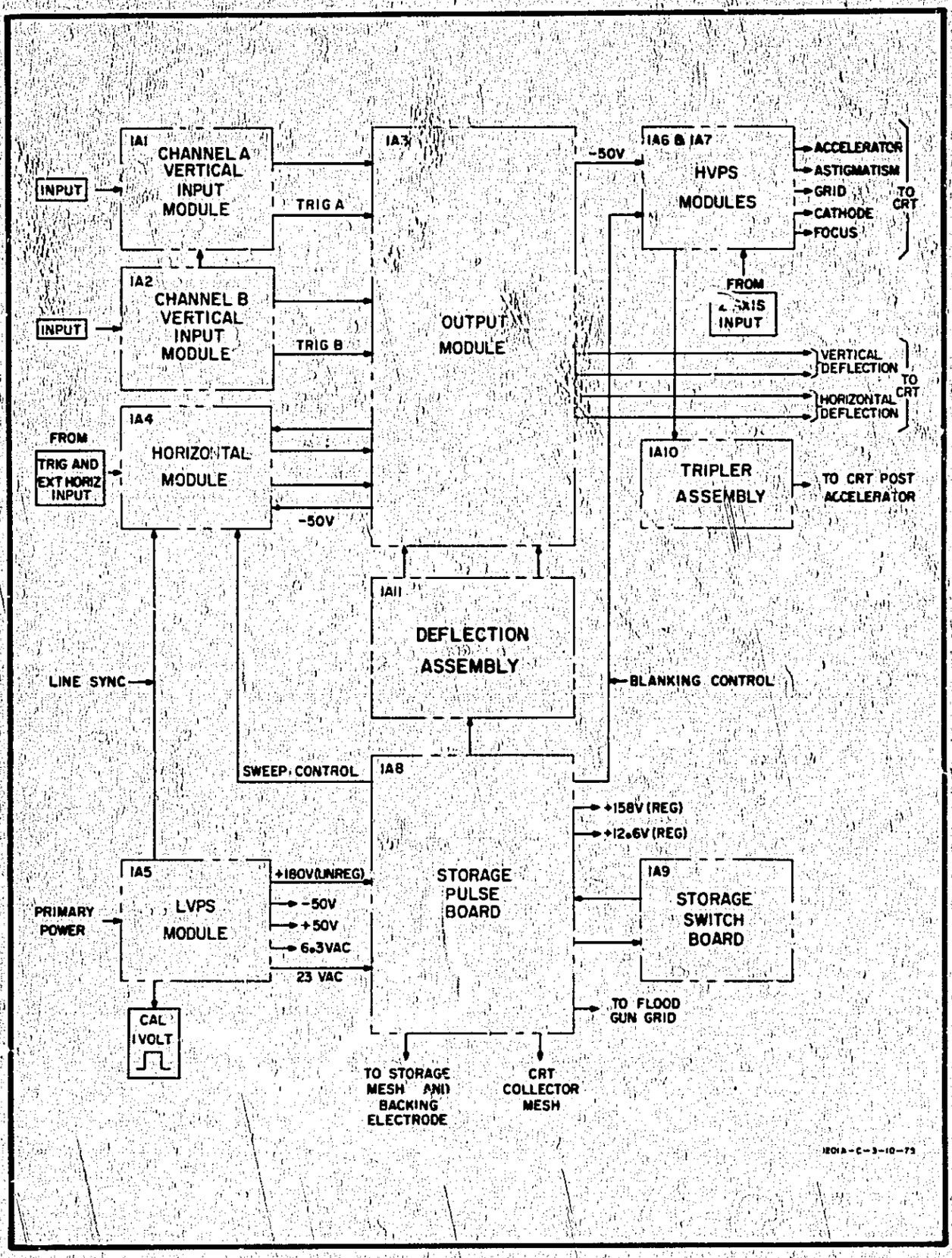


Figure 4-1. Simplified Block Diagram

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. Model 1201A/B Dual Trace Oscilloscope consists of nine functional modules: two independent (but identical) vertical amplifiers, a horizontal amplifier, a dual-channel output, mode switching and storage, a low voltage power supply, a high voltage power supply, and a high voltage tripler.

4-3. Figure 4-1 is a simplified block diagram showing the interrelationship of these modules. A complete functional block diagram is included in Section VIII.

4-4. PRELIMINARY INFORMATION.

4-5. The preliminary information in this section, while not in any way intended as a text of elementary electronics, contains brief basic circuit schematics and discussions. These basic circuit discussions are intended for the technician to aid him in understanding the operating characteristics of the HP Model 1201A/B Dual Trace Oscilloscope. Technicians already familiar with Hewlett-Packard instruments may wish to omit consideration of the preliminary information and proceed directly to the functional descriptions.

4-6. BASIC ATTENUATOR CIRCUIT.

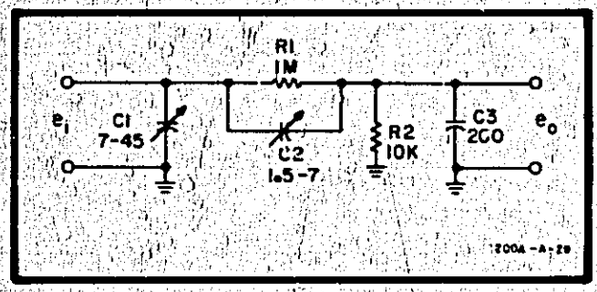


Figure 4-2. Basic Attenuator Circuit.

4-7. An attenuator is a device used to reduce the amplitude of an input signal or an output signal. In oscilloscope applications, it is used to reduce the input signal amplitude to avoid overdriving the oscilloscope circuits. In the attenuator circuit shown, amplitude reduction is accomplished by a resistive voltage divider with frequency compensation. The amount of DC and low frequency attenuation is determined by the ratio R2/(R1+R2). This ratio shows R2 to be approximately 1/100 of the total resistance; therefore, it is said to have a 100:1 ratio. C2 is adjustable so the R1C2 time-constant can be matched with the R2C3 time-constant. This makes frequency compensation possible over a wide spectrum. The attenuator input capacitance is established by C1.

4-8. DIFFERENTIAL AMPLIFIER.

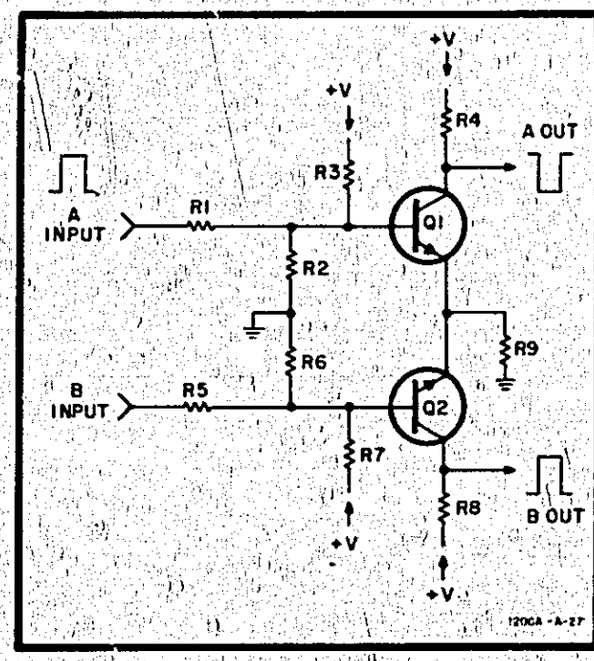


Figure 4-3. Basic Differential Amplifier.

4-9. When two input signals from different sources are simultaneously applied to the two inputs of a differential amplifier, those portions of each signal having the same oscillation characteristics are removed by the common mode element of the differential amplifier. In other words, the two signals are subtracted algebraically and only the resultant signal is amplified and applied to the output of the amplifier. A differential amplifier may also be used to convert a ground-referenced single-ended signal at one input into a double-ended signal at the output of the amplifier.

4-10. The two sides of the Basic Differential Amplifier shown may be referred to as inverting and/or non-inverting due to the common mode element between the amplifier emitters. R9 is called the common mode element because it is common to the emitters of Q1 and Q2. When a signal is applied to the A Input, the A Out signal is inverted and the B Out signal is not inverted. The opposite condition exists when the signal is applied to B Input. Both outputs have the same amplitude, but are 180° out-of-phase with each other.

4-11. When signals from different sources are applied to the A and B inputs simultaneously, Q1 and Q2 invert the signal applied to their respective inputs. The output becomes the algebraic difference (or resultant signal) between the two input signals.

4-12. CASCODE AMPLIFIER.

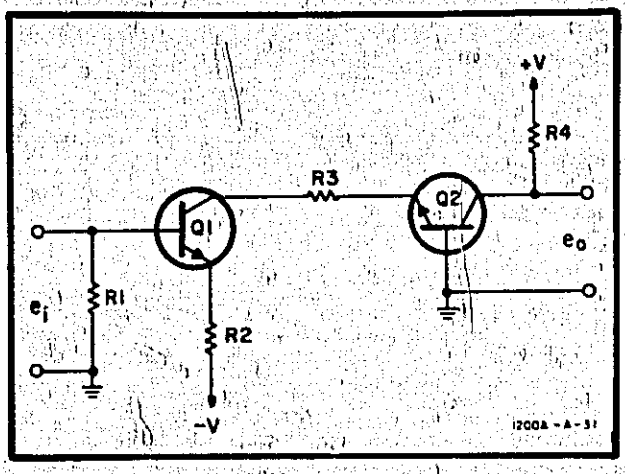


Figure 4-4. Basic Cascode Amplifier.

4-13. The output amplifier in this instrument takes advantage of the high gain without loss of frequency response provided by a cascode amplifier. In the circuit shown in Figure 4-4, Q1, the driver transistor, is a low voltage gain, high current gain transistor. When two cascode amplifiers are used in a differential configuration, an unregulated supply to the output transistor, Q2, does not affect the power match of the transistors.

4-14. Because Miller capacity does not affect the current gain of a transistor, the use of a current amplifier in the first stage and a voltage amplifier in the second stage essentially eliminates Miller capacitance in the circuit. The voltage gain of a Cascode Amplifier can be approximated by the formula: Av=R4/R2.

4-15. ASTABLE MULTIVIBRATOR.

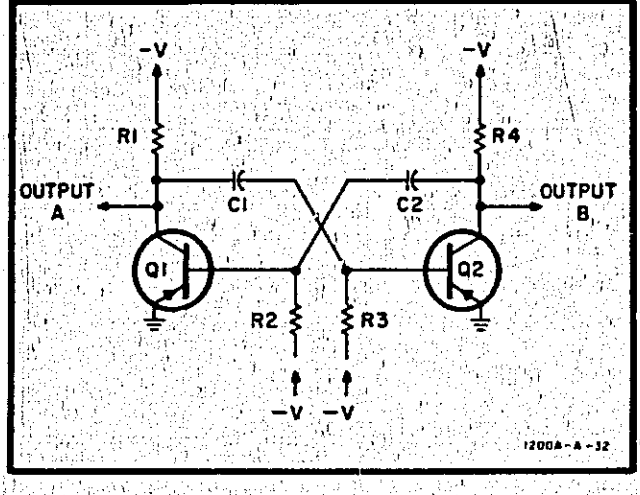


Figure 4-5. Astable Multivibrator

4-16. An Astable Multivibrator is a free-running square wave generator. Transistors Q1 and Q2 in the figure alternate between on and off states. This action produces square wave outputs at their respective collectors.

4-17. Assume that Q1 is conducting, Q2 is off, C2 is charging, and C1 is discharging. The discharging action of C1 tends to drive the base of Q2 negative. When the base of Q2 becomes sufficiently negative, Q2 turns on and begins to conduct. This causes B Output to become less negative. This voltage swing in a positive direction is coupled through C2 to Q1 base. Q1 base now goes in a positive direction and turns Q1 off. The resulting negative swing at A Out is coupled through C1 to the base of Q2. This completes one half-cycle. Now the R2/C2 time-constant turns Q1 on and the positive-going swing at A Out, coupled through C1, turns Q2 off. The R2/C2 and R3/C1 time constants are equal and provide astable operation. A full cycle is complete and because the action is self-sustaining the Multivibrator continues to free-run and generate a square wave at the output.

4-18. SCHMITT TRIGGER.

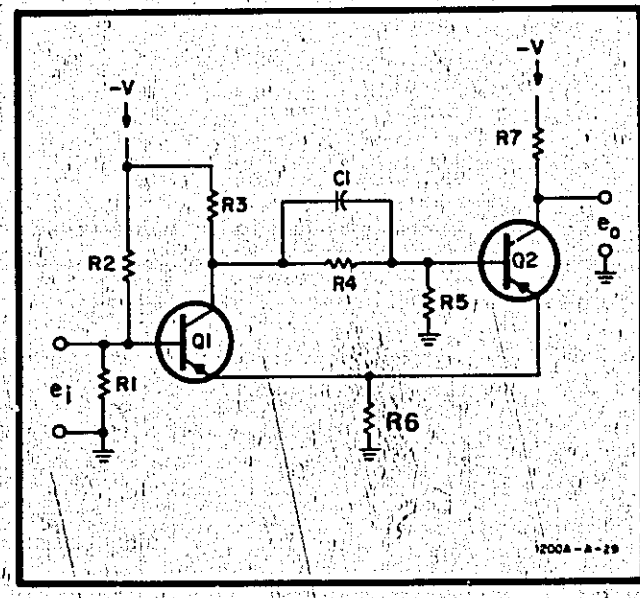


Figure 4-6. Basic Schmitt Trigger

4-19. The Schmitt Trigger is essentially a bistable triggered multivibrator. It could also be called a squaring circuit because a sine wave at the input produces a square wave at the output. With no signal input applied, Q1 is biased into the on state by the R1/R2 voltage divider. The bias voltage on Q1 base also determines the common emitter voltage (the voltage drop across R6). When Q1 is in the on state, Q2 is biased off by the Q1 collector voltage and R4/R5. A sufficient positive change applied to the base of Q1 (such as the positive portion of a sine wave), biases Q2 into the on condition. At this moment, Q1 is turned off. Q2 remains on until a sufficient negative change biases Q1 on. At this point Q2 is biased off.

4-20. COMPLEMENTARY SCHMITT TRIGGER.

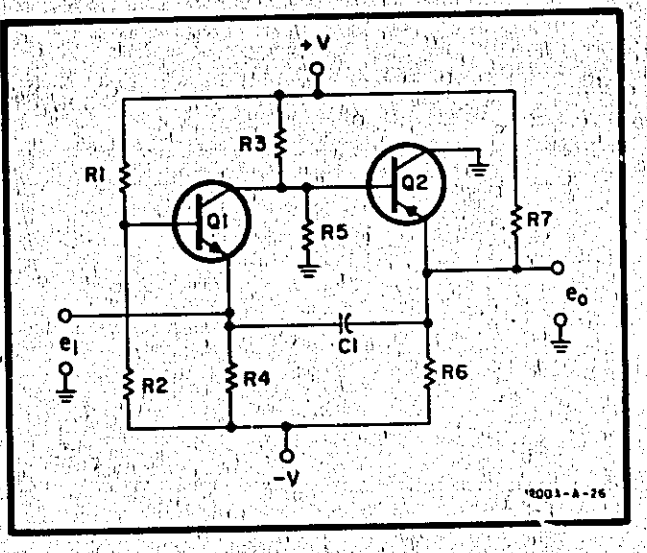


Figure 4-7. Complementary Schmitt Trigger.

4-21. In this variation of the Schmitt Trigger, both transistors are biased either on or off. With no signal input, Q1 and Q2 are both on. A positive signal applied to the input turns Q1 off and allows its collector to go positive. At the same time, the positive collector voltage turns Q2 off and the emitter output of Q2 goes positive. A sufficiently negative input turns both Q1 and Q2 on and the output goes in a positive direction.

4-22. FUNCTIONAL DESCRIPTION.

4-23. A complete functional Block Diagram in Section VIII may be used to follow the circuit descriptions given below.

4-24. VERTICAL DEFLECTION.

4-25. Since Channel A and Channel B Vertical Amplifiers are identical, only Channel A is discussed, but the information applies equally to Channel B.

4-26. The input signal to the Vertical Preamplifier may be either single-ended (referenced to ground) or differential (independent of ground). The input signal is applied to the Vertical Preamplifier through the COUPLING switch. The COUPLING switch is preset to connect the signal directly (DC) or capacitively (AC). The COUPLING switch may also be used to disconnect the input signal and ground the attenuator input. When the VOLTS/DIV switch is set to one of the eleven most sensitive positions, the signal is applied without attenuation to the appropriate Vertical Preamplifier and converted to a differential signal.

4-27. The Output module receives the signal from the Preamplifier module, develops vertical CRT deflection voltages, and applies them to the CRT vertical deflection plates. The DISPLAY switch at this point selects the mode of vertical display: Channel A; Channel B; Channel A vs Channel B; Alternating; or Chopped. The DISPLAY switch determines Multivibrator and Current Source operation.

4-28. In Channel A display mode, the Multivibrator locks in Current Source A. This enables Channel A Vertical Amplifier, and disables Channel B Vertical Amplifier. The same principle is used in Channel B operation.

4-29. In Channel A vs Channel B Mode, Vertical Amplifier A is enabled by the Multivibrator. Vertical Amplifier B is enabled by the Horiz/A vs B Current Source. Channel A vertical output operates as in Channel A display, but Channel B vertical output is switched to the Horizontal Output Amplifier by the A vs B section of the DISPLAY switch. This results in display of Channel B signal in a horizontal plane.

4-30. In the ALT display mode, Channel A and Channel B operate as outlined above except that the Multivibrator operates in a bistable condition. A trigger from the Sweep Generator switches the Multivibrator at the beginning of each sweep, causing display of Channel A then Channel B on alternate sweeps.

4-31. In CHOP display, the Multivibrator is in an astable condition and switches between Channel A and Channel B Current Sources at a 100 kHz rate. The Current Sources enable their respective Vertical Amplifiers at the same rate and provide a time-shared display.

4-32. HORIZONTAL DEFLECTION.

4-33. The horizontal circuits generate sweep triggers, sweep signals, and condition the external horizontal input signals. The SOURCE switch preselects the type of trigger input to be used: INT (internal), EXT (external), or LINE. An INT trigger signal, taken from the Vertical Preamplifier output, is derived from the vertical input signal selected for display. Trigger signals from an EXT source are applied to an attenuator to limit signal amplitudes at the Horizontal Preamplifier input and to establish the deflection factor. The LINE trigger signal is supplied by the Low Voltage Power Supply at the frequency of the primary power source.

4-34. The selected trigger from the Horizontal Preamplifier is applied to the Trigger Generator and Sweep Generator where horizontal sweep voltages, unblanking gate signals, and ALT sweep signals are developed. The sweep voltage is coupled through the Horizontal Amplifier to the Horizontal Output Amplifier in the Output module. The ALT trigger signal is applied to the Multivibrator to provide required switching for ALT display.

4-35. Selection of EXT HORIZ applies the input signal through an attenuator to the Horizontal Preamplifier. Bypassing the Trigger Generator and Sweep Generator, the signal is applied to the output module where differential horizontal CRT voltages are developed.

4-36. VARIABLE PERSISTENCE AND STORAGE.

4-37. Since variable persistence and storage may be unfamiliar to the reader, this section will deal with basic theory of operation to aid in understanding the concepts involved.

4-38. The storage CRT consists mainly of a conventional electron gun (write gun) with associated deflection plates and aluminized phosphor viewing screen. In addition, it contains a flood gun, flood beam shaping and accelerating grids, a collector mesh, and storage mesh. A schematic drawing of this CRT is shown in Figure 4-8.

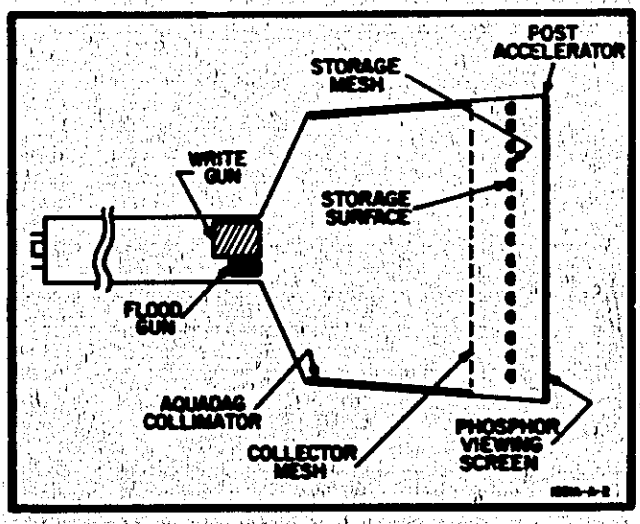


Figure 4-8. Schematic Drawing of CRT.

4-39. The write gun functions as a conventional electrostatic deflection gun. Elements which provide storage and variable persistence are located between the write gun and the phosphor.

4-40. The flood gun is located physically just outside the horizontal deflection plates and emits a cloud of electrons from its cathode. This cloud of electrons is shaped and accelerated toward the viewing area by the collimator (the coating on the inside of the funnel section of the glass) and the collector mesh. Potentials on the storage mesh and the storage surface exert further control of flood electrons as they arrive at the storage surface, where storage of information takes place.

4-41. The Secondary Emission Ratio curve shown in Figure 4-9. is the basis for storage of information on the storage surface. The point where the number of electrons leaving the storage surface is the same as the number of electrons arriving is called the 'first crossover' point. When more electrons are leaving than arriving, the storage surface potential rises; when more electrons are arriving than leaving, the storage surface potential decreases.

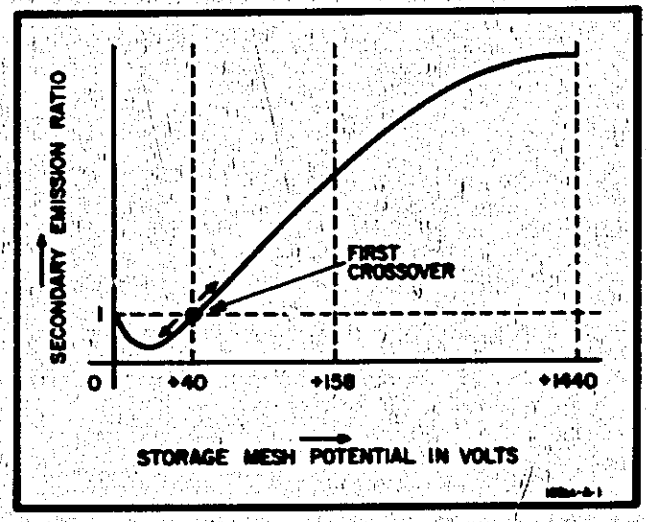


Figure 4-9. Crossover Voltage Curve.

4-42. Figure 4-10. graphically represents the actions of the storage mesh and storage surface potentials during the ERASE cycle. When the ERASE pushbutton is pressed the storage mesh and storage surface are brought to the same potential as the collector mesh, +158 V. When the ERASE pushbutton is released, both storage mesh and storage surface are dropped to a potential of approximately −12.5 volts. During an erase timing control period of approximately 1 second, an RC charging action brings the storage mesh up to +14 volts. Capacitive coupling, created by the dielectric material in the storage surface, causes the storage surface to follow this charging action and bring the storage surface potential to 0 volts. At the end of the one second erase timing control period, the storage mesh potential is returned to +4 volts and the storage surface potential is returned to −10 volts.

4-43. Write gun electrons (with much higher than first crossover energy) charge the storage surface in a positive direction only in the areas where they strike the storage surface. Flood electrons pass through these areas and are pulled to the viewing area by the high post accelerator potentials.

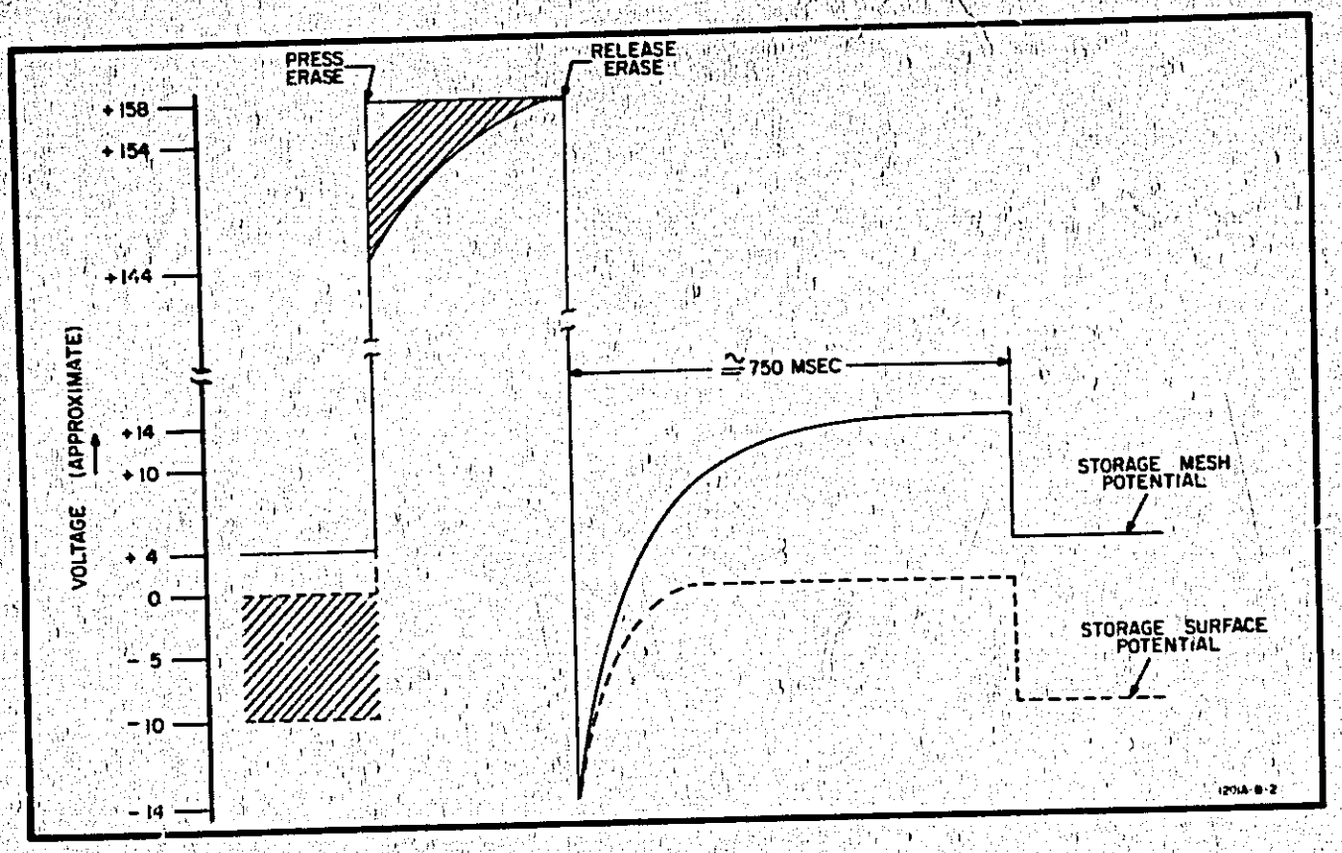


Figure 4-10. Erase Pulse.

4-44. The method of obtaining variable persistence is represented in Figure 4-11. After erasure, the unwritten storage surface is at approximately −10 volts. Those areas of the storage surface struck by electrons from the write gun become charged to near zero volts. The written areas are clamped near zero volts. When erase pulses are applied to the storage mesh, the storage surface is capacitively increased 10 volts for the duration of the pulse. While at this potential, the written areas of the storage surface attract and capture flood gun electrons. This tends to lower the potential of written areas because it charges the capacitor (created by the dielectric material) towards zero volts. When the storage mesh returns to its normal level, the storage surface drops 10 volts. The unwritten areas of the storage surface return to a −10 volt potential and the written areas return to a slightly negative potential, somewhat lower (more negative) than their initial value. This decrease in potential reduces the ability of the post accelerator potential to reach through and capture flood gun electrons, and trace brightness is slightly reduced.

4-45. A train of erase pulses gradually erases the written trace as shown in Figure 4-11. The repetition rate of the erase pulses varies the persistence of the written trace. While the storage mesh is pulsed positive, flood electrons are allowed through to the phosphor viewing screen at all areas on the storage surface, causing a light background glow under some conditions.

4-46. When the storage mesh potential is reduced to about −30 volts, in the CONV (conventional) mode, it acts as a control grid to flood electrons repelling them from the viewing phosphor. It has little effect on the write gun electrons allowing them to pass through to the viewing area.

4-47. However, some of these write gun electrons strike the storage surface and drive it in a positive direction. At high INTENSITY settings, this change in potential is very rapid. The energy from this sudden change is converted into heat in the storage surface and may burn the dielectric material. In the storage modes of operation, this burning action is visible as trace blooming. However, trace blooming is not visible during CONV operation. Therefore, the INTENSITY level should be set just below the blooming point in STD mode before switching to the CONV mode of operation.

4-48. Fade positive of the storage surface (causing the entire viewing area to be illuminated) limits the viewing time of a persisting trace. This effect is caused primarily by flood gun electrons ionizing residual gas molecules. Fade positive is reduced by turning off the flood gun except for brief periods during use in the STORE mode. These turn-on periods occur frequently at the MINUTES end of the STORAGE TIME control and produce a trace

near normal intensity. No turn-on periods occur at the HOURS end of the STORAGE TIME control and the trace is not visible.

4-49. DETAILED CIRCUIT DESCRIPTIONS.

4-50. Schematic diagrams in Section VIII may be used in conjunction with the following discussion. To simplify reading, short form reference designators are used in the text. The first time a component is referenced in the text, the complete reference designator is given. Components of the same module subsequently mentioned, are referenced by component designator only. For example: If the first component referenced on module 1A1A1 is Q1; it will be referenced 1A1A1Q1 and any other components on this same board are referenced on Q2, R1, C3, etc.

4-51. VERTICAL DEFLECTION CIRCUITS.

4-52. Vertical Preamplifier Modules for Channel A and Channel B are identical and the following information applies to both.

4-53. INPUT ATTENUATOR. The Input Attenuator (V/DIV switch) receives an input signal through the + or — front panel COUPLING switches where direct (DC), capacitive (AC), or grounded input (OFF) coupling is selected. The OFF switch position disconnects the front panel INPUT jack and grounds the corresponding preamplifier input. This provides a convenient method of determining a zero volt base line on the CRT. In the six least sensitive switch positions (0.5 V/DIV to 2 V/DIV), the Input Attenuator provides a 100:1 attenuation ratio to extend the deflection factor to 20 volts/division. In the remaining 11 switch positions (0.1 MV/DIV to 0.2 V/DIV), the input signal bypasses the attenuator and is applied directly to the Vertical Preamplifier.

4-54. VERTICAL PREAMPLIFIER. Field Effect Transistor (FET), 1A1A1Q1A/Q1B, provides a high impedance input to prevent loading the circuit under test. For simplicity, the preamplifier can be discussed by individual circuit. When broken down, the preamplifier consists of two Feedback Amplifiers (Q1A/Q2/Q3/Q6 and Q1B/Q4/Q5/Q7), an Interstage Attenuator, and a Unity Gain Amplifier (Q10/Q11/Q12). Feedback Amplifier gain is determined by the amount of resistance switched into the emitters of Q6 and Q7. Front panel BAL adjustment equalizes the DC voltage across the Interstage Attenuator so that changing the attenuator does not affect the DC output voltage.

4-55. COMMON MODE REJECTION RATIO. Any common mode signal applied to the INPUTS (+ and —) appears at the input (junction of R26 and R27) to the Unity Gain Amplifier (Q10/Q11/Q12). The output of this

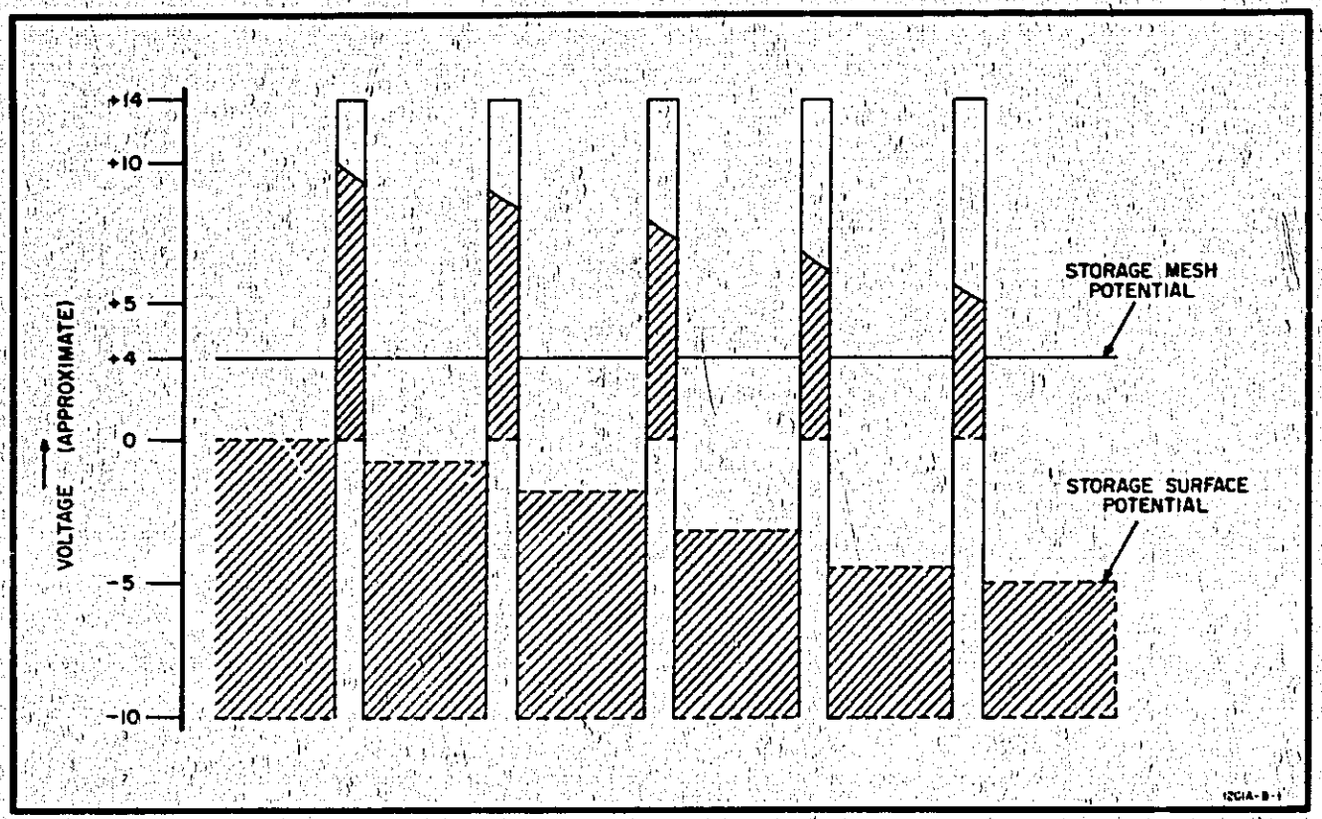


Figure 4-11. Variable Persistance Pulse.

amplifier equals the common mode input signal and is applied through Q3 and Q4 and to the drains of Q1A and Q1B. This signal voltage, being equal to the voltage on the gate, creates a zero-volt potential across the FET. Therefore the FET cannot amplify the gate signal. This establishes a high Common Mode Rejection Ratio (CMRR) of at least 100,000 to 1 (100 dB) for the 100 uV/DIV range with a maximum CMRR input of 20 volts peak-to-peak from DC to 10 kHz.

4-56. Pressing the BW (Bandwidth) LIMIT pushbutton connects a capacitor across the Feedback Amplifier output circuit and attenuates noise level by limiting high frequency gain to 50 kHz. Various bandwidth limits may be achieved by substituting capacitors of other values as outlined in Section V. Pressing the BW LIMIT pushbutton again releases the switch and restores bandwidth to normal.

4-57. VERTICAL AMPLIFIER.

4-58. FIRST HALF CASCODE AMPLIFIER. The signal from the Vertical Preamplifier is coupled through Emitter Followers 1A3Q1/Q2 to the First Half Cascode Amplifier of the Vertical Output Amplifier. When Channel A is selected, the DISPLAY switch turns on the Channel A Current Source, Q14, and Channel A signal is amplified by the Vertical Output Amplifier.

4-59. POSITION. Rotating either channel POSITION control causes a current increase in one side of the amplifier and a decrease in the other side. Output voltage from the Cascode Amplifier changes proportionately with the current change and shifts the vertical display up or down on the CRT viewing area.

4-60. DISPLAY. CHANNEL A position provides −50 volts to saturate the A side of the Multivibrator, Q15/Q16. This turns on the Current Source for Channel A, Q14, and supplies current to the Channel A First Half Cascode Amplifiers, Q3/Q4.

4-61. CHANNEL B position applies −50 volts to saturate the B side of the Multivibrator, Q15/Q16. This turns on the B Current Source, Q18, and supplies current to the Channel B First Half Cascode Amplifiers, Q7/Q8.

4-62. ALT position sets the Multivibrator for operation in a bistable condition. A trigger supplied by the Sweep Generator at the beginning of each sweep causes the Multivibrator to change state. With this type of operation, Channel A is displayed during one sweep and Channel B is displayed on the next sweep. The selected sweep speed determines the rate of display alternation.

4-63. CHOP setting supplies −50 volts to both sides of the Multivibrator. In this condition, the Multivibrator becomes astable, and switches Channel A and Channel B Current Sources on and off at a 100 kHz rate. This switching action alternately enables each Vertical Amplifier to drive the common Vertical Output Amplifier and results in a time-shared display of both channels.

4-64. The A vs B position supplies −50 volts to lock the A side of the Multivibrator in an on condition and supply current to the Channel A First Half Cascode Amplifier. In this operating mode, the horizontal deflection circuit Current Source, Q18, is switched into the First Half Cascode Amplifier of Channel B. Output from the Channel B First Half Cascode Amplifier, Q7/Q8, is now operating in conjunction with the Horizontal Second Half Cascode Amplifier, Q11/Q12, to present Channel B Output in a horizontal plane.

4-65. Signals from the Preamplifier are coupled to the Output Amplifier consisting of two cascode amplifiers in a differential configuration and operating as explained under Preliminary Information at the beginning of this section. The amplifier output signal is applied to the CRT vertical deflection plates.

4-66. HORIZONTAL DEFLECTION CIRCUITS.

4-67. SOURCE, SWEEP/EXT HORIZ, COUPLING. These front panel control switches provide selectable direction of incoming horizontal signals to the appropriate circuits for producing the desired horizontal display.

4-68. The SOURCE switch selects INT., EXT., or LINE trigger signal source. In the INT position, a trigger signal from the Vertical Preamplifier of the channel being displayed is applied to the Horizontal Preamplifier.

4-69. In EXT position, a trigger signal from an external source is applied, from the TRIG & EXT HORIZ jack, to the Horizontal Preamplifier.

4-70. In the LINE position, a winding from the Low Voltage Power Supply transformer provides a trigger signal at the frequency of the primary power source to the Horizontal Preamplifier.

4-71. The SWEEP/EXT HORIZ switch determines whether the input signal is applied to the trigger circuits or to the horizontal deflection circuits.

4-72. The COUPLING switch may be used to couple the input signal capacitively (AC) or directly (DC) to the Horizontal Preamplifier.

4-73. HORIZONTAL PREAMPLIFIER. The Horizontal Preamplifier, 1A4A1Q1/Q2/Q3/Q4/Q5, is a differential

feedback amplifier having a single-ended signal applied to one side (Q1) and a variable DC input voltage from the front panel TRIGGER LEVEL control applied to the other side (Q4). This variable DC voltage determines the amplitude level required of an incoming signal to trigger a sweep. A single-ended signal is taken from the collector of Q3 and applied, through the SLOPE switch, to the Trigger Generator Polarity Amplifier.

4-74. HORIZONTAL AMPLIFIER. Output from the collector of Q3 is also applied through the SWEEP/EXT HORIZ switch to the Horizontal Amplifier, 1A4Q10/Q11. The Emitter Follower, Q10, serves an impedance converting function for the feedback amplifier. The amplified signal from the collector of Q11 is fed back to Q10 and also applied to the Horizontal Output Amplifier.

4-75. Position, centering and magnification of the horizontal deflection signals are controlled at this point. Position and position-centering of the horizontal display on the CRT viewing area are controlled by using 1A4A1R36 and 1A4R4 to regulate the amount of current applied to the horizontal amplifier from Emitter Follower 1A4A2Q1. In the MAG position of the SWEEP/EXT HORIZ switch, the current drawn from Q1 is increased by a factor of 10. This increases the POSITION gain of the Horizontal Amplifier by a factor of 10. Position centering is supplied by R34A.

4-76. TRIGGER GENERATOR CIRCUIT.

4-77. POLARITY AMPLIFIER. The Polarity Amplifier is identified as 1A4A1Q6/Q7. The signal from the Horizontal Preamplifier output is applied through the SLOPE switch. The SLOPE switch permits pre-selection of negative slope or positive slope display of the horizontal signal. With the SLOPE switch in the negative position, the signal is applied to the base of Q6. The non-inverting action of Q6 provides the desired display. With the SLOPE switch in the positive position, the signal is applied to the base of Q7 where it is inverted to provide the desired positive-going display.

4-78. TRIGGER AMPLIFIER. The output from the Polarity Amplifier is further amplified by Q8. As the collector of Q8 rises, more current flows through the tunnel diode, CR4, until it switches to its high voltage state. This shapes the amplified trigger signal into a fast risetime 450 mV positive step, used to switch Q9.

4-79. When the TRIGGER LEVEL control is in AUTO detent, 1A4C2/C3 are connected in series with the Polarity Amplifier inputs, to remove the low DC input impedance of the Amplifier. 1A4A1Q6 is biased by R15/R16 and Q7 is biased by R14 and the AUTO feedback voltage through R18. AUTO feedback is generated by applying Trigger Amplifier output voltage through R31 to C15. As C15 charges and discharges, sufficient current is drawn by Q8 to cause the tunnel diode, CR4, to fire at a rate determined by time-constant R31/C15. This firing rate of 40 Hz presents a baseline in the absence of a trigger signal. (Faster sweep speeds require an increase in INTENSITY level.) AUTO feedback voltage holds Q7 near its most sensitive region. The voltage level at which overriding trigger signals initiate the sweep is not selectable in this position, due to the AC coupling of 1A4C2/C3, and therefore the sweep triggers at its average value.

4-80. SWEEP GENERATOR CIRCUIT.

4-81. MODE. This front panel control provides selection of three types of sweep operation: NORM allows normally triggered sweeps, SINGLE allows one sweep cycle through the armed circuit, and FREE RUN allows continuous, non-synchronous sweep at a rate selected by the Time/Division switch. NORM operation is extensively discussed in the following paragraphs. SINGLE and FREE RUN are discussed in more detail in later paragraphs.

4-82. TRIGGER SCHMITT. The Trigger Schmitt is identified as 1A4A1Q12/Q13 on the Sweep Generator schematic. With the MODE switch in NORM, the pulse from the Trigger Generator is differentiated and applied to the input of the Trigger Schmitt, Q12/Q13. This is a complementary Schmitt Trigger in which both transistors operate in the same state.

4-83. Consider the Sweep Generator in the reset state: a sweep is completed; Q12/Q13 are both turned off; the Control Schmitt, Q20/Q21, has armed the Trigger Schmitt; the circuit is ready to accept an incoming trigger signal.

4-84. A negative trigger signal is applied by the Trigger Generator. The Trigger Schmitt, Q12/Q13, turns on and a negative-going pulse is applied to Emitter Follower Q14. The output from Q14 takes three paths:

a. An ALT sweep signal is applied to the Multivibrator.

b. An unblanking signal is applied to the Gate Amplifier.

c. A signal is applied to the Ramp Control.

4-85. RAMP CONTROL. The Ramp Control consists of Q15, an emitter controlled switch and Q23, part of the control circuit. Q23 biases Q15 in an off condition, CR9/CR10/CR11 are reverse-biased, enabling the Integrator to initiate a sweep.

4-86. INTEGRATOR. Figure 4-12, Integrator block diagram, shows the electrical equivalent of the Integrator and Time/Division switch portions of the Sweep Generator schematic. In order for a linear ramp to be generated, the Integrator input must draw little or no current. This is accomplished by the use of Source Follower, Q16. The

current through R_t (R12 through R18) is offset by the current through C_t (C5 and C6). The R_t current is almost constant because the voltage at both ends of R_t is almost constant. The gate voltage of Q16 is controlled at a near constant value by the negative feedback through C_t. Since the R_t current is constant, the current through C_t must also be constant.

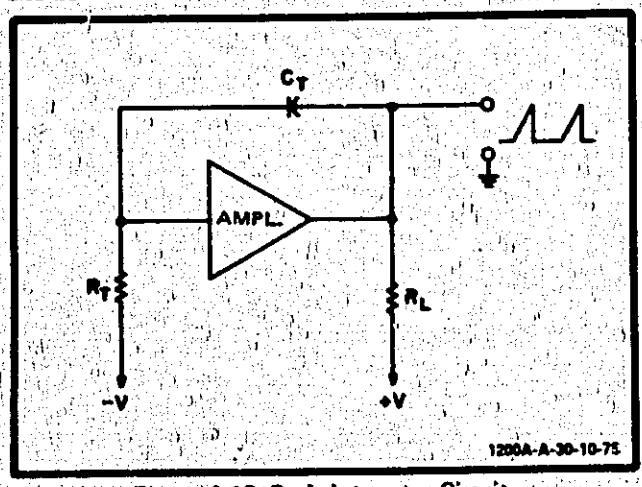


Figure 4-12. Basic Integrator Circuit.

4-87. Because a constant current through a capacitor develops a linear ramp across the capacitor, and because Q16 gate voltage is near constant, the Integrator output voltage must, therefore, approach a linear ramp. Rate of change of this ramp can be varied by changing R_t and/or C_t.

4-88. In sum, then, Source Follower Q16 provides the high impedance necessary for the Integrator; Q17 provides the required high gain; and Q18 provides the low impedance output to supply current needed by R_t and C_t.

4-89. CONTROL SCHMITT AND HOLD OFF. The Control Schmitt (Q20/Q21) turns off at a predetermined positive portion of the ramp signal and is held off by the Hold-Off circuit. The Trigger Schmitt is disabled while the Control Schmitt is turned off and its output goes more positive. This forward-biases CR9/CR10/CR11. This action stops the ramp signal and discharges the timing capacitors on the Sweep Time switch. At this point Q23: turns on and charges the Hold Off capacitor; turns on the Control Schmitt; enables the Trigger Schmitt; and returns the Sweep Generator to a condition ready to accept the next incoming trigger signal.

4-90. SINGLE SWEEP MODE. With the MODE switch in this position, operation of the Sweep Generator is basically the same. However, after the sweep feedback signal turns the Control Schmitt off, R83 and R84 keep the Control Schmitt off and the Hold-Off circuit cannot turn the Control Schmitt on again. Because of this action, the Trigger Schmitt cannot arm and subsequent triggers cannot initiate a sweep. Pressing the RESET pushbutton initiates an Arming Delay cycle by applying a more positive voltage to the base of Q25 and charging C31. When the pushbutton is released, C31 discharges, draws the junction of R83/R84 in a negative direction, and allows the Control Schmitt to turn on. The RESET indicator lamp lights during the time the Control Schmitt is in the on condition. At the completion of the arming delay period, the Trigger Schmitt is armed and the first trigger signal that arrives initiates a single sweep cycle.

4-91. FREE-RUN. When FREE-RUN operation is selected, a negative voltage is applied to the input circuit of the Sweep Generator. This turns the Trigger Schmitt on and initiates a sweep cycle. When the cycle completes, the Trigger Schmitt is still turned on by the negative voltage at the input, and another sweep cycle is initiated. In this mode, the sweep runs free and does not require any input trigger signals.

4-92. PULSE BOARD CIRCUITS: STD AND FAST MODE

4-93. Storage Pulse circuits are designed to provide outputs to CRT elements which, in turn, control display characteristics required by the various modes of operation. Refer to the waveforms adjacent to the Pulse Board schematic in Section VIII to visualize the operational changes which take place in each mode.

4-94. PULSE TIMER. Setting the front panel PERSISTENCE control, 1R11, determines the amount of current available from the Pulse Timer current source, 1A8Q3. C4 charges to a potential which turns Q4 on. C4 discharges through Q4, Q4 turns off, and C4 again begins to build a ramp voltage. The recurrence frequency of this action is speeded or retarded by changing the setting of the front panel PERSISTENCE control. The output of Q4 results in a pulse with a very sharp spike which is coupled through C5 to the Multivibrator. This portion of the circuitry is active in all modes of operation.

4-95. MULTIVIBRATOR. The Multivibrator, Q5/Q6, operating in a monostable condition, receives the pulses from the Pulse Timer, and applies a negative-going pulse (approximately 10 usec wide) to the base of the Output Pulser, Q7.

4-96. OUTPUT PULSER. The negative-going pulse from the Multivibrator turns on the Output Pulser, Q7, and the output of Q7 becomes an amplified positive-going pulse. The amount of amplification is controlled by the setting of the Fast Write Depth Adjustment, R21, or the Standard Write Depth adjustment, R22, depending on whether FAST or STANDARD mode is being used. These positive-going pulses are then passed on to the CRT Storage Mesh Backing Electrode. In STANDARD or FAST modes of operation, all the other circuits of the Pulse Board are in a quiescent condition until an ERASE cycle is initiated.

4-97. ERASE TIMING AND ERASE PULSE SHAPER. The Erase Timer and Erase Pulse shaper circuits are in a quiescent state during operation in either STD or FAST write modes. Erase Timer, Q9 is on, Q8 is turned off, and CR5 in the Erase Pulse Shaping circuit is back-biased. This effectively disconnects the Pulse Shaping circuit from the junction of CR4 and CR6.

4-98. At the instant the ERASE pushbutton is depressed, the following actions take place simultaneously:

a. A +158 volt potential is connected by the pushbutton switch to the Erase Timing circuit at R35. CR9 is forward-biased and C9 charges to approximately 5 volts.

b. CR10 is forward-biased and saturates Q10 in the Sweep and Blanking Control. This turns Q11 off, forward-biasing CR14 and, by changing the DC potential, causes the Sweep Control Schmitt to change states. This terminates and resets the sweep.

c. CR15 becomes forward-biased, applies a positive voltage to the Gate Amplifier, and blanks the CRT write gun.

d. +158 volts is also applied to the junction of R32 and CR8 in the Output Pulser circuit, and brings the Storage Mesh Backing Electrode and the Collector Mesh to the same potential. Also from this point, a reverse-bias is applied to CR6 and Q8 is turned on. When Q8 is turned on, C7 discharges through Q8 and forward-biases CR5. The forward-bias on CR5 places approximately −12.5 volts at the junction of CR4/CR5/CR6. This voltage reverse-biases CR4, turning it off and holding CR6 off.

e. The circuits remain in this state as long as the ERASE pushbutton is depressed.

4-99. When the ERASE pushbutton is released, the following circuit actions occur simultaneously:

a. The +158 volt potential is removed from R35, a negative step is coupled through C9 turning Q9 off, and C9 begins to discharge through R37/R38. The collector of Q9 is clamped at approximately +50 volts by CR20. Q9 remains off during the discharge time of C9 (approximately 1 second). Q9 then resumes its normal on state.

b. With the +158 volts removed from the junction of R32/CR8, the Storage Mesh Backing Electrode goes in the direction of −50 volts through R31/R32/R33/R35/R36. However, with the high positive potential removed, CR6 is forward-biased and turns on, effectively clamping the Storage Mesh Backing Electrode at approximately −12.5 volts. Q8 is now turned off and C7 begins to charge toward a voltage determined by R27/R28. As C7 charges, CR5 becomes reverse-biased and turns off, effectively disconnecting the Erase Pulse Shaper from the Output Pulser circuit.

c. The increase of positive potential at the collector of Q9 is coupled to the base of Q13 in the Collimator Control. The output of Q13 is increased and results in over-collimation which ensures thorough erasure of the storage surface.

d. The increased positive potential at the collector of Q9 also reverse-biases CR11 and turns it off. The anode of CR11 is then at a small positive potential which is applied to the base of, and saturates, Q5. With Q5 saturated, pulses from the Pulse Timer cannot cause the Multivibrator to change states. In this condition, no pulses are applied to the Output Pulser.

e. C9 discharges in about 1 second and Q9 turns on, Q5 is no longer saturated and delivers pulses to the Output Pulser.

f. The Collimator Control, Q13, returns to its quiescent condition after C9 has discharged and Q9 turns on.

g. Q10 in the Sweep and Blanking Control comes out of saturation, but Q11 is held in the off state during the discharge time of C10/F47, approximately 40 msec. When C10 is discharged, Q11 turns on and the Sweep and Blanking Control returns to its quiescent state.

4-100. At this point, all circuits in the Pulse Board have returned to the condition they were in prior to depressing the ERASE pushbutton, and pulses from the Pulse Timer may again be applied to the Storage Mesh Backing Electrode.

4-101. PULSE BOARD CIRCUITS: STORE MODE.

4-102. FLOOD GUN GRID CONTROL. A +12.6 volt potential is applied by the STORE pushbutton to the junction of R4/R5 of the Flood Gun Grid Control. This positive-going voltage is applied to the collector of Q2. When a negative-going pulse from Q5 collector is applied to the base of Q2, Q2 turns off while C1 charges through Q1 and R5. This charging action continues during the 10 usec pulse width of the pulse from Q5. When the negative-going pulse from Q5 is removed, Q2 turns on and a negative-going step is coupled to the base of Q1 through C1 and turns Q1 off. This action results in a positive pulse on the collector of Q1 which has a duration of approximately 30 usec. This pulse is applied to the Flood Gun Accelerator and turns the Flood Gun on for the duration time of the pulse.

4-103. The recurrence of these positive pulses at the collector of Q1 is now determined by the setting of the STORAGE TIME control, 1R12, which replaces the PERSISTENCE control when the STORE pushbutton is depressed.

4-104. The +12.6 volt potential is also applied as a saturation voltage at the base of Q7 to prevent any Pulse Timer pulses being passed on to the Storage Mesh Backing Electrode.

4-105. A slight amount of secondary grid emission from the write gun is possible even when the CRT is blanked. If large deflecting voltages are applied to the CRT vertical deflection plates, the emitted secondary grid electrons are deflected away from the target area. In the store mode, or during the erase cycle, deflection assembly 1A11 provides the necessary voltages to vertical output amplifiers 1A3Q5/1A3Q6 to deflect the write gun beam off screen and prevent the electrons emitted by secondary grid emission from writing on the center of the CRT target area.

4-106. PULSE BOARD CIRCUITS: CONVENTIONAL MODE.

4-107. When the CONV pushbutton is depressed, a +158 volt potential is removed from the Pulse Board at R24, and the voltage divider R25/R31/R32/R33/R35/R36 brings the Storage Mesh Backing Electrode to approximately −30 volts. CR4 is reverse-biased preventing Output Pulser signals from passing through. This action, in effect, produces conventional oscilloscope operation by disabling the variable persistence actions.

SECTION V

PERFORMANCE CHECK AND ADJUSTMENTS

5-1. INTRODUCTION.

5-2. This section provides the performance checks (Paragraph 5-5) and the adjustment procedures (Paragraph 5-9) for Model 1201A/B. Troubleshooting information, Schematic diagrams, and component location photographs are contained in Section VIII.

5-3. TEST EQUIPMENT.

5-4. Test equipment required to maintain and check the performance of Model 1201A/B is listed in Table 5-1. Test equipment having characteristics equal to those listed in the table may be used for the performance checks and adjustments if necessary.

5-5. PERFORMANCE CHECK.

5-6. This performance check verifies whether or not the Model 1201A/B is operating within the specifications given in Table 1-1. This check may be used as an incoming quality control inspection, as a periodic operational check, or after repairs and/or adjustments have been made. Use recently calibrated test equipment when performing this check.

5-7. Performance Check Records are included in this manual. As the initial performance check is accomplished, enter actual readings on these forms at the rear of this section.

Table 5-1. Recommended Test Equipment.

Recommended Instrument		Required Characteristics	Used For:
Type	Model		
DC Standard	HP Model 740B	0.5 mV to 100 V dc ±0.2% accuracy	Adjustment Procedure Performance Check
Oscillator	HP Model 200 CD	50 Hz to 500 kHz; up to 8.0 Volt peak-to-peak at 500 kHz; 20 Volt peak-to-peak at 10 kHz	Adjustment Procedure Performance Check
Time Mark Generator	Customer's Choice	Markers from 1 usec to 5 sec	Adjustment Procedure Performance Check
Digital Voltmeter	HP Model 3465A	±50 Volt; ±0.05% accuracy -165 Volt; ±0.05% accuracy	Adjustment Procedure
100:1 Divider Probe	HP Model 11044A	−3000 Vdc	Adjustment Procedure
AC Voltmeter	HP Model 427A	10 V; 2% accurate 50 kHz to 500 kHz	Performance Check
LCR Meter	HP 4332A	45 pF ±3%	Adjustment Procedure
Square Wave Generator	HP Model 211B	4.5 Volt peak-to-peak at 1 kHz risetime ≅ 0.5 usec	Adjustment Procedure Performance Check
Frequency Compensated Divider Probe	HP Model 10001A	10:1; DC to 30 mHz; 10 megohms; 10 pF; 2%; 600 Volts; risetime ≅ 5 nsec	Adjustment Procedure
Test Oscilloscope	HP Model 1200A	100 mV; 100 kHz	Adjustment Procedure

Remove the completed forms from the manual and file in a safe place. Compare readings taken at a later date with the original readings for evaluation of equipment performance.

5-8. The Performance Check is contained in Table 5-3. Before performing each Procedure step, be sure the corresponding control settings have been made. Note corresponding result shown before proceding to the next step. Do not attempt to enter Table 5-3 in mid-sequence because succeeding steps are dependent upon the control settings and results of preceding steps. Before going on to Table 5-3, perform the following preliminary checks:

a. Perform Preoperational Procedure, paragraph 3-45.

b. Allow fifteen minutes warm-up period.

c. Adjust Amplifier Balance, paragraph 3-59.

d. Rotate INTENSITY through its range. Display brightness should vary from extinguished to extremely bright. Adjust for normal viewing level. Do not bloom the display.

e. Rotate FOCUS through its range. The display should be defocused at each extreme of the range and focused at near midrange. Adjust for sharpest display.

f. Adjust POSITION controls to remove display from CRT screen. Depressing FIND BEAM pushbutton should return display to screen. Readjust POSITION controls to center display.

g. Proceed to Table 5-3 to complete the performance check.

5-9. ADJUSTMENT PROCEDURE.

5-10. Procedures for adjusting Model 1201A/B are detailed in the following paragraphs. Recommended test equipment is listed in Table 5-1. Equipment meeting the minimum required characteristics may be substituted. Adjustment location photos are on a foldout sheet at the rear of this section.

5-11. Perform the adjustment procedure in the sequence given. Do not start adjustments in mid-sequence because succeeding steps are dependent upon control settings and results of previous steps.

5-12. LOW VOLTAGE POWER SUPPLY.

5-13. Table 5-2 provides information for making checks of the Power Supply Voltages as an aid to troubleshooting. Use a Digital Voltmeter to make these checks.

Table 5-2. Power Supply Outputs

Supply	Adjustment	Limits
-50 volt	1A5R29	±0.02 volts
+50 volt	none	±1.00 volt
+12.6 volt	1A8R55A	±0.1 volt
+158 volt	none	±4 volt

5-14. HIGH VOLTAGE POWER SUPPLY.

WARNING

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

a. Monitor the -50 volt supply output (violet wire on 1A5) using the Digital Voltmeter and 100:1 Divider Probe.

b. Note voltage reading carefully (about -0.500 V).

c. Multiply reading of step b by 58.30.

d. Monitor the High Voltage output (958 wire between 1A6 and 1A7) with the Digital Voltmeter and 100:1 Divider Probe.

Note

Use of the 100:1 Divider Probe in steps a through d provides automatic correction for accuracy of the probe. Total tolerance for the -2915 volt supply is ±5 volts.

e. Adjust 1A6R17B to obtain a reading the same as calculated in step c (approximately −29.15V).

f. Disconnect the Digital Voltmeter.

5-15. FLOOD GUN COLLIMATION.

a. STD Mode

1. Set:

Presentation Selector ..... STD
PERSISTENCE ..... Full ccw
INTENSITY ..... Full ccw
Vert. Inputs ..... OFF

2. Adjust 1A8R21 and 1A8R22 to midrange; FLOOD GUN GRID adjustment 1A8R55C to midrange; WRITE GUN INTENSITY LIMIT, 1A6R11, fully cw.

3. Adjust 1A8R49B, STANDARD COLLIMATION adjust, so FLOOD GUN illumination just fills CRT viewing area.

4. Set FLOOD GUN GRID adjust, 1A8R55C fully cw; adjust 1A8R55C slowly ccw to achieve most uniform bright illumination of CRT viewing area.

b. FAST mode.

1. Set Presentation Selector to FAST position.

2. Press ERASE pushbutton, then adjust FAST COLLIMATION adjust, 1A8R49C, so flood gun electrons just fill CRT viewing area.

5-16. STANDARD WRITE DEPTH ADJUST.

a. Set:

Presentation Selector ..... STD
INTENSITY ..... Full ccw
PERSISTENCE ..... Full cw

b. Set STANDARD WRITE DEPTH adj 1A8R22 fully ccw and press ERASE pushbutton. Viewing area should glow green and hold.

c. Rotate 1A8R22 cw in small increments, pressing ERASE with each adjustment, until complete erasure of CRT viewing area is achieved.

d. Adjust 1A8R22 approximately 10 degrees further cw.

5-17. FAST WRITE DEPTH ADJUSTMENT.

a. Set:

Presentation Selector ..... FAST
INTENSITY ..... Full ccw
PERSISTENCE ..... Full cw

b. Erase CRT, adjust 1A8R21, FAST WRITE DEPTH adj, until a uniform prefogged background appears on CRT viewing area.

c. Adjust 1A8R49C, FAST COLLIMATION ADJ, for most uniform background illumination.

5-18. GATE ADJUSTMENT.

a. Set:

SWEEP/EXT HORIZ X1
Sweep MODE ..... SINGLE
INTENSITY ..... Full cw

b. Measure gate output at junction of 1A6R4/C10, using Digital Voltmeter.

c. Adjust 1A8R55B, GATE AMPLIFIER ADJUST, until DC level of gate output is +10 to +11 volts.

5-19. WRITE GUN INTENSITY LIMIT ADJUST.

a. Set:

SWEEP/EXT HORIZ X1
Presentation Selector ..... STD
PERSISTENCE ..... Full ccw
INTENSITY ..... Full cw
INPUTS ..... OFF
Sweep MODE ..... FREE RUN

b. Adjust WRITE GUN INTENSITY LIMIT, 1A6R11, ccw until a faint trace appears on CRT viewing area.

c. Focus display and position start of sweep near center screen.

CAUTION

Do not bloom display or leave it on CRT longer than necessary.

d. Set:

Presentation Selector ..... FAST
Sweep MODE ..... SINGLE
PERSISTENCE ..... Fully cw

e. Press and release ERASE pushbutton while adjusting 1A6R11, WRITE GUN INTENSITY LIMIT ADJ., ccw until bright spot at start of sweep just appears.

f. Adjust 1A6R11 cw to point where pressing and releasing ERASE pushbutton causes bright spot at start of sweep to just disappear.

Note

A slight spot may appear while ERASE pushbutton is being pressed and released, but no residual spot should exist after ERASE is completed and no spot should appear for 15 seconds after erasure.

5-20. STANDARD WRITING SPEED AND STORAGE TIME.

a. Set:

INTENSITY ..... Full ccw
SWEEP/EXT HORIZ X1
Presentation Selector ..... STD
Time/Division ..... 10 MSEC/DIV
STORE TIME ..... Full ccw
VOLTS/DIV ..... 50 MV/DIV
Sweep MODE ..... NORM
PERSISTENCE ..... Full ccw
DISPLAY ..... A
CHANNEL A INPUT ..... ON

b. Connect 80 Hz signal output of oscillator to Channel A + INPUT and adjust for 8 divisions of vertical deflection.

c. Set VOLTS/DIV to 5 MV/DIV; Sweep MODE to SINGLE; PERSISTENCE to full cw; INTENSITY to full cw; press ERASE pushbutton to erase CRT.

d. Press SWEEP RESET to write display.

e. Observe usable trace to remain on CRT for at least 60 seconds.

5-21. FAST WRITING SPEED AND STORAGE TIME.

a. Set:

INTENSITY	Full ccw
Presentation Selector	FAST
Time/Division	0.5 MSEC/DIV
VOLTS/DIV	50 MV/DIV
PERSISTENCE	Full ccw

b. ERASE CRT; Set Sweep MODE to NORM; INTENSITY to viewable level.

c. Adjust oscillator for 2 kHz signal and 8 divisions of vertical deflection.

d. Set Sweep MODE to SINGLE; INTENSITY full cw; PERSISTENCE fully cw; VOLTS/DIV to 5 MV/DIV.

e. Press sweep RESET to write display.

f. Observe usable trace to remain on CRT for at least 15 seconds.

5-22. Use these control settings when making the Adjustments in the following paragraphs:

Presentation Selector	STD
PERSISTENCE	Full ccw
INTENSITY	minimum required to make test

5-23. ASTIGMATISM.

a. Set:

DISPLAY	A
VOLTS/DIV	20 V/DIV
SWEEP/EXT HORIZ	EXT HORIZ
EXT HORIZ	1 V/DIV

b. Center low intensity spot on CRT with POSITION controls.

c. Rotate FOCUS control fully ccw and adjust 1A6R17A, ASTIGMATISM ADJ, for largest, roundest spot possible.

d. Adjust FOCUS control for sharp, clear spot. Spot should remain round when in focus.

5-24. HORIZONTAL DEFLECTION FACTOR.

a. Set SWEEP/EXT HORIZ to 0.1 V/DIV and COUPLING to DC.

b. Connect dc standard to TRIG and HORIZ INPUT and set dc standard for 0 volt.

c. Adjust INTENSITY, FOCUS, and Vertical and Horizontal POSITION controls to place dot on left-hand vertical graticule line.

d. Set dc standard for 1 volt dc output.

e. Adjust 1A3R4D to place dot on right-hand vertical graticule line.

f. Repeat steps b through e until 1-volt input causes 10-division deflection.

g. Disconnect DC Standard.

5-25. HORIZONTAL VERNIER BALANCE.

a. Center spot with Horizontal POSITION control.

b. Rotate Horizontal Vernier control full ccw and note position of spot.

c. Return Horizontal Vernier to CAL detent and, with Horizontal POSITION control, move spot to opposite side of center an amount equal to amount noted in step b.

d. Adjust 1A4A1R10A to return spot to center.

e. Repeat steps b through d until there is no change in spot location.

5-26. HORIZONTAL ATTENUATOR COMPENSATION.

a. Set SWEEP/EXT HORIZ to 0.1 V/DIV.

b. Connect 1 kHz output from Square Wave Generator to TRIG & HORIZ INPUT jack.

c. Adjust Generator output for 9 divisions horizontal deflection (2 dots 9 divisions apart.)

d. Adjust 1A4C1 to eliminate any tails on the dots (these tails are caused by preshoot or corner-rounding on the square wave flat-top).

e. Disconnect the Square Wave Generator.

5-27. AUTO TRIGGER.

a. Set:

TRIGGER LEVEL	AUTO
SWEEP/EXT HORIZ	X1
Time/Division	5 MSEC/DIV
COUPLING	AC
SOURCE	INT
Sweep MODE	NORM
HORIZ VERNIER	CAL

b. Connect oscilloscope CAL 1 Volt output to Channel A + INPUT.

c. Center 1A4A1R21.

d. Adjust 1A4A1R34B cw until sweep free-runs. Rotate it ccw until sweep stops. Center between these two points.

e. Set Volts/Division to 20 V/DIV.

f. Adjust 1A4A1R21 to obtain triggering on both + and – positions of the SLOPE switch.

g. Disconnect CAL 1 VOLT from Channel A INPUT.

5-28. HORIZONTAL POSITION CENTERING.

a. Set Vertical Volts/Division to 1 V/DIV.

b. Adjust 1A4A1R36 so beginning and end of display are same distance from center of graticule in cw and ccw extremes of Horizontal POSITION control.

5-29. SWEEP LENGTH.

a. Select + SLOPE and set Time/Division to 1 MSEC/DIV.

b. Adjust INTENSITY to a viewable level.

c. Switch channel A and B INPUTS to OFF.

d. Adjust 1A8R49A for a sweep length of 10 divisions.

e. Using HORIZONTAL POSITION control, place end of sweep on 9th division.

f. Increase sweep length to 10th division.

5-30. MAGNIFIER CENTERING.

a. Set: Time/Division to 0.1 MSEC/DIV; Horizontal POSITION control to position beginning of sweep at center of graticule.

b. Set SWEEP/EXT HORIZ to MAG.

c. Adjust 1A4A1R34A to position beginning of sweep within 1 division of center of graticule.

d. Change SWEEP/EXT HORIZ to X1.

e. Connect Square Wave Generator 1 kHz output to Channel A + INPUT.

f. Adjust Horizontal POSITION control to place negative-going edge of square wave on center graticule line.

g. Set SWEEP/EXT HORIZ to MAG.

h. Adjust 1A4A1R34A to place negative-going portion of square wave on center graticule line.

i. Repeat steps d through g until there is no change.

5-31. SWEEP TIME CALIBRATION.

a. Set:

DISPLAY ..... A
+ COUPLING ..... AC
– COUPLING ..... OFF
SOURCE ..... INT
MODE ..... NORM
COUPLING ..... AC
SLOPE ..... (+)

b. Connect Time Mark Generator to Channel A + INPUT and set for 5 usec time marks.

c. Set Time/Division to 5 USEC/DIV (Vernier in CAL). Adjust TRIGGER LEVEL control for stable display.

d. Adjust Horizontal POSITION control to place first time mark on left edge graticule line.

e. Adjust 1A4A1R10B to obtain one time mark/division.

f. Set Time/Division to 0.5 MSEC/DIV and change to 0.5 msec time marks. Adjust TRIGGER LEVEL control for stable display.

g. Adjust 1A4A1R10C to obtain one time mark/division.

h. Set Time/Division to 50 MSEC/DIV and 50 msec time marks.

i. Adjust 1A4A1R10D to obtain one time mark/division.

j. Disconnect Time Mark Generator.

5-32. VERTICAL VERNIER.

a. Obtain free-running display with no vertical input and both COUPLING switches OFF.

b. Set display to mid-screen reference with Volts/Division VERNIER in CAL detent.

c. Rotate VERNIER out of CAL detent, check for display shift through its range.

d. Adjust 1A1A1R19 until no display shift occurs with rotation of Volts/Division VERNIER. Return VERNIER to CAL detent.

e. Perform amplifier balance procedure in paragraph 3-59.

f. Set DISPLAY to B.

g. Repeat steps a through e for Channel B, adjusting 1A2A1R19 in step d.

5-33. OUTPUT AMPLIFIER GAIN.

a. Set:

DISPLAY ..... A
Volts/Division (both) ..... 1 V/DIV
+COUPLING (both) ..... DC

–COUPLING (both) ..... OFF
Time/Division ..... 1 MSEC/DIV
SLOPE ..... +
TRIGGER LEVEL ..... AUTO
COUPLING ..... DC
SOURCE ..... INT
MODE ..... NORM

b. Connect 5 volt output from DC Standard to Channel A +INPUT.

c. Adjust 1A3R4A for 5 divisions vertical deflection.

d. Change DISPLAY to A vs B.

e. Connect 5-volt output from DC Standard to Channel B +INPUT.

f. Adjust 1A3R4B for 5 divisions horizontal deflection.

g. Set DISPLAY to B.

h. Adjust 1A3R4C for 5 divisions vertical deflection.

i. Disconnect DC Standard.

5-34. INPUT CAPACITANCE AND ATTENUATOR COMPENSATION.

a. Set:

Volts/Division ..... 0.2 V/DIV
+COUPLING ..... DC
–COUPLING ..... OFF
Time/Division ..... 0.2 MSEC/DIV

b. Connect LCR Meter between Channel A +INPUT and GROUND terminals.

c. Adjust 1A1A1C14 for 45 pF reading on LCR Meter.

d. Disconnect LCR Meter.

e. Set Volts/Division to 0.5 V/DIV.

f. Connect 1 kHz signal from Square Wave Generator to Channel A +INPUT.

g. Adjust amplitude of Square Wave Generator for 6 divisions vertical deflection.

h. Adjust 1A1A2C5 for best square wave response.

i. Disconnect Square Wave Generator.

j. Connect LCR Meter between Channel A +INPUT and GROUND terminals.

k. Adjust 1A1A2C4 for 45 pF reading on LCR Meter.

m. Set Volts/Division to 0.2 V/DIV, –COUPLING to DC, and +COUPLING to OFF.

n. Connect LCR Meter between Channel A –INPUT and GROUND terminals.

p. Adjust 1A1A2C2 for 45 pF reading on LCR Meter. Disconnect LCR Meter.

q. Set Volts/Division to 0.5 V/DIV.

r. Connect 1 kHz signal from Square Wave Generator to Channel A –INPUT.

s. Adjust Square Wave Generator amplitude for 6 division vertical display.

t. Adjust 1A1A2C2 for best square wave response.

u. Disconnect Square Wave Generator.

v. Connect LCR Meter between Channel A –INPUT and GROUND terminals.

w. Adjust 1A1A2C1 for 45 pF reading on LCR Meter. Disconnect LCR Meter.

x. Repeat steps a through w for Channel B, adjusting 1A2A1C14 in step c, 1A2A2C5 in step h, 1A2A2C4 in step k, 1A2A1C2 in step p, 1A2A2C2 in step t, and 1A2A2C1 in step w.

5-35. CMRR BALANCE.

Note

CMRR must be adjusted with the instrument covers installed.

a. Short Channel A + and –INPUT jacks together.

b. Connect a 20 volt peak-to-peak, 100 Hz signal from the Oscillator to the Channel A + and –INPUT jacks and GROUND terminals.

c. Set Volts/Division switch to 0.1 MV/DIV, COUPLING to DC, DISPLAY to A, and obtain free-running trace.

d. Adjust 1A1A1C16 for minimum vertical deflection (2 divisions or less).

e. Adjust Oscillator output to 20 volts peak-to-peak at 10 kHz.

f. Adjust 1A1A1C17 for minimum vertical deflection (2 divisions or less).

g. Repeat steps a through f for Channel B, adjusting 1A2A1C16 in step d, and 1A2A1C17 in step f.

Table 5–3. Performance Check

STORAGE OPERATION			
STEP	CONTROL SETTINGS	PROCEDURE	RESULT
1.	PERSISTENCE AND STORAGE		
a.	PRES. SEL . . . . . STD SWEEP/EXT HORIZ . . . . . X1 SWEEP MODE . . . . . FREE RUN SWEEP SPEED . . . . . 1 MSEC/DIV INTENSITY . . . . . Full ccw SOURCE . . . . . INT PERSISTENCE . . . . . Full ccw		
b.		Depress ERASE pushbutton for 2 sec. and release	CRT glows with uniform flood of green illumination.
c.		Rotate PERSISTENCE control maximum cw.	Illumination decreases until screen is dark when PERSISTENCE is full cw.
d.		Rotate PERSISTENCE full ccw.	
e.		Obtain trace using INTENSITY and POSITION controls. (DO NOT BLOOM TRACE.)	
f.		Rotate INTENSITY cw.	Display shall intensify as INTENSITY control is rotated.
g.	PRES. SELECTOR . . . . . STD PERSISTENCE . . . . . full cw		CRT viewing area not illuminated.
h.	STORAGE TIME . . . . . Full cw INTENSITY . . . . . cw until trace appears.		
i.	INTENSITY . . . . . Full ccw		Display remains on screen.
j.	PRES. SEL. . . . . STORE STORAGE TIME . . . . . 90° ccw		Display stored at reduced intensity.
k.	STORAGE TIME . . . . . Full ccw		Display at about the same intensity as STD.
m.		Rotate INTENSITY control to full cw and return; rotate PERSISTENCE control to full ccw and return; hold ERASE pushbutton in for 2 seconds.	No change in CRT viewing area.
n.	PERSISTENCE . . . . . Full cw PRES. SELECTOR . . . . . STD		Display remains on screen.
p.		Press ERASE pushbutton for one second and release.	Display should disappear.

Table 5–3. Performance Check (Cont'd)

STEP	CONTROL SETTINGS	PROCEDURE	RESULT
STORAGE OPERATION (CONT'D)			
	PERSISTENCE AND STORAGE (Cont'd)		
q.		Rotate INTENSITY cw until display appears; return INTENSITY full ccw. Rotate PERSISTENCE control ccw.	Display should gradually disappear and CRT viewing area should have green glow.
r.	SWEEP TIME ..... 0.5 SEC/DIV PRES. SEL. ..... STD PERSISTENCE ..... Full ccw SWEEP MODE ..... AUTO INTENSITY ..... cw until trace appears.	Check "tail" on display of normal intensity.	Tail no longer than 0.5 division.
VERTICAL AMPLIFIERS			
2.	**DEFLECTION FACTOR CHECK**		
a.	VERTICAL (A & B) Vernier ..... CAL DISPLAY ..... A +Coupling ..... DC -Coupling ..... OFF HORIZONTAL Time/Division ..... 1 MSEC/DIV SLOPE ..... + TRIGGER LEVEL ..... AUTO COUPLING ..... DC SOURCE ..... INT MODE ..... NORM	Connect DC Standard (with 0-volt output) to CHANNEL A +INPUT Adjust 1201A/B base line to bottom graticule line.	
b.	Vertical Sensitivity 20 V/DIV 10 V/DIV 5 V/DIV 2 V/DIV 1 V/DIV 0.5 V/DIV 0.2 V/DIV 0.1 V/DIV 50 MV/DIV 20 MV/DIV 10 MV/DIV 5 MV/DIV 2 MV/DIV 1 MV/DIV 0.5 MV/DIV 0.2 MV/DIV 0.1 MV/DIV	DC Standard output 100 V 50 V 30 V 10 V 5 V 3 V 1 V 0.5 V 0.3 V 0.1 V 50 mV 30 mV 10 mV 5 mV 3 mV 1 mV 0.5 mV	Vertical Deflection of 5 div. ±0.15 div unless otherwise shown. 6 div. ±0.18 div. 6 div. ±0.18 div. 6 div. ±0.18 div. 6 div. ±0.18 div. 6 div. ±0.18 div.

Table 5–3. Performance Check (Cont'd)

STEP	CONTROL SETTINGS	PROCEDURE	RESULT
	VERTICAL AMPLIFIERS (CONT'D)		
	DEFLECTION FACTOR CHECK (Cont'd)		
c.	+Coupling (A) ..... OFF –Coupling (A) ..... DC Vert. Sensitivity ..... 0.5 V/DIV Vert. Sensitivity ..... 0.2 V/DIV	Connect dc signal from DC Standard to CHANNEL A –INPUT. INPUT. Output ..... 3 V Output ..... 1 V	Vertical Deflection of: 6 div. ±0.18 div. 5 div. ±0.15 div.
d.	DISPLAY ..... B +Coupling (A and B) ..... DC –Coupling (A and B) ..... OFF	Connect dc signal from DC Standard to CHANNEL B +INPUT.	
e.		Repeat step b above.	
f.	+Coupling (B) ..... OFF –Coupling (B) ..... DC	Repeat step c above for CHANNEL B –INPUT.	
3.	**BANDWIDTH**		
a.	DISPLAY ..... A +Coupling (A and B) ..... DC –Coupling (A and B) ..... OFF Vert. Sensitivity (A and B) .. 1 V/DIV	Connect 1 kHz Oscillator output to CHANNEL A +INPUT.	
b.		Adjust Oscillator output for 8 divisions display. Monitor output with AC Voltmeter and note reading.	
c.		Adjust Oscillator frequency to 500 kHz.	
d.		Set Oscillator output to same reading noted in step b.	
e.		Record amplitude of display.	Deflection at least 5.6 divisions.
f.	CHANNEL A +Coupling ..... OFF –Coupling ..... DC	Connect 1 kHz Oscillator output to CHANNEL A –INPUT.	
g.		Repeat steps b through e.	Deflection at least 5.6 divisions.
h.	Press CHANNEL A BW LIMIT switch.	Set Oscillator frequency to 50 kHz.	
j.		Repeat steps d through e.	Deflection less than 5.7 divisions.

Table 5–3. Performance Check (Cont'd)

STEP	CONTROL SETTINGS	PROCEDURE	RESULT
	VERTICAL AMPLIFIERS (CONT'D)		
	BANDWIDTH (Cont'd)		
k.	Release CHANNEL A BW LIMIT switch. DISPLAY ..... B	Connect 1 kHz Oscillator output to CHANNEL B +INPUT.	
m.		Repeat steps b through e.	Deflection at least 5.6 divisions.
n.	CHANNEL B +Coupling ..... OFF –Coupling ..... DC	Connect 1 kHz Oscillator output to CHANNEL B –INPUT.	
p.		Repeat steps b through e.	Deflection at least 5.6 divisions.
q.	CHANNEL B Press BW LIMIT switch.	Set Oscillator frequency to 50 kHz.	
r.		Repeat steps h and j.	Deflection less than 5.7 divisions.
4.	**NOISE/DISPLAY RATIO**		
a.	MODE ..... FREE RUN +Coupling (A and B) ..... OFF –Coupling (A and B) ..... OFF Vert. Sensitivity (A and B) ..... 0.1 MV/DIV BW LIMIT (B) ..... Released	Record amplitude of display (noise).	0.5 divisions or less.
b.	DISPLAY ..... A	Repeat step a.	0.5 divisions or less.
c.	DISPLAY ..... CHOP	Rotate both VERTICAL POSITION controls.	Traces move independently with no interaction.
d.	DISPLAY ..... ALT	Rotate both VERTICAL POSITION controls.	Traces move independently with no interaction.
5.	**COMMON MODE REJECTION RATIO**		
a.	DISPLAY ..... A +Coupling (A and B) ..... DC –Coupling (A and B) ..... DC Vert. Sensitivity (A and B) ..... 0.1 MV/DIV	Connect 20 volt pk-pk 100 Hz sine wave from Oscillator to CHANNEL A + and –INPUT (+ and – shorted) and ground.	Deflection of 2 divisions or less.
b.		Set Oscillator frequency to 10 kHz.	Deflection of 2 divisions or less.
c.		Remove short from VERTICAL + and –.	
d.	DISPLAY ..... B Vert. Sensitivity (A and B) 0.1MV/DIV	Connect Oscillator output to CHANNEL B + and –INPUT (+ and – shorted) and ground.	Deflection of 2 divisions or less.

Table 5–3. Performance Check (Cont'd)

STEP	CONTROL SETTINGS	PROCEDURE	RESULT
	VERTICAL AMPLIFIERS		
	COMMON MODE REJECTION RATIO (Cont'd)		
e.		Set Oscillator frequency to 100 Hz	Deflection of 2 divisions or less.
f.		Remove short from + and —.	
6.	**A vs B PHASE SHIFT**		
a.	DISPLAY ..... A vs B Vert. Sensitivity (A and B) ..... 0.2 V/DIV	Connect 100 kHz sine wave from Oscillator to CHANNEL A and B +INPUT.	
b.		Adjust Oscillator output to obtain a horizontal and vertical display of 5 divisions.	Minor diameter of ellipse (if visible) shall be 0.1 division or less.
c.	Vert. Sensitivity (A and B) ..... 0.5 V/DIV	Repeat steps a and b.	Same as step b.
7.	**VERTICAL POSITION RANGE**		
a.	Vert. Sensitivity (A and B) ..... 0.1 V/DIV Time/Division ..... 1 MSEC/DIV +Coupling (A and B) ..... DC DISPLAY ..... B	Apply 100 kHz sine wave from Oscillator output to the CHANNEL B +INPUT. Adjust the Oscillator output for a vertical deflection of 8 divisions.	Display must be able to move out of graticule area at top and bottom.
b.	DISPLAY ..... A	Apply Oscillator output to CHANNEL A +INPUT.	Display must be able to move out of graticule area at top and bottom.
	HORIZONTAL AMPLIFIERS		
8.	**SWEEP TIMES**		
a.	DISPLAY ..... A +Coupling (A) ..... DC —Coupling (A) ..... OFF MODE ..... NORM Vertical Sensitivity as required for 3 to 5 divisions of vertical deflection.	Connect Time Mark Generator to CHANNEL A + INPUT.	

Table 5-3. Performance Check (Cont'd)

STEP	CONTROL SETTINGS	PROCEDURE	RESULT
	HORIZONTAL AMPLIFIERS		
	SWEEP TIMES (Cont'd)		
b.	Time/Division (Set first time mark on left edge graticule line). 5 SEC/DIV 2 SEC/DIV 1 SEC/DIV 0.5 SEC/DIV 0.2 SEC/DIV 0.1 SEC/DIV 50 MSEC/DIV 20 MSEC/DIV 10 MSEC/DIV 5 MSEC/DIV 2 MSEC/DIV 1 MSEC/DIV 0.5 MSEC/DIV 0.2 MSEC/DIV 0.1 MSEC/DIV 50 USEC/DIV 20 USEC/DIV 10 USEC/DIV 5 USEC/DIV 2 USEC/DIV 1 USEC/DIV	Set Time Mark Generator for marker period of: 5 sec. 2 sec. 1 sec. 500 msec. 200 msec. 100 msec. 50 msec. 20 msec. 10 msec. 5 msec. 2 msec. 1 msec. 500 usec. 200 usec. 100 usec. 50 usec. 20 usec. 10 usec. 5 usec. 2 usec. 1 usec.	11 time marks in 10 divisions, within ±0.3 division of right edge graticule line.
9.	**MAGNIFIER AND SWEEP TIME VERNIER**		
a.	SWEEP ..... MAG Time/Division ..... 1 MSEC/DIV	Marker period ..... 1 msec.	11 marks in 10 divisions ±0.5 division.
b.	SWEEP ..... X1 Time/Division ..... 0.5 MSEC/DIV	Marker period ..... 1 msec.	6 marks in 10 divisions ±0.5 division.
c.	Time/Division ..... 0.2 MSEC/DIV Vernier ..... full ccw	Marker period ..... 1 msec.	At least 6 marks in 10 divisions.
d.	Vert. Sensitivity ..... 0.5 V/DIV Time/Division ..... 0.1 MSEC/DIV Horiz. Vernier ..... CAL SLOPE ..... +	Apply 1 kHz output from Square Wave Generator to CHANNEL A + INPUT. Adjust Generator for 4 divisions vertical deflection. Adjust HORIZONTAL POSITION to put the negative going edge on the center graticule line.	
e.	SWEEP ..... MAG	Center of magnified sweep at approximate center of graticule.	Waveform shall remain centered ±0.5 division.

Table 5-3. Performance Check (Cont'd)

HORIZONTAL AMPLIFIERS			
STEP	CONTROL SETTINGS	PROCEDURE	RESULT
10	TRIGGERING		
a.	MODE ..... NORM TRIGGER LEVEL ..... AUTO	Remove all inputs.	A baseline shall be displayed at all settings of the Time/Division switch (display will be dim at fastest repetition rates).
b.	Time/Division ..... 5 MSEC/DIV	Connect 50 Hz Oscillator output to CHANNEL A +INPUT.	
c.	SLOPE .....+	Adjust Oscillator output to obtain 0.5 divisions deflection.	A stable display with sweep starting on positive-going portion of waveform.
d.	SLOPE ..... –		A stable display with sweep starting on negative-going portion of waveform.
e.	COUPLING ..... AC		Stable display.
f.	Time/Division ..... 1 USEC/DIV	Set Oscillator frequency to 500kHz. (To check upper limit, use a different Oscillator and set at 1 mHz.)	Instrument triggers on opposite slope from 300 to 500 kHz. Triggers correctly at 1 MHz.
g.		Repeat steps c through e.	As in steps c, d, e.
h.	SOURCE ..... EXT VOLTS/DIV ..... 50 MV/DIV	Connect Oscillator output to CHANNEL A + INPUT and to TRIG & HORIZ INPUT.	
j.		Adjust Oscillator output to obtain 4 divisions deflection (0.2 V).	Stable display with sweep starting on negative-going portion of waveform.
k.	Coupling ..... DC SLOPE .....+		Stable display with sweep starting on positive-going portion of waveform.
m.	Time/Division ..... 5 MSEC/DIV	Set Oscillator frequency to 50 Hz and adjust output for 4 divisions of deflection.	Stable display with sweep starting on positive-going portion of waveform.
n.	SLOPE ..... –		Stable display with sweep starting on negative-going portion of waveform.
p.	MODE ..... SINGLE TRIGGER LEVEL ..... mid-range SOURCE ..... INT	Adjust Oscillator output for 0.5 division deflection. Press sweep RESET button and, if necessary adjust TRIGGER LEVEL to trigger sweep.	Sweep occurs only once.
q.	MODE ..... FREE RUN		Unsynchronized normal intensity display.

Table 5-3. Performance Check (Cont'd)

HORIZONTAL AMPLIFIERS			
STEP	CONTROL SETTINGS	PROCEDURE	RESULT
11.	**DEFLECTION FACTORS**		
a.	Horiz. Sensitivity . . . . . 1 V/DIV	Connect a dc signal from DC Standard to TRIG & HORIZ INPUT.	
b.	Horizontal Sensitivity 1 V/DIV 0.5 V/DIV 0.2 V/DIV 0.1 V/DIV	DC Standard output 10 V 5 V 2 V 1 V	All settings should give 10 divisions of deflection ±0.3 division.
c.	Horiz. Vernier . . . . . ccw		Horizontal deflection less than 4 divisions.
12.	**BANDWIDTH**		
a.		Connect 1 kHz Oscillator output to TRIG & HORIZ INPUT.	
b.		Adjust Oscillator output for 10 divisions horizontal deflection. Monitor output with Voltmeter and record reading.	
c.		Set Oscillator frequency to 300 kHz.	
d.		Set Oscillator output to same reading recorded in step b.	Deflection shall be at least 7 divisions.

PERFORMANCE CHECK RECORD

Serial No. _____

REFERENCE STEP	DESCRIPTION	RESULTS		
		MIN	ACTUAL	MAX
1.	**PERSISTENCE AND STORAGE**			
b.	Depress ERASE pushbutton.	Uniform green illumination.	_____	
c.	PERSISTENCE .....Full cw	Screen dark when full cw.	_____	
f.	Rotate INTENSITY..... cw	Display intensifies as control rotates.	_____	
g.	SELECTOR .....STD PERSISTENCE .....Full cw	CRT not illuminated.	_____	
i	INTENSITY .....Full ccw	Display remains on screen.	_____	
j.	SELECTOR .....STORE STORAGE TIME.....90° ccw	Display stored at reduced intensity.		
k.	STORAGE TIME.....Full ccw	Display at same intensity as STD.	_____	
m.	INTENSITY full cw and return; PERSISTENCE full ccw and return; ERASE for two seconds.	No change in CRT viewing area.	_____	
n.	PERSISTENCE .....Full cw PRES SEL .....STD	Display remains on screen.	_____	
p.	ERASE for one second and release.	Display disappears.	_____	
q.	Rotate INTENSITY and PERSISTENCE.	Display disappears; CRT has green glow.	_____	
r.	Check "tail" on display.		_____	0.5 div.

PERFORMANCE CHECK RECORD

Serial No. _____

REFERENCE STEP	DESCRIPTION	RESULTS			
		MIN	ACTUAL		MAX
VERTICAL AMPLIFIERS					
2.	**DEFLECTION FACTORS**		A	B	
b. e.	20 V/DIV	4.85 div.	____	____	5.15 div.
	10 V/DIV	4.85 div.	____	____	5.15 div.
	5 V/DIV	5.82 div.	____	____	6.18 div.
	2 V/DIV	4.85 div.	____	____	5.15 div.
	1 V/DIV	4.85 div.	____	____	5.15 div.
	0.5 V/DIV	5.82 div.	____	____	6.18 div.
	0.2 V/DIV	4.85 div.	____	____	5.85 div.
	0.1 V/DIV	4.85 div.	____	____	5.85 div.
	50 MV/DIV	5.82 div.	____	____	6.18 div.
	20 MV/DIV	4.85 div.	____	____	5.85 div.
	10 MV/DIV	4.85 div.	____	____	5.85 div.
	5 MV/DIV	5.82 div.	____	____	6.18 div.
	2 MV/DIV	4.85 div.	____	____	5.85 div.
	1 MV/DIV	4.85 div.	____	____	5.85 div.
	0.5 MV/DIV	5.82 div.	____	____	6.18 div.
	0.2 MV/DIV	4.85 div.	____	____	5.85 div.
	0.1 MV/DIV	4.85 div.	____	____	5.85 div.
c. f.	0.5 V/DIV	5.82 div.	____	____	6.18 div.
	0.2 V/DIV	4.85 div.	____	____	5.15 div.
3.	**BANDWIDTH**				
e. m.		5.60 div.	____	____	
g. p.		5.60 div.	____	____	
j. r.			____	____	5.70 div.
4.	**NOISE/DISPLAY**				
a. b.	Coupling (A and B) . . . . . OFF		____	____	0.50 div.
c.	CHOP	Independent displays.	____	____	
d.	ALT	Independent displays.	____	____	
5.	**COMMON MODE REJECTION RATIO**				
a. e.	Coupling (A and B) . . . . . DC 20 V pk-pk, 100 Hz		____	____	2.0 div.

PERFORMANCE CHECK RECORD

Serial No. _____

REFERENCE STEP	DESCRIPTION	RESULTS		
		MIN	ACTUAL	MAX
	COMMON MODE REJECTION RATIO (CONT'D)			
b. d.	20 V pk-pk, 10 kHz		____ ____	2.0 div.
6.	**A vs B PHASE SHIFT**			
b.	0.2 V/DIV		____	0.10 div.
c.	0.5 V/DIV		____	0.10 div.
7.	**VERTICAL POSITION RANGE**			
a.	8 division display	Off screen	____	
b.	8 division display	Off screen	____	
	HORIZONTAL AMPLIFIERS			
8.	**SWEEP TIMES**			
b.	5 SEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	2 SEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	1 SEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	0.5 SEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	0.2 SEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	0.1 SEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	50 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	20 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	10 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	5 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	2 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	1 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	0.5 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	0.2 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	0.1 MSEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	50 USEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	20 USEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	10 USEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	5 USEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	2 USEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
	1 USEC/DIV	11 in 9.7 div.	____	11 in 10.3 div.
9.	**MAGNIFIER AND SWEEP TIME VERNIER**			
a.	MAG ..... 1 MSEC/DIV	11 in. 9.5 div.	____	11 in. 10.5 div.
b.	X1 .....0.5 MSEC/DIV	6 in. 9.5 div.	____	6 in. 10.5 div.

PERFORMANCE CHECK RECORD

Serial No. _____

REFERENCE STEP	DESCRIPTION	RESULTS		
		MIN	ACTUAL	MAX
	MAGNIFIER AND SWEEP TIME VERNIER (CONT'D)			
c.	Vernier ..... Full ccw	6 in. 10.0 div.	_____	
e.	Magnifier position check	Centered ±1/2 div.	_____	
10.	**TRIGGERING**			
a.	AUTO Trigger Check	Baseline with all settings of Time/Division switch.	_____	
c. g.	SLOPE .....+	Stable positive trigger.	_____	
d. g.	SLOPE ..... –	Stable negative trigger.	_____	
e. g.	Coupling ..... AC	Stable display.	_____	
j.	SOURCE ..... EXT	Stable negative trigger.	_____	
k.	SLOPE .....+	Stable positive trigger.	_____	
m.	Time/Div ..... 5 MSec/DIV	Stable, positive trigger.	_____	
n	SLOPE ..... –	Stable, negative trigger.	_____	
p.	SINGLE Sweep operation	One sweep.	_____	One sweep.
q.	FREE RUN operation.	Unsynchronized recurring sweep.	_____	
11.	**DEFLECTION FACTORS**			
b.	1 V/DIV 0.5 V/DIV 0.2 V/DIV 0.1 V/DIV	9.70 div. 9.70 div. 9.70 div. 9.70 div.	_____ _____ _____ _____	10.3 div. 10.3 div. 10.3 div. 10.3 div.
c.	Horizontal vernier .....ccw		_____	3.0 div.
12.	**BANDWIDTH**			
d.	Frequency, 300 kHz	7.0 div.	_____	

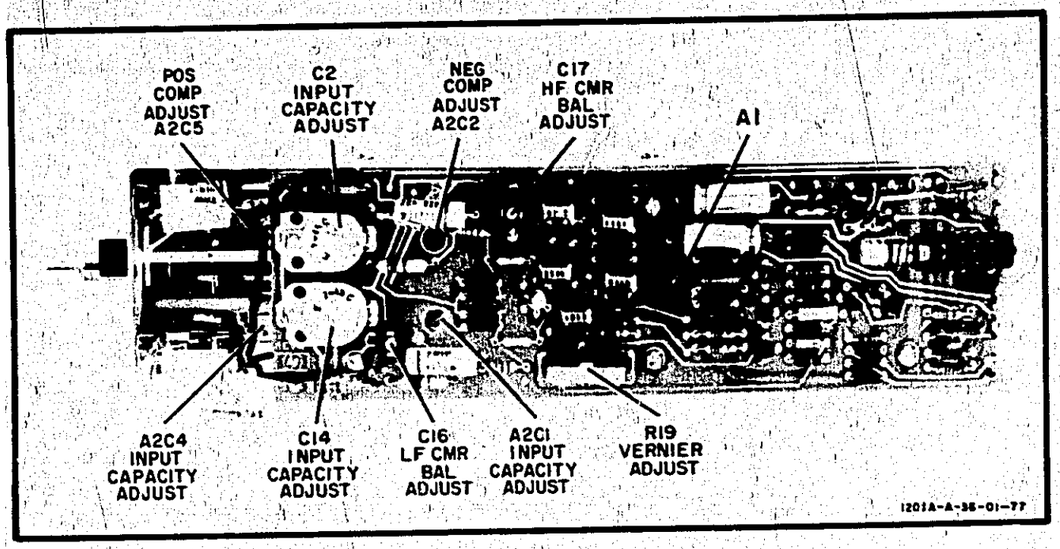


Figure 5-1. Adjustment Locations

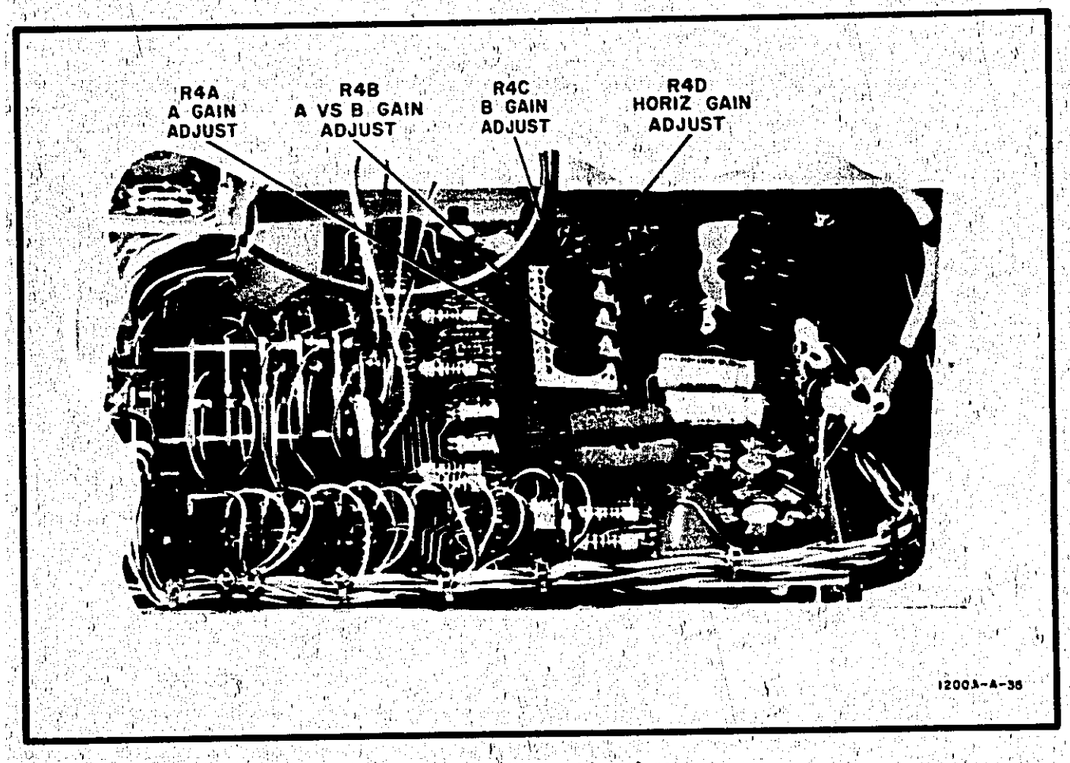


Figure 5-2. Adjustment Locations

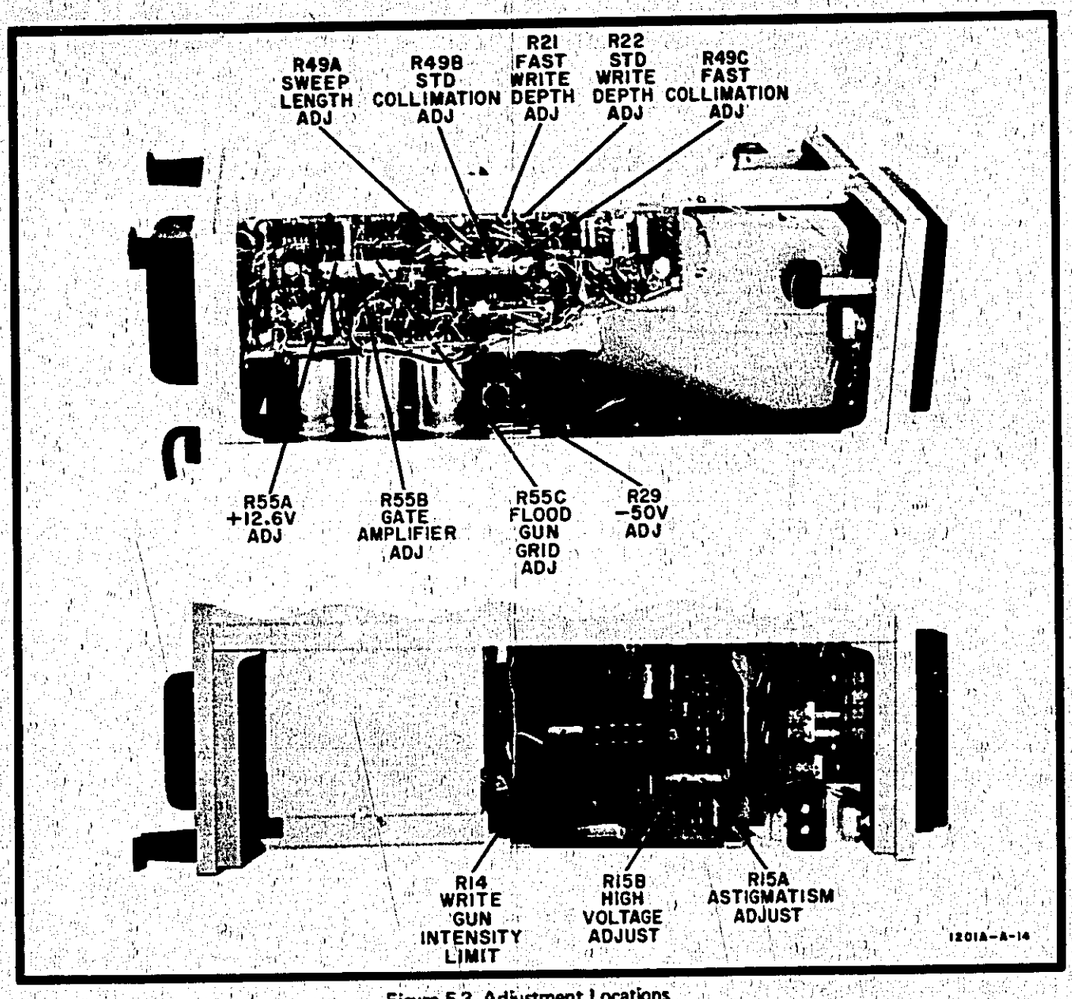


Figure 5-3. Adjustment Locations

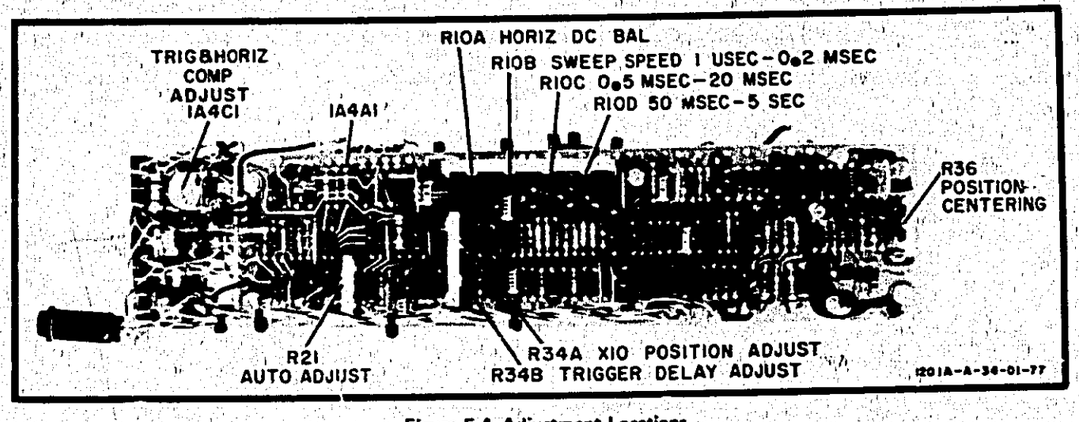


Figure 5-4. Adjustment Locations

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

6-2. This section contains information for ordering parts. Table 6-1 lists abbreviations used in the parts list and througnout the manual. Table 6-2 lists all replaceable parts in reference designator order. Table 6-3 contains the names and addresses that correspond to the manufacturer's code numbers.

6-3. ORDERING INFORMATION.

6-4. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

6-5. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

6-6. SPARE PARTS KIT.

6-7. Stocking spare parts for an instrument is often done to ensure quick return to service after a malfunction occurs. Hewlett-Packard has a Spare Parts Kit available for this purpose. The kit consists of selected replaceable assemblies and components for this instrument. The contents of the kit and the Recommended Spares list are based on failure reports and repair data, and parts support for one year. A Recommended Spares list for this instrument may be obtained on request and the Spare Parts Kit may be ordered through your nearest Hewlett-Packard office.

6-8. DIRECT MAIL ORDER SYSTEM.

6-9. Within the USA, Hewlett-Packard can supply parts through a direct mail order system. Advantages of using the system are as follows:

a. Direct ordering and shipment from the HP Parts Center in Mountain View, California.

b. No maximum or minimum on any mail order (there is a minimum order amount for parts ordered through a local HP office when the orders require billing and invoicing).

c. Prepaid transportation (there is a small handling charge for each order).

d. No invoices — to provide these advantages, a check or money order must accompany each order.

6-10. Mail order forms and specific ordering information is available through your local HP office. Addresses and phone numbers are located at the back of this manual.

Table 6-1. Reference Designators and Abbreviations

REFERENCE DESIGNATORS

A	= assembly	F	= fuse	MP	= mechanical part	U	= integrated circuit
B	= motor	FL	= filter	P	= plug	V	= vacuum tube, neon bulb, photocell, etc
BT	= battery	IC	= integrated circuit	Q	= transistor		
C	= capacitor	J	= jack	R	= resistor	VR	= voltage regulator
CP	= coupler	K	= relay	RT	= thermistor	W	= cable
CR	= diode	L	= inductor	S	= switch	X	= socket
DL	= delay line	LS	= loudspeaker	T	= transformer	Y	= crystal
DS	= device signaling (lamp)	M	= meter	TB	= terminal board	Z	= tuned cavity, network
E	= misc electronic part	MK	= microphone	TP	= test point		

ABBREVIATIONS

A	= amperes	H	= henries	N/O	= normally open	RMO	= rack mount only
AFC	= automatic frequency control	HDW	= hardware	NOM	= nominal	RMS	= root mean square
AMPL	= amplifier	HEX	= hexagonal	NPO	= negative positive zero (zero temperature coefficient)	RMV	= reverse working voltage
		HG	= mercury				
BFO	= beat frequency oscillator	HR	= hour(s)				
BE CU	= beryllium copper	HZ	= hertz	NPN	= negative-positive-negative	S-B	= slow blow
BH	= binder head					SCR	= screw
BP	= bandpass			NRFR	= not recommended for field replacement	SE	= selenium
BRS	= brass	IF	= intermediate freq			SECT	= section(s)
BWO	= backward wave oscillator	INCD	= incandescent	NSR	= not separately replaceable	SEMICON	= semiconductor
		INCL	= incandescent			SI	= silicon
CCW	= counter-clockwise	INCL	= included(s)			SIL	= silver
CER	= ceramic	INS	= insulation(ed)	OBD	= order by description	SL	= slide
CHO	= cabinet mount only	INT	= internal	OH	= over-all	SPG	= spring
COEF	= coefficient			OX	= oxide	SPL	= special
COM	= common	K	= kilo (× 1000)			SST	= stainless steel
COMP	= composition					SR	= split ring
COMPL	= complete	LH	= left hand	P	= peak	STL	= steel
CONN	= connector	LIN	= linear taper	PC	= printed circuit		
CP	= cadmium plate	LK WASH	= lock washer	PF	= picofarads = 10⁻¹² farads	TA	= tantalum
CRT	= cathode ray tube	LOG	= logarithmic taper			TD	= time delay
CW	= clockwise	LPF	= low pass filter	PH BRZ	= phosphor bronze	TGL	= toggle
				PHL	= Phillips	THD	= thread
DEPC	= deposited carbon	M	= milli = 10⁻³	PIV	= peak inverse voltage	TI	= titanium
DR	= drive	MEG	= meg = 10⁶	PNP	= positive-negative-positive	TOL	= tolerance
		MET FLM	= metal film			TRIM	= trimmer
ELECT	= electrolytic	MET OX	= metallic oxide	PVD	= part of	TWT	= traveling wave tube
ENCAP	= encapsulated	MFR	= manufacturer	POLY	= polystyrene		
EXT	= external	MHZ	= mega hertz	PORC	= porcelain	U	= micro = 10⁻⁶
		MINIAT	= miniature	POS	= position(s)		
F	= farads	MOM	= momentary	POT	= potentiometer	VAR	= variable
FH	= flat head	MOS	= metal oxide substrate	PP	= peak-to-peak	VDCW	= dc working (volts)
FIL H	= fillister head	MTG	= mounting	PT	= point		
FXD	= fixed	MY	= mylar	PWV	= peak working voltage	W	= watt(s)
						W	= watts
G	= giga (10⁹)	N	= nano (10⁻⁹)	RECT	= rectifier	WTI	= working inverse voltage
GE	= germanium	N/C	= normally closed	RF	= radio frequency		
GL	= glass	NE	= neon	RH	= round head or right hand	WW	= wirewound
GRD	= ground(ed)	NI PL	= nickel plate			W/O	= without

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1A1	01200-63506	2	MODULE ASSEMBLY, PREAMPLIFIER, 100 UV	28480	01200-63506
1A2	01200-63506		MODULE ASSEMBLY, PREAMPLIFIER, 100 UV	28480	01200-63506
1A3	01201-66506	1	BOARD ASSEMBLY, DUAL CHANNEL OUTPUT	28480	01201-66506
1A4	01200-63503	1	MODULE ASSEMBLY, SWEEP	28480	01200-63503
1A5	01200-66514	1	BOARD ASSEMBLY, LOW VOLTAGE POWER SUPPLY	28480	01200-66514
1A6	01201-66511	1	BOARD ASSEMBLY, HIGH VOLTAGE REGULATOR	28480	01201-66511
1A7	01201-66510	1	BOARD ASSEMBLY, HIGH VOLTAGE RECTIFIER	28480	01201-66510
1A8	01201-66502	1	BOARD ASSEMBLY, STORAGE PULSE	28480	01201-66502
1A9	01201-66501	1	BOARD ASSEMBLY, STORAGE SWITCH	28480	01201-66501
1A10	01201-61103	1	ASSEMBLY, HIGH VOLTAGE TRIPLER, NON REPAIRABLE	28480	01201-61103
1A12	01201-66509	1	BOARD ASSEMBLY, DEFLECTION	28480	01201-66509
1C1	0180-2157	1	CAPAD ELECT 500 UF +100-10% 50VDCW	28480	0180-2157
1DS1	1450-0566	1	LIGHT-IND MNT-TL .4-DIA SLDR-LUG-TERM	91802	2910317
1F1	2110-0059	1	FUSE 1.5A 250V SLO-BLO 1.25X.25 UL (STANDARD, 115V OPERATION)	75915	31301.5
1F1	2110-0020	1	FUSE .6A 250V SLO-BLO 1.25X.25 UL (OPTIONAL, 230V OPERATION)	71400	MDL 8/10
1H1	2190-0003	REF	WASHER-LK HLCL NO.-4 .115-IN-ID (CABINET = 6, RACK = 8)	28480	2190-0003
1H2	2190-0006	8	WASHER-LK INTL T NO.-8 .168-IN-ID	02660	820-8C
1H3	2190-0016	5	WASHER-LK INTL T NO.-3/8 .377-IN-ID	28480	2190-0016
1H4	2190-0017	REF	WASHER-LK HLCL NO.-8 .168-IN-ID (CABINET = 6, RACK = 8)	28480	2190-0017
1H5	2190-0018	12	WASHER-LK HLCL NO.-6 .141-IN-ID	28480	2190-0018
1H6	2190-0027	5	WASHER-LK INTL T NO.-1/4 .256-IN-ID	78189	1914-00
1H7	2190-0033	1	WASHER-LK INTL T NO.-5/16 .316-IN-ID	78189	1918-02
1H8	2190-0037	1	WASHER-LK INTL T NO.-1/2 .512-IN-ID	78189	1228-08
1H9	2190-0102	1	WASHER-LK INTL T NO.-7/16 .472-IN-ID	78189	1922-31
1H10	2190-0120	1	WASHER-LK INTL T NO.-5/8 .64-IN-ID	78189	1928-02
1H11	2190-0069	REF	WASHER-LK INTL T NO.-8 .118-IN-ID (CABINET = 2, RACK = 8)	73734	09402
1H12	2190-0555	2	WASHER-LK INTL T NO.-3/8 .384-IN-ID	28480	2190-0569
1H13	2190-0909	8	WASHER-LK NO.-6 .145-IN-ID .333-IN-OD	78189	6706-05-02-0531
1H14	2200-0103	8	SCREW-MACH 6-40 .25-IN-LG PAN-HD-POZI	28480	2200-0103
1H15	2200-0139	REF	SCREW-MACH 6-40 .25-IN-LG PAN-HD-POZI (CABINET = 2, RACK = 8)	28480	2200-0139
1H16	2200-0141	2	SCREW-MACH 8-40 .312-IN-LG PAN-HD-POZI	28480	2200-0141
1H17	2200-0145	1	SCREW-MACH 8-40 .838-IN-LG PAN-HD-POZI	28480	2200-0145
1H18	2200-0147	6	SCREW-MACH 8-40 .5-IN-LG PAN-HD-POZI	28480	2200-0147
1H19	2200-0155	2	SCREW-MACH 8-40 1-IN-LG PAN-HD-POZI	28480	2200-0155
1H20	2200-0179	1	SCREW-MACH 8-40 .125-IN-LG PAN-HD-POZI	28480	2200-0179
1H21	2260-0001	12	NUT-EX-DBL-CHAM 8-40-THD .098-THK	28480	2260-0001
1H22	2260-0002		NUT-HEX-DBL-CHAM 8-40-THD .062-THK	28480	2260-0005
1H23	2360-0115	REF	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI (CABINET = 15 RACK = 8 EA)	28480	2360-0115
1H24	2360-0121	2	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI	28480	2360-0121
1H25	2360-0195	4	SCREW-MACH 6-32 .312-IN-LG PAN-HD-POZI	28480	2360-0195
1H26	2360-0197		SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI (PANEL)	28480	2360-0197
1H27	2360-0201	REF	SCREW-MACH 6-32 .5-IN-LG PAN-HD-POZI (CABINET = 1, RACK = 8)	28480	2360-0201
1H28	2360-0236	1	SCREW-MACH 8-32 .312-IN-LG PAN-HD-POZI	28480	2360-0236
1H29	2420-0003	1	NUT-HEX-DBL-CHAM 6-32-THD .094-THK	28480	2420-0004
1H30	2510-0137	2	SCREW-MACH 8-32 2.375-IN-LG PAN-HD-POZI (CABINET ONLY)	28480	2510-0137
1H31	2510-0107	8	SCREW-MACH 8-32 .5-IN-LG PAN-HD-POZI (RACK ONLY)	28480	2510-0107
1H32	2510-0138	REF	SCREW-MACH 8-32 3-IN-LG PAN-HD-POZI (CABINET = 2, RACK = 8)	28480	2510-0138
1H33	2580-0004	REF	NUT-EX-DBL-CHAM 8-32-THD .125-THK (CABINET = 2, RACK = 8)	28480	2580-0004
1H34	2630-0003	2	SCREW-MACH 8-32 .5-IN-LG BDG MOC-HD-PHL (CABINET ONLY)	28480	2630-0003
1H35	2360-0002	4	SCREW-MACH 6-32 .375-IN-LG RD-HD-SLT (RACK ONLY)	28476	2360-0002
1H36	2950-0001	4	NUT-HEX-DBL-CHAM 3/8-32-THD .094-THK	28480	2950-0030
1H37	2950-0006	5	NUT-HEX-DBL-CHAM 1/4-32-THD .094-THK	73734	9000
1H38	2950-0034	1	NUT-HEX-DBL-CHAM 3/8-32-THD .81-THK	28480	2950-0014
1H39	2950-0035	2	NUT-HEX-DBL-CHAM 15/32-32-THD .078-THK	28480	2950-0039
1H40	2950-0038	1	NUT-SPCLY 1/2-28-THD .125-THK .698-A/F	75915	903-12
1H41	2950-0043	1	NUT-HEX-DBL-CHAM 3/8-32-THD .094-THK	73743	2x 28200
1H42	2950-0079	1	NUT-HEX-DBL-CHAM 5/8-24-THD .125-THK	76854	1b9997-002
1H43	3050-0001	REF	WASHER-FL MTLC NO.-8 .172-IN-ID (CABINET = 6, RACK = 8)	28480	3050-0001
1H44	3050-0016	4	WASHER-FL MTLC NO.-6 .147-IN-ID	28480	3050-0016
1H45	3050-0066	12	WASHER-FL MTLC NO.-6 .147-IN-ID	28480	3050-0066

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
1W46	3050-0071	2	WASHER-FL MTLC NO.-8 .169-IN-ID (CABINET ONLY)	28480	3050-0071
1W47	3050-0221	4	WASHER-SHLDR NO.-8 .186-IN-ID .375-IN-OD	28480	3050-0221
1W48	3050-0235	3	WASHER-FL MTLC NO.-4 .117-IN-ID	28480	3050-0235
1J1	1251-0063	1	CONNECTOR-BNC JACK SINGLE	74970	108-903
1J2	1510-0084	5	BINDING POST-SGL 6-32 JGN/RED THD STUD	28480	1510-0084
1J3	1510-0087	3	BINDING POST-SGL 6-32 JGN/BLK THD STUD	28480	1510-0087
1J4	1510-0084		BINDING POST-SGL 6-32 JGN/RED THD STUD	28480	1510-0084
1J5	1510-0087		BINDING POST-SGL 6-32 JGN/BLK THD STUD	28480	1510-0087
1J6	1510-0084		BINDING POST-SGL 6-32 JGN/RED THD STUD	28480	1510-0084
1J7	1510-0084		BINDING POST-SGL 6-32 JGN/RED THD STUD	28480	1510-0084
1J8	1510-0087		BINDING POST-SGL 6-32 JGN/BLK THD STUD	28480	1510-0087
1J9	1510-0084		BINDING POST-SGL 6-32 JGN/RED THD STUD	28480	1510-0084
1J10	1251-2357	1	CONNECTOR-AC PWR INPUT MALE FLG-MTG	28480	1251-2357
1L1	01200-66001	1	COIL ASSEMBLY, ALIGNMENT	28480	01200-66001
1MP1	0370-0348	1	KNOB, BLACK, EXT HORIZ	28480	0370-0348
1MP2	0370-0432	8	KNOB, LEVER SWITCH	28480	0370-0432
1MP3	0370-0453	1	KNOB, W/DIAL INDEX	28480	0370-0453
1MP4	5020-0876	1	BEZEL	28480	5020-0876
1MP5	5040-0886	1	SHIELD, LIGHT, SHORT	28480	5040-0886
1MP6	5040-0847	4	FOOT, REAR, LONG, CABINET ONLY	28480	5040-0847
1MP7	5060-0548	1	FIT, CONTRAST FILTER	28480	5060-0548
1MP8	01201-60601	1	SHIELD ASSEMBLY, CRT	28480	01201-60601
1MP9	00180-01218	2	BRACKET, ALIGNMENT COIL	28480	00180-01218
1MP10	00180-67402	3	KNOB ASSEMBLY, BLACK W/ARROW	28480	00180-67402
1MP11	01200-00207	1	PANEL, REAR, RACK	28480	01200-00207
1MP12	01201-00501	1	FRAME, RACK, LEFT SIDE	28480	01201-00501
1MP13	01200-00503	1	FRAME, RACK, RIGHT SIDE	28480	01200-00503
1MP14	01200-00604	1	SHIELD, HVPS, RACK	28480	01200-00604
1MP15	01200-04101	1	COVER, TOP, RACK	28480	01200-04101
1MP15	01200-04116	1	COVER, TOP, CABINET	28480	01200-04116
1MP16	01200-04102	1	COVER, BOTTOM, RACK	28480	01200-04102
1MP16	01200-04105	1	COVER ASSEMBLY, BOTTOM, CABINET	28480	01200-04105
1MP17	01710-04103	1	COVER, TRANSFORMER, RACK	28480	01710-04103
1MP17MP1	01200-04107	1	COVER, TRANSFORMER, TOP, CABINET	28480	01200-04107
1MP17MP2	01200-04109	2	COVER, TRANSFORMER, SIDE, CABINET	28480	01200-04109
1MP18	01701-04108	1	COVER, CRT	28480	01701-04108
1MP19	01200-00503	1	FRAME, CABINET, FRONT	28480	01200-00503
1MP20	01200-04701	1	SUPPORT, CRT	28480	01200-04701
1MP21	01200-04702	REF	SUPPORT,BOARD,RACK#6,CABINET#8	28480	01200-04702
1MP22	01200-04703	1	SUPPORT, CRT SHIELD	28480	01200-04703
1MP23	01200-67401	2	KNOB ASSEMBLY, 100 UV ATTENUATOR	28480	01200-67401
1MP24	01200-67402	1	KNOB ASSEMBLY, SWEEP	28480	01200-67402
1MP25	01200-67403	1	KNOB, MODE	28480	01200-67403
1MP26	01200-67404	1	KNOB ASSEMBLY, SWEEP/EXT HORIZ	28480	01200-67404
1MP27	01201-00205	1	PANEL, FRONT, CABINET	28480	01201-00205
1MP27	01201-00206	1	PANEL, FRONT, RACK	28480	01201-00206
1MP28	01201-00601	1	SHIELD, HIGH VOLTAGE	28480	01201-00601
1MP29	01201-04101	1	COVER, HVPS	28480	01201-04101
1MP30	01201-04702	1	SUPPORT, BOARD	28480	01201-04702
1MP31	01201-20503	1	FRAME, CABINET, REAR	28480	01201-20503
1MP32	01201-00505	1	FRAME ASSEMBLY, RACK	28480	01201-00505
1MP33	01201-23701	1	SHAFT, ERASE	28480	01201-23701
1MP34	01201-61901	1	SWITCH ASSY:PUSHBUTTON W/INDICATOR, STORE STD FAST	28480	01201-61901
1MP35	01201-67401	1	KNOB ASSEMBLY, ERASE	28480	01201-67401
1MP36	0370-0458	1	KNOB, PUSHBUTTON, STORE	28480	0370-0458
1MP37	0370-0795	1	KNOB, PUSHBUTTON, STD	28480	0370-0795
1MP38	0370-0796	1	KNOB, PUSHBUTTON, CONV	28480	0370-0796
1MP39	0370-0797	1	KNOB, PUSHBUTTON, FAST	28480	0370-0797
1MP40	01821-67401	1	KNOB ASSEMBLY, LEVEL	28480	01821-67401
1MP41	01200-67405	3	KNOB ASSEMBLY, CAL VERNIER	28480	01200-67405
1MP42	5020-8728	1	SHIELD, CRT SAFETY	28480	5020-8728
1MP43	5020-0522	2	HANDLE, 5-1/8" PACK	28480	5020-0522
1MP44	00181-04101	1	COVER, HIGH VOLTAGE CONNECTOR	28480	00181-04101
1MP45	01200-00106	1	DECK, RACK, TOP	28480	01200-00106
1MP45	01200-00103	1	DECK, CABINET	28480	01200-00103
1P1			NSR/ P/O 1A1		
1Q1	1853-0079	1	TRANSISTOR PNP SI PD=8W FT=4MHZ	28480	1853-0079
1Q2	1854-0320	2	TRANSISTOR NPN SI PD=83.5W FT=4MHZ	28480	1854-0320
1Q3	5080-0484	1	TRANSISTOR, NPN, SI	28480	5080-0484
1Q4	1854-0320		TRANSISTOR NPN SI PD=83.5W FT=4MHZ	28480	1854-0320
1R1	0684-4731	5	RESISTOR 47K 10% .25W FC TC=-400/+800	01121	CB4731
1R2	2100-0013	1	RESISTOR-VAR CONTROL CC 50K 20% LIN	12697	47
1R3	2100-2ab3	1	RESISTOR-VAR CONTROL WW 5K 10% LIN	10582	AW
1R4	2100-2563	1	RESISTOR-VAR CONTROL CC 5M 20% LIN	28480	2100-25a3
1R5			NOT ASSIGNED		

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1R6	2100-2594	2	RESISTOR-VAR CONTROL CC 2.5K 10% LIN	12697	47
1R7	2100-2594		RESISTOR-VAR CONTROL CC 2.5K 10% LIN	12697	47
1R8	0684-1041	8	RESISTOR 100K 10% .25W FC TC=-400/+800	01121	CB1041
1R9			NOT ASSIGNED		
1R10			NOT ASSIGNED		
1R11	2100-2845	1	RIVAR CERMET 1 MEGOHM 20% 2W	28480	2100-2845
1R12	2100-2446	1	RESISTOR-VAR CONTROL C 1K 20% LIN	11236	551
1S1	3101-0036	1	SWITCH-TGL BASIC DPST NS 3A 250VAC/DC	28480	3101-0036
1S2	3101-1310	1	SWITCH-PB SPDT MOM .25A	82389	125-1038
1S3	3101-1234	1	SWITCH-SL DPDT NS STD 1.5A 250VAC	82389	11A-1242A
1T1	9100-1127	1	TRANSFORMER, POWER, RACK	28480	9100-1127
1T1	9100-1128	1	TRANSFORMER, POWER, CABINET	28480	9100-1128
1V1	5083-2570	1	CRT:P31 (EXCEPT OPTION 031)	28480	5083-2570
1V1	5083-2575	1	CRT:P31 (OPTION 031 ONLY)	28480	5083-2575
1W1	8120-1521	1	CABLE ASSY 3-COND 18-AWG	28480	8120-1521
1W2			DELETED		
1W3	01201-61628	1	CABLE:MAIN, CABINET	28480	01201-61628
1W3	01201-61627	1	CABLE, MAIN, RACK	28480	01201-61627
1W4	01201-61604	1	LEAD, TWIN GREEN/WHITE, CABINET	28480	01201-61604
1W4	01201-61605	1	LEAD, TWIN GREEN/WHITE, RACK	28480	01201-61605
1W5	01201-61622	1	LEAD:TWIN BLUE/WHITE, CABINET	28480	01201-61622
1W5	01201-61623	1	LEAD:TWIN BLUE/WHITE, RACK	28480	01201-61623
1W6	01201-61610	1	CABLE ASSEMBLY, 2C GR, CABINET	28480	01201-61610
1W6	01201-61611	1	CABLE ASSEMBLY, PLS CRT, RACK	28480	01201-61611
1W7	01201-61612	1	CABLE, STORAGE CONT, CABINET	28480	01201-61612
1W7	01201-61619	1	CABLE, STORAGE CONT, RACK	28480	01201-61619
1XF1	1400-0084	1	FUSEHOLDER-EXTR POST 15A 250V UL	28480	1400-0084
1XQ1	5060-0585	REF	CABLE:TRANSISTOR, 3=CABINET, 2=RACK	28480	5060-0585
1XQ2	5060-0586	REF	CABLE:TRANSISTOR, 1=CABINET, 0=RACK	28480	5060-0586
1XV1	1200-0037	1	SOCKET-TUBE 14-CONT CRT-PKG	28480	1200-0037
1XV1MP1	1200-0408	1	COVER:CRT SOCKET	28480	1200-0408

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1A1	01200-63506		MODULE ASSEMBLY, PREAMPLIFIER, 100 UV	28480	01200-63506
1A1C1	0160-0917	1	CAPACITOR-FXD MY 0.1 UF 20% 600VDCW	28480	0160-0917
1A1MP1	0370-0500	2	KNOB:PUSHBUTTON	28480	0370-0500
1A1MP2	01200-60603	2	SHIELD, PREAMP, INCL 1A1B1 & 1A1B2	28480	01200-60603
1A1MP3	01200-63701	2	SHAFT ASSEMBLY, PUSHBUTTON	28480	01200-63701
1A1S1	3100-1376	4	SWITCH:LEVER	28480	3100-1376
1A1S2	3100-1376		SWITCH:LEVER	28480	3100-1376
1A1A1	01200-66522	2	BOARD ASSEMBLY, 100 UV AMPLIFIER	28480	01200-66522
1A1A1C1	0180-0091	7	CAPACITOR-FXD 10UF+50-10% 100VDC AL	56289	30D106F100DC2
1A1A1C2	0121-0045	4	CAPACITOR-V TRMR-CER 7/45PF 500V PNL-MTG	72982	503-001 C 7-45
1A1A1C3	0170-0040	4	CAPACITOR-FXD .047UF +-10% 200VDC POLYE	56289	292P47392
1A1A1C4	0160-2239	2	CAPACITOR-FXD 1.8PF +-.25PF 500VDC CER	28480	0160-2239
1A1A1C5	0160-2258	10	CAPACITOR-FXD 11PF +-5% 500VDC CER	28480	0160-2258
1A1A1C6	0160-2264	4	CAPACITOR-FXD 20PF +-5% 500VDC CER	28480	0160-2264
1A1A1C7	0160-3638	4	CAPACITOR-FXD .22UF +80-20% 200VAC CER	28480	0160-3638
1A1A1C8	0160-3638		CAPACITOR-FXD .22UF +80-20% 200VAC CER	28480	0160-3638
1A1A1C9	0150-0084	2	CAPACITOR-FXD .1UF +80-20% 100VDC CER	28480	0150-0084
1A1A1C10	0180-0228	3	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
1A1A1C11	0180-0376	2	CAPACITOR-FXD .47UF+-10% 35VDC TA	56289	150D474X9035A2
1A1A1C12	0160-3073	2	CAPACITOR-FXD 100PF +100-0% 1000WVDC CER	28480	0160-3073
1A1A1C13	0140-0215	3	CAPACITOR-FXD 90PF +-2% 300WVDC MICA	72136	DM15E900G0300WV1CR
1A1A1C14	0121-0045		CAPACITOR-V TRMR-CER 7/45PF 500V PNL-MTG	72982	503-001 C 7-45
1A1A1C15	0170-0040		CAPACITOR-FXD .047UF +-10% 200WVDC POLYE	56289	292P47392
1A1A1C16	0132-0004	4	CAPACITOR-V TRMR-PSTN .7/3PF 350V	72982	535-009-4R
1A1A1C17	0132-0004		CAPACITOR-V TRMR-PSTN .7/3PF 350V	72982	535-009-4R
1A1A1C18	0160-2258		CAPACITOR-FXD 11PF +-5% 500WVDC CER	28480	0160-2258
1A1A1C19	0160-2264		CAPACITOR-FXD 20PF +-5% 500WVDC CER	28480	0160-2264
1A1A1C20	0180-0091		CAPACITOR-FXD 10UF+50-10% 100VDC AL	56289	30D106F100DC2
1A1A1CR1	1901-0579	8	DIODE-SWITCHING 40V 20MA 300NS DO-7	28480	1901-0579
1A1A1CR2	1901-0579		DIODE-SWITCHING 40V 20MA 300NS DO-7	28480	1901-0579
1A1A1CR3	1901-0579		DIODE-SWITCHING 40V 20MA 300NS DO-7	28480	1901-0579
1A1A1CR4	1901-0579		DIODE-SWITCHING 40V 20MA 300NS DO-7	28480	1901-0579
1A1A1CR5	1901-0040	68	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A1A1CR6	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A1A1Q1	1855-0086	2	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0086
1A1A1Q2	1854-0071	24	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A1A1Q3	1853-0049	4	TRANSISTOR PNP SI PD=310MW FT=200MHZ	28480	1853-0049
1A1A1Q4	1853-0049		TRANSISTOR PNP SI PD=310MW FT=200MHZ	28480	1853-0049
1A1A1Q5	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A1A1Q6	1853-0036	25	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A1A1Q7	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A1A1Q8	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A1A1Q9	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A1A1Q10	1855-0057	3	TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0057
1A1A1Q11	1854-0215	13	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A1A1Q12	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A1A1R1	0684-6801	4	RESISTOR 68 10% .25W FC TC=-400/+500	01121	CB6801
1A1A1R2	0757-0459	4	RESISTOR 1M 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1004-F
1A1A1R3	0698-3623	5	RESISTOR 46.4K 1% .5W F TC=0+-100	91637	MFF-1/2-10
1A1A1R4	0757-0421	4	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
1A1A1R5	0757-0409	4	RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
1A1A1R6	0684-3331	10	RESISTOR 33K 10% .25W FC TC=-400/+800	01121	CB3331
1A1A1R7	0684-1231	3	RESISTOR 12K 10% .25W FC TC=-400/+800	01121	CB1231
1A1A1R8	0684-3331		RESISTOR 33K 10% .25W FC TC=-400/+800	01121	CB3331
1A1A1R9	0757-0453	6	RESISTOR 30.1K 1% .125W F TC=0+-100	4546	C4-1/8-T0-3012-F
1A1A1R10	0684-5611	4	RESISTOR 560 10% .25W FC TC=-400/+800	01121	CB5611
1A1A1R11	0684-2211	16	RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211
1A1A1R12	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211
1A1A1R13	0684-8221	6	RESISTOR 8.2K 10% .25W FC TC=-400/+700	01121	CB8221
1A1A1R14	0757-0437	4	RESISTOR 4.75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4751-F
1A1A1R15			NOT ASSIGNED		
1A1A1R16	0757-0437		RESISTOR 4.75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4751-F
1A1A1R17			NOT ASSIGNED		
1A1A1R18	0757-0442	13	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A1A1R19	2100-0940	3	RESISTOR-TRMR 500 20% CC SIDE-ADJ 1-TRN	71590	70-1 SERIES 5
1A1A1R20	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A1A1R21	0684-4741	7	RESISTOR 470K 10% .25W FC TC=-800/+900	01121	CB4741
1A1A1R22	0684-2731	2	RESISTOR 27K 10% .25W FC TC=-400/+800	01121	CB2731
1A1A1R23	0684-1011	6	RESISTOR 100 10% .25W FC TC=-400/+500	01121	CB1011
1A1A1R24	0757-0200	3	RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
1A1A1R25	0684-1011		RESISTOR 100 10% .25W FC TC=-400/+500	01121	CB1011

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1A1A1R26	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A1A1R27	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A1A1R28	0757-0467	4	RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
1A1A1R29	0757-0059		RESISTOR 1M 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1004-F
1A1A1R30	0698-3423		RESISTOR 46.4K 1% .5W F TC=0+-100	91637	MFF-1/2-10
1A1A1R31	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-8250-F
1A1A1R32	0757-0409		RESISTOR 274 1% .125W F TC=0+-100	24546	C4-1/8-T0-274R-F
1A1A1R33	0684-3331		RESISTOR 33K 10% .25W FC TC=-400/+800	01121	CB3331
1A1A1R34	0698-3432	2	RESISTOR 26.1 1% .125W F TC=0+-100	03888	PME55-1/8-T0-26R1-F
1A1A1R35	0757-0453		RESISTOR 30.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3012-F
1A1A1R36	0684-5611		RESISTOR 560 10% .25W FC TC=-400/+800	01121	CB5611
1A1A1R37	0684-2211		RESISTOR 220 10% .25W FC TC=-800/+800	01121	CB2211
1A1A1R38	0684-8221		RESISTOR 8.2K 10% .25W FC TC=-400/+700	01121	CB8221
1A1A1R39	0684-6801		RESISTOR 68 10% .25W FC TC=-400/+500	01121	CB6801
1A1A1S1	3101-0535	2	SWITCH-PB DPDT ALTNG .45A 115VAC	28480	3101-0535
1A1A1VR1	1902-3150	2	DIODE-ZNR 9.09V 2% DO-7 PD=.4W TC=+.057%	28480	1902-3150
1A1A1VR2	1902-0017	2	DIODE-ZNR 6.81V 10% DO-7 PD=.4W	15818	CD 35457
1A1A1VR3	1902-0055	3	DIODE-ZNR 14.7V 10% DO-7 PD=.4W	04713	SZ 10939-229
1A1A1VR4	1902-3234	4	DIODE-ZNR 19.6V 5% DO-7 PD=.4W TC=+.073%	04713	SZ 10939-286
1A1A1VR5	1902-3234		DIODE-ZNR 19.6V 5% DO-7 PD=.4W TC=+.073%	04713	SZ 10939-286
1A1A2	01200-61903	2	SWITCH ASSEMBLY, 100 UV ATTENUATOR	28480	01200-61903
1A1A2C1	0130-0001	4	CAPACITOR-V TRMR-CER 7/45PF 500V PC-MTG	72982	503-000 C 7-45
1A1A2C2	0130-0003	4	CAPACITOR-V TRMR-CER 1.5/7PF 500V PC-MTG	33095	53-707-002-CV11A070
1A1A2C3	0140-0090	4	CAPACITOR-FXD 200PF +-5% 500WVDC MICA	72136	DM15E201J0500WV1CR
1A1A2C4	0130-0001		CAPACITOR-V TRMR-CER 7/45PF 500V PC-MTG	72982	503-000 C 7-45
1A1A2C5	0130-0003		CAPACITOR-V TRMR-CER 1.5/7PF 500V PC-MTG	33095	53-707-002-CV11A070
1A1A2C6	0140-0090		CAPACITOR-FXD 200PF +-5% 500WVDC MICA	72136	DM15E201J0500WV1CR
1A1A2R1	0698-8502	4	RESISTOR 990K 1% .5W F	28480	0698-8502
1A1A2R2	0698-3109	4	RESISTOR 10.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1012-F
1A1A2R3	0698-8502		RESISTOR 990K 1% .5W F	28480	0698-8502
1A1A2R4	0698-3109		RESISTOR 10.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1012-F
1A1A2R5	0757-0449	3	RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
1A1A2R6	0698-3484	2	RESISTOR 6.65K 1% .125W F TC=0+-100	24546	C4-1/8-T0-6651-F
1A1A2R7	0757-0430	2	RESISTOR 2.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2211-F
1A1A2R8	0698-4467	2	RESISTOR 1.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1051-F
1A1A2R9	0757-0416	6	RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
1A1A2R10	0698-6729	2	RESISTOR 202 1% .125W F TC=0+-100	24546	C4-1/8-T0-202R-F
1A1A2R11	0757-0401	4	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
1A1A2R12	0757-0277	2	RESISTOR 89.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-89R9-F
1A1A2R13	0757-0388	2	RESISTOR 20 1% .125W F TC=0+-100	19701	MFAC1/8-T0-20R0-F
1A1A2R14	0757-0346	3	RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
1A1A2R15	2100-2618	2	RESISTOR-VAR CONTROL CC 50 10% LIN	01121	G
1A1A2R16	2100-2617	2	RESISTOR-VAR W/SW 5K 10% 10CCW SPST-NC	28480	2100-2617
1A1A2S1	3100-2523	2	SWITCH-ROTARY 6 SECT 17 POSITION	28480	3100-2523
1A2	01200-63506		MODULE ASSEMBLY, PREAMPLIFIER, 100 UV SAME AS 1A1, USE PREFIX 1A2	28480	01200-63506
1A3	01201-66506		BOARD ASSEMBLY, DUAL CHANNEL OUTPUT	28480	01201-66506
1A3C1	0160-2240	8	CAPACITOR-FXD 2PF +-.25PF 500WVDC CER	28480	0160-2240
1A3C2	0160-2240		CAPACITOR-FXD 2PF +-.25PF 500WVDC CER	28480	0160-2240
1A3C3	0160-2240		CAPACITOR-FXD 2PF +-.25PF 500WVDC CER	28480	0160-2240
1A3C4	0160-2240		CAPACITOR-FXD 2PF +-.25PF 500WVDC CER	28480	0160-2240
1A3C5	0160-2237	1	CAPACITOR-FXD 1.2PF +-.25PF 500WVDC CER (FACTORY SELECTED PART)	28480	0160-2237
1A3C6	0160-2913	3	CAPACITOR-FXD .01UF +80-20% 500WVDC CER	28480	0160-2913
1A3C7	0140-0205	1	CAPACITOR-FXD 62PF +-5% 300WVDC MICA	72136	DM15E620J0300WV1CR
1A3C8	0140-0206	1	CAPACITOR-FXD 270PF +-5% 500WVDC MICA	72136	DM15F271J0500WV1CR
1A3C9	5081-7647	1	CAPACITOR, FXD MATCHED PAIR, INCL 1A3C12	28480	5081-7647
1A3C10	0160-2203	2	CAPACITOR-FXD 91PF +-5% 300WVDC MICA	28480	0160-2203
1A3C11	0160-2203		CAPACITOR-FXD 91PF +-5% 300WVDC MICA NOT REPLACE WITH 1A3C9	28480	0160-2203
1A3C12					
1A3C13	0160-2930	1	CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-2930
1A3C14	0180-0091		CAPACITOR-FXD 10UF+50-10% 100VDC AL	56289	30D106F100DC2
1A3C15	0180-0091		CAPACITOR-FXD 10UF+50-10% 100VDC AL	56289	30D106F100DC2
1A3C16	0160-2243	1	CAPACITOR-FXD 2.7PF +-.25PF 500WVDC CER (FACTORY SELECTED PART)	28480	0160-2243
1A3CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR3	1901-0050	5	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
1A3CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040

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
1A3CR6	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
1A3CR7	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR8	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR9	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
1A3CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR12	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
1A3CR13	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR14	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR15	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
1A3CR16	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR17	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR18	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR19	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR20	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR21	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR22	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR23	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR24	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR25	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR26	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR27	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR28	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR29	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR30	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3CR31	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A3L1	9100-1652	4	COIL-MLD 820UH 5% Q=80 .190X.44LG	24226	19/823
1A3L2	9100-1652		COIL-MLD 820UH 5% Q=80 .190X.44LG	24226	19/823
1A3L3	9100-1652		COIL-MLD 820UH 5% Q=80 .190X.44LG	24226	19/823
1A3L4	9100-1652		COIL-MLD 820UH 5% Q=80 .190X.44LG	24226	19/823
1A3MP1	1205-0095	2	HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
1A3MP2	01200-01201	1	BRACKET, MODE SWITCH MOUNTING	28480	01200-01201
1A3Q1	1853-0098	2	TRANSISTOR PNP SI PD=310MW FT=40MHZ	28480	1853-0098
1A3Q2	1853-0098		TRANSISTOR PNP SI PD=310W FT=40MHZ	28480	1853-0098
1A3Q3	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A3Q4	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A3Q5	1854-0238	6	TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	02735	2N3440
1A3Q6	1854-0238		TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	02735	2N3440
1A3Q7	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A3Q8	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A3Q9	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A3Q10	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A3Q11	1854-0238		TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	02735	2N3440
1A3Q12	1854-0238		TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	02735	2N3440
1A3Q13	1854-0022	10	TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
1A3Q14	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
1A3Q15	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A3Q16	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A3Q17	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
1A3Q18	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
1A3R1	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
1A3R2	0684-8221		RESISTOR 8.2K 10% .25W FC TC=-400/+700	01121	CB8221
1A3R3	0698-3447	3	RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
1A3R4	2100-2578	1	RESISTOR-TRMR 1K TSECT 4 SECT	71590	71-4 SERIES 5
1A3R5	0684-8221		RESISTOR 8.2K 10% .25W FC TC=-400/+700	01121	CB8221
1A3R6	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+600	01121	CB2211
1A3R7	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+600	01121	CB2211
1A3R8	0683-3935	5	RESISTOR 39K 5% .25W FC TC=-400/+800	01121	CB3935
1A3R9	0683-3935		RESISTOR 39K 5% .25W FC TC=-400/+800	01121	CB3935
1A3R10	0757-0822	6	RESISTOR 1.3K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1301-F
1A3R11	0757-0822		RESISTOR 1.3K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1301-F
1A3R12	0757-0008	4	RESISTOR 10K 5% 3W MO TC=0+-250	27167	FP3-3-250-1002-J
1A3R13	0757-0008		RESISTOR 10K 5% 3W MO TC=0+-250	27167	FP3-3-250-1002-J
1A3R14	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
1A3R15	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
1A3R16	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
1A3R17	0683-3935		RESISTOR 39K 5% .25W FC TC=-400/+800	01121	CB3935
1A3R18	0683-3935		RESISTOR 39K 5% .25W FC TC=-400/+800	01121	CB3935
1A3R19	0757-0822		RESISTOR 1.3K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1301-F
1A3R20	0757-0822		RESISTOR 1.3K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1301-F
1A3R21	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A3R22	0683-3935		RESISTOR 39K 5% .25W FC TC=-400/+800	01121	CB3935
1A3R23	0757-0274	2	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
1A3R24	0757-0274		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
1A3R25	0757-0445	1	RESISTOR 13K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1302-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
1A3R26	0757-0419		RESISTOR 511 1% .125W F TC=0+-100	24546	C4-1/8-T0-511R-F
1A3R27	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	24546	C4-1/8-T0-422R-F
1A3R28	0757-0822		RESISTOR 1.3K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1301-F
1A3R29	0757-0822		RESISTOR 1.3K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-1301-F
1A3R30	0767-0008		RESISTOR 10K 5% 3W MO TC=0+-250	27167	FP3-3-250-1002-J
1A3R31	0767-0008		RESISTOR 10K 5% 3W MO TC=0+-250	27167	FP3-3-250-1002-J
1A3R32	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
1A3R33	0757-0456	3	RESISTOR 45.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4322-F
1A3R34	0684-1051	3	RESISTOR 1M 10% .25W FC TC=-800/+900	01121	CB1051
1A3R35	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A3R36	0757-0486	1	RESISTOR 750K 1% .125W F TC=0+-100	24546	NAA
1A3R37	0698-3457	1	RESISTOR 316K 1% .125W F TC=0+-100	91637	CMF-55-1, T-1
1A3R38	0684-1541	2	RESISTOR 150K 10% .25W FC TC=-800/+900	01121	CB1541
1A3R39	0757-0428	2	RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
1A3R40	0757-0751	2	RESISTOR 7.5K 1% .25W F TC=0+-100	19701	MF52C-1
1A3R41	0757-0438	3	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
1A3R42	0757-0433	3	RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
1A3R43	0757-0458	3	RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
1A3R44	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
1A3R45	0698-5102	2	RESISTOR 1.2M 10% .25W FC TC=-900/+1100	01121	CB1251
1A3R46	0757-0467		RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
1A3R47	0698-5102		RESISTOR 1.2M 10% .25W FC TC=-900/+1100	01121	CB1251
1A3R48	0757-0443	2	RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
1A3R49	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
1A3R50	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
1A3R51	0757-0433		RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
1A3R52	0757-0441	1	RESISTOR 8.25K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8251-F
1A3R53	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1621-F
1A3R54	0757-0751		RESISTOR 7.5K 1% .25W F TC=0+-100	19701	MF52C-1
1A3R55	0684-1541		RESISTOR 150K 10% .25W FC TC=-800/+900	01121	CB1541
1A3R56	0757-0413	1	RESISTOR 392 1% .125W F TC=0+-100	24546	C4-1/8-T0-392R-F
1A3R57	0757-0414	1	RESISTOR 432 1% .125W F TC=0+-100	24546	C4-1/8-T0-432R-F
1A3R58	0684-4711	2	RESISTOR 470 10% .25W FC TC=-400/+600	01121	CB4711
1A3R59	0698-0085	1	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2611-F
1A3R60	0757-0289	3	RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
1A3R61	0757-0394	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-51R1-F
1A3R62	0757-0397	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-68R1-F
1A3S1	3100-1377	1	SWITCH:ROTARY,5 SECTION 5 POSITION	28480	3100-1377
1A3W1	01200-61603	1	CABLE ASSEMBLY, COAXIAL	28480	01200-61603
1A4	01200-63503		MODULE ASSEMBLY, SWEEP	28480	01200-63503
1A4C1	0130-0010	1	CAPACITOR-V TRMR-CER 5/25PF 350V PC-MTG	72982	557-810-39A
1A4C2	0180-0155	5	CAPACITOR-FXD 2.2UF+-20% 20VDC TA	56289	150D225X0020A2
1A4C3	0180-0155		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	56289	150D225X0020A2
1A4L1	9140-0179	2	COIL-MLD 22UH 10% Q=75 .155DX.375LG	24226	15/222
1A4MP1	01200-60602	1	SHIELD ASSEMBLY, SWEEP,INCL 1A4S1,2,4,5	28480	01200-60602
1A4R1	01200-61501	1	RESISTOR, MODIFIED	28480	01200-61501
1A4R2	0757-0350	1	RESISTOR 909K 1% .25W F TC=0+-100	19701	MF52C1/4-T0-9093-F
1A4R3	2100-2613	1	RESISTOR-VAR W/SW 100K 20% LIN DPST-NO	28480	2100-2613
1A4R6	2100-1509	1	RESISTOR-VAR CONTROL CC 20K 20% LIN	12697	87
1A4S1	3100-1375	1	SWITCH:LEVER (PART OF 1A4MP1)	28480	3100-1375
1A4S2	3100-1374	1	SWITCH:LEVER (PART OF 1A4MP1)	28480	3100-1374
1A4S3			NSR, PART OF 1A4R3		
1A4S4	3100-1373	1	SWITCH:LEVER (PART OF 1A4MP1)	28480	3100-1373
1A4S5	3100-1372	1	SWITCH:LEVER (PART OF 1A4MP1)	28480	3100-1372
1A4S6	3101-0944	1	SWITCH-PB DPST-NO MOM 1A 115VAC CLR-LENS	28480	3101-0944
1A4W1	01200-61607	1	CABLE ASSEMBLY, SWEEP	28480	01200-61607
1A4A1	01200-66508	1	BOARD ASSEMBLY, SWEEP	28480	01200-66508
1A4A1C1	0160-2959	2	CAPACITOR-FXD 1000PF +80-20% 1000WVDC	28480	0160-2959
1A4A1C2	0160-2917	11	CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C3	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C4	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C5	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C6	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C7	0180-0155		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	56289	150D225X0020A2
1A4A1C8	0160-2258		CAPACITOR-FXD 11PF +-5% 500WVDC CER	28480	0160-2258
1A4A1C9	0160-2258		CAPACITOR-FXD 11PF +-5% 500WVDC CER	28480	0160-2258
1A4A1C10	0140-0198	6	CAPACITOR-FXD 200PF +-5% 300WVDC MICA	72136	DM15F201J0300WV1CR

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1A4A1C11	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C12	0160-2258		CAPACITOR-FXD 11PF +-5% 500WVDC CER	28480	0160-2258
1A4A1C13	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C14	0160-2959		CAPACITOR-FXD 1000PF +80-20% 1000WVDC	28480	0160-2959
1A4A1C15	0180-0155		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	56289	150D225X0020A2
1A4A1C16	0150-0115	4	CAPACITOR-FXD 27PF +-10% 500WVDC CER	28480	0150-0115
1A4A1C17	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C18	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C19	0160-2258		CAPACITOR-FXD 11PF +-5% 500WVDC CER	28480	0160-2258
1A4A1C20	0160-2258		CAPACITOR-FXD 11PF +-5% 500WVDC CER	28480	0160-2258
1A4A1C21	0140-0198		CAPACITOR-FXD 200PF +-5% 300WVDC MICA	72136	DM15F201J0300WV1CR
1A4A1C22	0150-0115		CAPACITOR-FXD 27PF +-10% 500WVDC CER	28480	0150-0115
1A4A1C23	0140-0198		CAPACITOR-FXD 200PF +-5% 300WVDC MICA	72136	DM15F201J0300WV1CR
1A4A1C24	0150-0115		CAPACITOR-FXD 27PF +-10% 500WVDC CER	28480	0150-0115
1A4A1C25	0160-2913		CAPACITOR-FXD .01UF +85-20% 500WVDC CER	28480	0160-2913
1A4A1C26	0140-0198		CAPACITOR-FXD 200PF +-5% 300WVDC MICA	72136	DM15F201J0300WV1CR
1A4A1C27	0140-0207	2	CAPACITOR-FXD 330PF +-5% 500WVDC MICA	72136	DM15F331J0500WV1CR
1A4A1C28	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C29	0140-0207		CAPACITOR-FXD 330PF +-5% 500WVDC MICA	72136	DM15F331J0500WV1CR
1A4A1C30	0160-2917		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0160-2917
1A4A1C31	0160-2913		CAPACITOR-FXD .01UF +85-20% 500WVDC CER	28480	0160-2913
1A4A1C32	0150-0115		CAPACITOR-FXD 27PF +-10% 500WVDC CER	28480	0150-0115
1A4A1CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR4	1912-0009	1	DIODE-TNL 1N3712 IPP=.6MA IF=5MA	03508	1N3712
1A4A1CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR6	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR7	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR8	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR9	1901-0376	1	DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
1A4A1CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR12	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR13	1910-0016	1	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
1A4A1CR14	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR15	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR16	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1CR17	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A1Q1	1854-0539	4	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0539
1A4A1Q2	1854-0539		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0539
1A4A1Q3	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q4	1854-0539		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0539
1A4A1Q5	1854-0539		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0539
1A4A1Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q7	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q8	1853 0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853 0036
1A4A1Q9	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A4A1Q10	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q11	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q12	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q13	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q14	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q15	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q16	1855-0090	1	TRANSISTOR J-FET N-CHAN D-MODE TO-72 SI	28480	1855-0090
1A4A1Q17	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q18	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q19	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q20	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q21	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q22	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q23	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1Q24	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q25	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A4A1Q26	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A4A1R1	0698-5092	2	RESISTOR 160K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1603-F
1A4A1R2	0757-0976	4	RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A4A1R3	0757-0427	1	RESISTOR 1.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1501-F
1A4A1R4	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MFAC1/8-T0-1332-F
1A4A1R5	0687-1531	1	RESISTOR 15K 10% .5W CC TC=0+765	01121	EB1531
1A4A1R6	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1102-F
1A4A1R7	0757-0959	3	RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
1A4A1R8	0757-0914	3	RESISTOR 390 2% .125W F TC=0+-100	24546	C4-1/8-T0-391-G
1A4A1R9	0757-0988	3	RESISTOR 47K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4702-G
1A4A1R10	2100-0387	1	RESISTOR-TRMR ML7SECT 1K SECT	71590	70-9

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
1A4A1R11	0684-2231	10	RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A4A1R12	0698-3640	1	RESISTOR 1.8K 5% 2W MO TC=0+-200	11502	RG42
1A4A1R13	0684-2201	4	RESISTOR 22 10% .25W FC TC=-400/+500	01121	CB2201
1A4A1R14	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A4A1R15	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A4A1R16	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211
1A4A1R17	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211
1A4A1R18	0684-4741		RESISTOR 470K 10% .25W FC TC=-800/+900	01121	CB4741
1A4A1R19	0757-0924	2	RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
1A4A1R20	0757-0952	3	RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A4A1R21	2100-0960		RESISTOR-TRMR 500 20% CC SIDE-ADJ 1-TRN	71590	70-1 SERIES 5
1A4A1R22	0698-6818	2	RESISTOR 10K 2% .25W F TC=0+-100	27167	C5
1A4A1R23	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A4A1R24	0757-0935	2	RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3001-G
1A4A1R25	0757-0956	2	RESISTOR 22K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2202-G
1A4A1R26	0757-0914		RESISTOR 390 2% .125W F TC=0+-100	24546	C4-1/8-T0-391-G
1A4A1R27	0757-0962	1	RESISTOR 39K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3902-G
1A4A1R28	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211
1A4A1R29	0760-0028	1	RESISTOR 6.2K 2% 1W MO TC=0+-200	11502	RG32
1A4A1R30	0757-0928	3	RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
1A4A1R31	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A4A1R32	0684-2241	2	RESISTOR 220K 10% .25W FC TC=-800/+900	01121	CB2241
1A4A1R33	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211
1A4A1R34	2100-2581	1	RESISTOR-TRMR MLTSECT 2 SECT	71590	70-2 SERIES 5
1A4A1R35	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211
1A4A1R36	2100-0381	1	RESISTOR-TRMR 25K 30% CC SIDE-ADJ 1-TURN	71590	70-1 SERIES 5
1A4A1R37	0757-0972	7	RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A4A1R38	0757-0457	1	RESISTOR 47.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4752-F
1A4A1R39	0684-3331		RESISTOR 33K 10% .25W FC TC=-400/+800	01121	CB3331
1A4A1R40	0684-1041		RESISTOR 100K 10% .25W FC TC=-400/+800	01121	CB1041
1A4A1R41	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211
1A4A1R42	0684-3331		RESISTOR 33K 10% .25W FC TC=-400/+800	01121	CB3331
1A4A1R43	0757-0928		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
1A4A1R44	0757-0972		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A4A1R45	0757-0944		RESISTOR 47K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4702-G
1A4A1R46	0698-3155	3	RESISTOR 8.04K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8041-F
1A4A1R47	0757-0453		RESISTOR 30.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3012-F
1A4A1R48	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
1A4A1R49	0757-0918		RESISTOR 390 2% .125W F TC=0+-100	24546	C4-1/8-T0-391-G
1A4A1R50	0698-6816	1	RESISTOR 6.2K 2% .25W F TC=0+-100	27167	C5
1A4A1R51	0757-0931	2	RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
1A4A1R52	0757-0972		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A4A1R53	0757-0752		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A4A1R54	0684-4741		RESISTOR 470K 10% .25W FC TC=-800/+900	01121	CB4741
1A4A1R55	0684-3331		RESISTOR 33K 10% .25W FC TC=-400/+800	01121	CB3331
1A4A1R56	0757-0288	1	RESISTOR 9.09K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-9091-F
1A4A1R57	0684-2201		RESISTOR 22 10% .25W FC TC=-400/+500	01121	CB2201
1A4A1R58	0684-2201		RESISTOR 22 10% .25W FC TC=-400/+500	01121	CB2201
1A4A1R59	0757-0924		RESISTOR 1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1001-G
1A4A1R60	0684-1041		RESISTOR 100K 10% .25W FC TC=-400/+800	01121	CB1041
1A4A1R61	0684-1041		RESISTOR 100K 10% .25W FC TC=-400/+800	01121	CB1041
1A4A1R62	0757-0935		RESISTOR 3K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3001-G
1A4A1R63	0757-0972		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A4A1R64	0757-0944		RESISTOR 47K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4702-G
1A4A1R65	0757-0757	3	RESISTOR 15K 1% .25W F TC=0+-100	19701	MF52C-1
1A4A1R66	0757-0281	1	RESISTOR 2.74K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2741-F
1A4A1R67	0698-6818		RESISTOR 10K 2% .25W F TC=0+-100	27167	C5
1A4A1R68	0757-0948	2	RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0-6801-G
1A4A1R69	0698-3450	1	RESISTOR 42.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4222-F
1A4A1R70	0684-1051		RESISTOR 1M 10% .25W FC TC=-800/+900	01121	CB1051
1A4A1R71	0757-0952		RESISTOR 15K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A4A1R72	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-1332-F
1A4A1R73	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A4A1R74	0757-0976		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A4A1R75	0757-0959		RESISTOR 30K 2% .125W F TC=0+-100	245	C4-1/8-T0-3002-G
1A4A1R76	0757-0095	1	RESISTOR 5.1K 2% .25W F TC=0+-100	27167	C5
1A4A1R77	0757-0950	2	RESISTOR 12K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1202-G
1A4A1R78	0757-0928		RESISTOR 1.5K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1501-G
1A4A1R79	0757-0930	3	RESISTOR 1.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1801-G
1A4A1R80	0698-6815	1	RESISTOR 1.8K 2% .25W F TC=0+-100	27167	C5
1A4A1R81	0757-0944		RESISTOR 6.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0-6801-G
1A4A1R82	0757-0940	1	RESISTOR 4.7K 2% .125W F TC=0+-100	24546	C4-1/8-T0-4701-G
1A4A1R83	0757-0956		RESISTOR 22K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2202-G
1A4A1R84	0757-0930		RESISTOR 1.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1801-G
1A4A1R85	0684-2211		RESISTOR 220 10% .25W FC TC=-400/+800	01121	CB2211

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1A4A1R86	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
1A4A1R87	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
1A4A1VR1	1902-0025	1	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	28480	1902-0025
1A4A1VR2	1902-0055		DIODE-ZNR 10.7V 10% DO-7 PD=.4W	04713	SZ 10939-229
1A4A1VR3	1902-0049	1	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
1A4A2	01200-61902	1	SWITCH ASSEMBLY, SWEEP	28480	01200-61902
1A4A2C1	0170-0022	1	CAPACITOR-FXD .1UF +-20% 600WVDC POLYE	28480	0170-0022
1A4A2C2	0160-2204	1	CAPACITOR-FXD 100PF +-5% 300WVDC MICA	28480	0160-2204
1A4A2C3	0160-2258		CAPACITOR-FXD 11PF +-5% 500WVDC CER	28480	0160-2258
1A4A2C4	0150-0093	2	CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0150-0093
1A4A2C5	0160-3133	1	CAPACITOR-FXD 2UF +-10% 100WVDC POLYE	84411	663UW20591M2
1A4A2C6	0170-0063	1	CAPACITOR-FXD .02UF +-10% 400WVDC POLYE	84411	663UW20394
1A4A2C7	0160-0168	6	CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
1A4A2C8	0160-0194	1	CAPACITOR-FXD .015UF +-10% 200WVDC POLYE	56289	292P15392
1A4A2C9	0160-0155	1	CAPACITOR-FXD 3300PF +-10% 200WVDC POLYE	56289	292P33292
1A4A2CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A2CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A4A2MP1	3130-0038	1	COUPLER:SWITCH SST U-SHAPED	76854	1227A-6
1A4A2MP2	01200-01203	1	BRACKET, SWEEP SWITCH MOUNTING	28480	01200-01203
1A4A2Q1	1854-0358	1	TRANSISTOR NPN SI PD=310MW FT=600MHZ	28480	1854-0358
1A4A2R1	0698-4009	1	RESISTOR 50K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5002-F
1A4A2R2	0757-0453		RESISTOR 30.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3012-F
1A4A2R3	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A4A2R4	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A4A2R5	2100-2616	1	RTVAR COMP 7K/25K OHM 30/20% LIN	28480	2100-2616
1A4A2R6	0698-5092		RESISTOR 160K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1603-F
1A4A2R7	0757-0959		RESISTOR 30K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3002-G
1A4A2R8	0757-0124	1	RESISTOR 39.2K 1% .125W F TC=0+-100	24546	C4, T=0
1A4A2R9	0757-0479	1	RESISTOR 392K 1% .125W F TC=0+-100	19701	MF4C1/8-T0-3923-F
1A4A2R10	0757-0471	1	RESISTOR 182K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1823-F
1A4A2R11	0698-4482	1	RESISTOR 17.4K 1% .125W F TC=0+-100	03888	PME55-1/8-T0-1742-F
1A4A2R12	0757-0472	1	RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
1A4A2R13	0757-0465	3	RESISTOR 100K 1% .125W F TC=0+-10	24546	C4-1/8-T0-1003-F
1A4A2R14	0698-6733	1	RESISTOR 30M 1% 1W CF TC=0+1300	01295	CD 1R
1A4A2R15	0698-7091	2	RESISTOR 10M 1% .25W F TC=0+-150	00327	M12-1/2-T0-1005-F
1A4A2R16	0698-7091		RESISTOR 10M 1% .25W F TC=0+-150	00327	M12-1/2-T0-1005-F
1A4A2R17	0757-0344	2	RESISTOR 1M 1% .25W F TC=0+-100	19701	MF52C-1
1A4A2R18	0757-0344		RESISTOR 1M 1% .25W F TC=0+-100	19701	MF52C-1
1A4A2R19	0757-0950		RESISTOR 12K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1202-G
1A4A2S1	3100-1378	1	SWITCH:ROTARY DUAL, DETENT	28480	3100-1378
1A4A2W1	01200-61628	1	CABLE, SWEEP SWITCH	28480	01200-61628
1A5	01200-66516		BOARD ASSEMBLY, LOW VOLTAGE POWER SUPPLY	28480	01200-66516
1A5C1	0180-2138	1	CAPACITOR-FXD 150UF+50-10% 250VDC AL	28480	0180-2138
1A5C2	0180-2159	2	CAPFXD ELECT 300 UF +75-10% 150VDCW	28480	0180-2159
1A5C3	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
1A5C4	0180-2134	2	CAPACITOR-FXD 20UF+50-10% 100VDC AL	56289	30D206F100EJ6
1A5C5	0180-2159		CAPFXD ELECT 300 UF +75-10% 150VDCW	28480	0180-2159
1A5C6	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
1A5C7	0180-0155		CAPACITOR-FXD 2.2UF+-20% 20VDC TA	56289	150D225X0020A2
1A5C8	0180-1731	1	CAPACITOR-FXD 4.7UF+-10% 50VDC TA	56289	150D475X9050B2
1A5C9	0180-2134		CAPACITOR-FXD 20UF+50-10% 100VDC AL	56289	30D206F100EJ6
1A5CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A5CR2	1901-0028	4	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
1A5CR3	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
1A5CR4	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
1A5CR5	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
1A5CR6	1901-0026	14	DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR7	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR8	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR9	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A5CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A5CR12	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A5CR13	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR14	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR15	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR16	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR17	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5CR18	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A5CR19	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A5CR20	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1A5CR21	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A5F1	2110-0004	1	FUSE .25A 250V FAST-BLO 1.25X.25 UL IEC	75915	312.250
1A5F2	2110-0012	2	FUSE .5A 250V FAST-BLO 1.25X.25 UL IEC	75915	312.500
1A5F3	2110-0012		FUSE .5A 250V FAST-BLO 1.25X.25 UL IEC	75915	312.500
1A5MP1	2110-0269	8	FUSEHOLDER-CLIP TYPE .25FUSE	28480	2110-0269
1A5Q1	1853-0020	2	TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
1A5Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A5Q3	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A5Q4	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
1A5Q5	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A5Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A5R1	0684-2251	1	RESISTOR 2.2M 1% .25W FC TC=-400/+1100	01121	CB2251
1A5R2	0684-1031	10	RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A5R3	0698-6734	1	RESISTOR 28.6K .5% .125W F TC=0+-100	24546	C4, T=0
1A5R4	0698-6218	1	RESISTOR 20K .5% .125W F TC=0+-100	24546	C4, T=0
1A5R5	0698-4055	1	RESISTOR 1K .25% .125W F TC=0+-100	03888	PME55-1/8-T0-1001-C
1A5R6	0684-1041		RESISTOR 100K 10% .25W FC TC=-400/+800	01121	CB1041
1A5R7	0684-1041		RESISTOR 100K 10% .25W FC TC=-400/+800	01121	CB1041
1A5R8	0698-3605	2	RESISTOR 15 5% 2W MO TC=0+-200	11502	RG42
1A5R9	0684-1021	8	RESISTOR 1K 10% .25W FC TC=-400/+800	01121	CB1021
1A5R10	0757-0456		RESISTOR 43.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4322-F
1A5R11	0764-0043	1	RESISTOR 2.7K 5% 2W MO TC=0+-200	11502	RG42
1A5R12	0757-0392	1	RESISTOR 43.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-43R2-F
1A5R13	0757-0450	2	RESISTOR 22.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2212-F
1A5R14	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
1A5R15	0757-0110	1	RESISTOR 12.8M 1% .25W F TC=0+-100	19701	MF52C1/4-T0-1282-F
1A5R16	0698-7142	1	RESISTOR 12.3M 1% .25W F TC=0+-100	19701	MF52C-1
1A5R17	0698-3605		RESISTOR 15 5% 2W MO TC=0+-200	11502	RG42
1A5R18	0684-1041		RESISTOR 100K 10% .25W FC TC=-400/+800	01121	CB1041
1A5R19	0684-1021		RESISTOR 1K 10% .25W FC TC=-400/+800	01121	CB1021
1A5R20	0698-5831	1	RESISTOR 5MK 10% .25W FC TC=-400/+800	01121	CB5031
1A5R21	0698-3443	1	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
1A5R22	0757-0750	1	RESISTOR 6.81K 1% .25W F TC=0+-100	19701	MF52C-1
1A5R23	0684-3331		RESISTOR 33K 10% .25W FC TC=-400/+800	01121	CB3331
1A5R24	0684-4741		RESISTOR 470K 10% .25W FC TC=-800/+900	01121	CB4741
1A5R25	0757-0757		RESISTOR 15K 1% .25W F TC=0+-100	19701	MF52C-1
1A5R26	0684-4741		RESISTOR 470K 10% .25W FC TC=-800/+900	01121	CB4741
1A5R27	0757-0389	1	RESISTOR 33.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-33R2-F
1A5R28	0757-0433		RESISTOR 3.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3321-F
1A5R29	2100-0935	1	RESISTOR-TRMR 1K 20% CC SIDE-ADJ 1-TRN	71590	70-1 SERIES S
1A5R30	0698-3264	1	RESISTOR 11.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1182-F
1A5R31	0684-3321	2	RESISTOR 3.3K 10% .25W FC TC=-400/+700	01121	CB3321
1A5VR1	1902-3357	2	DIODE-ZNR 56.2V 5% DO-7 PD=.4W TC=+.081%	04713	SZ 10939-398
1A5VR2	1902-0038	1	DIODE-ZNR 5.76V 10% DO-7 PD=.4W	04713	SZ 10939-112
1A5VR3	1902-3357		DIODE-ZNR 56.2V 5% DO-7 PD=.4W TC=+.081%	04713	SZ 10939-398
1A5VR4	1902-0018	1	DIODE-ZNR 1N941 11.7V 5% DO-7 PD=.5W	04713	1N941
1A6	01201-66511	2	BOARD ASSEMBLY, HIGH VOLTAGE REGULATOR	28480	01201-66511
1A6C1	0150-0096	2	CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0150-0096
1A6C2	0160-0163	1	CAPACITOR-FXD .033UF +-10% 200WVDC POLYE	56289	292P33392
1A6C3	0150-0091	1	CAPACITOR-FXD 1.5PF +-.25PF 500WVDC CER	28480	0150-0091
1A6C4	0150-0096		CAPACITOR-FXD .05UF +80-20% 100WVDC CER	28480	0150-0096
1A6C5	0180-0109	1	C:FXD ELECT 10 UF 100VDCW	56289	40D106F100DW 6M1
1A6C6	0160-3008	5	CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3008
1A6C7	0160-3008		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3008
1A6C8	0160-3007	6	CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3007
1A6C9	0160-3007		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3007
1A6C10	0160-3007		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3007
1A6C11	0160-0165	2	CAPACITOR-FXD .05UF +-10% 200WVDC POLYE	56289	292P56392
1A6C12			NOT ASSIGNED		
1A6C13	0160-2403	1	CAPACITOR-FXD 1500PF +-20% 5000WVDC CER	28480	0160-2403
1A6C14	0160-0165		CAPACITOR-FXD .056UF +-10% 200WVDC POLYE	56289	292P56392
1A6C15	0180-0091		CAPACITOR-FXD 10UF+50-10% 100VDC AL	56289	300106F100DC2
1A6C16	0180-0116	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	1500685X9035B2
1A6C17	0160-0162	3	CAPACITOR-FXD .022UF +-10% 200WVDC POLYE	56289	292P22392
1A6CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A6CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A6CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A6CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A6CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A6CR6	1901-0033	1	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
1A6CR7	1901-0049	1	DIODE-PWR RECT 50V 750MA DO-29	28480	1901-0049
1A6CR8	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A6CR9	1901-0045	5	DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
1A6CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040

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
1A6CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A6L1	9140-0129	2	COIL-MLD 220UH 5% Q=65 .155DX.375LG	24226	15/223
1A6L2	9140-0129		COIL-MLD 220UH 5% Q=65 .155DX.375LG	24226	15/223
1A6L3	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	24226	15/222
1A6MP1	1205-0095		HEAT SINK TO-5/TO-39-PKG	28480	1205-0095
1A6MP2	01201-01101	1	HEAT SINK, TRANSISTOR	28480	01201-01101
1A6MP3	0340-0451	1	INSUL/TOR-XSTR MICA	72983	14852600F03
1A6Q1	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A6Q2	1853-0037	1	TRANSISTOR PNP SI TO-39 PD=1W FT=100MHZ	28480	1853-0037
1A6Q3	1854-0271	1	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0271
1A6Q4	1854-0582	1	TRANSISTOR NPN SI PD=21W FT=10MHZ	28480	1854-0582
1A6Q5			NOT ASSIGNED		
1A6Q6	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
1A6Q7	1855-0057		TRANSISTOR J-FET N-CHAN D-MODE SI	28480	1855-0057
1A6R1	0757-0941	1	RESISTOR 5.1K 2% .125W F TC=0+-100	24546	C4-1/8-T0-5101-G
1A6R2	0757-0123	2	RESISTOR 34.8K 1% .125W F TC=0+-100	24546	C4, T-0
1A6R3	0698-3158	1	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
1A6R4	0687-1211	1	RESISTOR 120 10% .5W CC TC=0+520	01121	EB1211
1A6R5	0698-8397	1	RESISTOR 8.32K 1% 1W F TC=0+-100	19701	MF8C1-T0-8321-F
1A6R6	0698-8398	1	RESISTOR 8.75K 1% 1W F TC=0+-100	19701	MF8C1-T0-8751-F
1A6R7	0757-0280	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
1A6R8	0757-0757		RESISTOR 15K 1% .25W F TC=0+-100	19701	MF52C-1
1A6R9	0757-0456		RESISTOR 43.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4322-F
1A6R10	0757-0411	1	RESISTOR 332 1% .125W F TC=0+-100	24546	C4-1/8-T0-332R-F
1A6R11	2100-2692	1	RESISTOR-TRMR 1M 20% C SIDE-ADJ 1-TRN	30983	ET50X105
1A6R12	0698-8719	1	RESISTOR 20M 10% 1W CF TC=0+-5000	07716	CCR-7
1A6R13	0688-1051		RESISTOR 1M 10% .25W FC TC=-800/+900	01121	CB1051
1A6R14	0687-2221	1	RESISTOR 2.2K 10% .5W CC TC=0+647	01121	EB2221
1A6R15	2100-2580	1	RESISTOR-TRMR MLTSECT 2 SECT	71590	70-2 SERIES 5
1A6R16	0687-5631	1	RESISTOR 56K 10% .5W CC TC=0+765	01121	EB5631
1A6R17	0698-3817	1	RESISTOR 23.7K 1% .5W F TC=0+-100	91637	MFF-1/2-10
1A6R18	0757-0309	1	RESISTOR 61.9K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-6192-F
1A6R19	0686-1511	1	RESISTOR 150 10% .25W FC TC=-400/+600	01121	CB1511
1A6R20	0686-2211		RESISTOR 220 10% .25W FC TC=-400/+600	01121	CB2211
1A6R21			NOT ASSIGNED		
1A6R22	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
1A6R23			NOT ASSIGNED		
1A6R24	0686-1241	1	RESISTOR 120K 10% .25W FC TC=-800/+900	01121	CB1241
1A6R25	0757-0135	1	RESISTOR 511K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-5113-F
1A6R26	0698-6018	1	RESISTOR 30M 1% 3W CF TC=0+-100	03888	PVC175-3-T0-3004-F
1A6R27	0687-2751	1	RESISTOR 2.7M 10% .5W CC TC=0+1000	01121	EB2751
1A6R28	0693-6851	2	RESISTOR 6.8M 10% 2W CC TC=0+1000	01121	HB6851
1A6R29	0693-6851		RESISTOR 6.8M 10% 2W CC TC=0+1000	01121	HB6851
1A6R30	0698-6851	2	RESISTOR 6.49K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-6491-D
1A6R31	0698-6851		RESISTOR 6.49K .5% .125W F TC=0+-50	24546	NC4-1/8-T2-6491-D
1A6R32	0687-1001	1	RESISTOR 10 10% .5W CC TC=0+412	01121	EB1001
1A6R33	0684-4701	2	RESISTOR 47 10% .25W FC TC=-400/+500	01121	CB4701
1A6R34	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5111-F
1A6VR1	2140-0013	2	LAMP-GLOW 5AB-A 70/57VDC 300UA T-2 BULB	74276	NE23A
1A6VR2	2140-0013		LAMP-GLOW 5AB-A 70/57VDC 300UA T-2 BULB	74276	NE23A
1A7	01201-66510		BOARD ASSEMBLY, HIGH VOLTAGE RECTIFIER	28480	01201-66510
1A7C1	0160-3008		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3008
1A7C2	0160-3007		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3007
1A7C3	0160-3008		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3008
1A7C4	0160-3007		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3007
1A7C5	0160-3008		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3008
1A7C6	0160-3007		CAPACITOR-FXD 4700PF +-20% 4000WVDC CER	28480	0160-3007
1A7CR1	1901-0683	2	DIODE-HV RECT 18KV 5MA 250NS	28480	1901-0683
1A7CR2	1901-0683		DIODE-HV RECT 18KV 5MA 250NS	28480	1901-0683
1A7MP1	5040-0402	1	MOUNT:TRANSFORMER	28480	5040-0402
1A7MP2	5040-0430	1	MOUNT:TRANSFORMER	28480	5040-0430
1A7R1	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A7R2	0684-1531	2	RESISTOR 15K 10% .25W FC TC=-400/+800	01121	CB1531
1A7T1	01201-61102	1	TRANSFORMER ASSEMBLY, HIGH VOLTAGE	28480	01201-61102
1A8	01201-66502		BOARD ASSEMBLY, STORAGE PULSE	28480	01201-66502
1A8C1	0160-0153	1	CAPACITOR-FXD 1000PF +-10% 200WVDC POLYE	56289	292P10292
1A8C2	0160-2146	3	CAPACITOR-FXD .02UF +80-20% 100WVDC CER	28480	0160-2146
1A8C3	0160-2146		CAPACITOR-FXD .02UF +80-20% 100WVDC CER	28480	0160-2146
1A8C4	0160-0159	1	CAPACITOR-FXD 3000PF +-2% 300WVDC MICA	72136	DM19F302G030WV1CR
1A8C5	0160-2210	1	CAPACITOR-FXD 470PF +-5% 300WVDC MICA	28480	0160-2210

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
1A8C6	0160-0154	1	CAPACITOR-FXD 2200PF +-10% 200WVDC POLYE	56289	292P22292
1A8C7	0180-0228		CAPACITOR-FXD 22UF +-10% 15VDC TA	56289	150D226X9015B2
1A8C8	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
1A8C9	0180-1795	1	CAPACITOR-FXD 22UF +-20% 70VDC TA	56289	109D226X0100F2
1A8C10	0180-1746	2	CAPACITOR-FXD 15UF +-10% 20VDC TA	56289	150D156X902082
1A8C11	0160-2146		CAPACITOR-FXD .02UF +80-20% 100WVDC CER	28480	0160-2146
1A8C12	0180-0058	1	CAPACITOR-FXD 50UF +75-10% 25VDC AL	56289	30D506G025CC2
1A8C13	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
1A8C14	0180-0230	1	CAPACITOR-FXD 1UF +-20% 50VDC TA	56289	150D105X0050A2
1A8C15	0150-0093		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0150-0093
1A8C16	0160-0168		CAPACITOR-FXD .1UF +-10% 200WVDC POLYE	56289	292P10492
1A8C17	0180-0089	1	CAPACITOR-FXD 10UF +50-10% 150VDC AL	56289	30D106F150DD2
1A8C18	0180-1834	1	CAPACITOR-FXD 15UF +-20% 50VDC TA	56289	150D156X0050R2
1A8CR1	1901-0025	20	DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR2	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR3			NOT ASSIGNED		
1A8CR4	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A8CR5	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR6	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A8CR7	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR8	1901-0418	1	DIODE-PWR RECT 400V 1.5A	04713	SR1846-12
1A8CR9	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR10	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR11	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR12	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR13	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR14	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR15	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR16	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR17	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR18	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR19	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR20	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR21	1901-0045		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
1A8CR22	1901-0045		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
1A8CR23	1901-0045		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
1A8CR24	1901-0045		DIODE-PWR RECT 100V 750MA DO-29	28480	1901-0045
1A8CR26	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR26	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR27	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR28	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A8CR29	1901-0025		DIODE-GEN PRP 100V 200MA DO-7	28480	1901-0025
1A8CR30	1901-0026		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
1A8F1	2110-0033	1	FUSE .75A 250V NORM-BLO 1.25X.25	75915	FDZ-750V3/4AS
1A8MP1	2110-0269		FUSEHOLDER-CLIP TYPE .25 FUSE	28480	2110-0269
1A8Q1	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
1A8Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A8Q3	1853-0020		TRANSISTOR PNP SI PD=300MW FT=150MHZ	28480	1853-0020
1A8Q4	1855-0317	1	TSTR:UNIJUNCTION SI	04713	MU4894
1A8Q5	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A8Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A8Q7	1854-0254	1	TRANSISTOR NPN SI TO-5 PD=800MW	28480	1854-0254
1A8Q8	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S1[illegible]43
1A8Q9	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S1[illegible]43
1A8Q10	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A8Q11	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A8Q12	1854-0234		TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	02735	2N3440
1A8Q13	1854-0234		TRANSISTOR NPN 2N3440 SI TO-5 PD=1W	02735	2N3440
1A8Q14	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
1A8Q15	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
1A8Q16	1854-0022		TRANSISTOR NPN SI TO-39 PD=700MW	07263	S17843
1A8Q17	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A8R1	0757-0463	1	RESISTOR 82.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8252-F
1A8R2	0757-0954	2	RESISTOR 18K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1802-G
1A8R3	0757-0857	1	RESISTOR 82.5K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-8252-F
1A8R4	0757-0972		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A8R5	0757-0838	1	RESISTOR 3.9K 2% .125W F TC=0+-100	24546	C4-1/8-T0-3901-G
1A8R6	0757-0831		RESISTOR 2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2001-G
1A8R7	0757-0948	4	RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A8R8	0757-0123		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4, T-0
1A8R9	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
1A8R10	0757-0446	1	RESISTOR 15K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1502-F
1A8R11	0757-0462	1	RESISTOR 75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7502-F
1A8R12	0757-0926	1	RESISTOR 1.2K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1201-G
1A8R13	0684-1011		RESISTOR 100 10% .25W FC TC=-400/+500	01121	CB1011
1A8R14	0684-1831	1	RESISTOR 18K 10% .25W FC TC=-400/+800	01121	CB1831
1A8R15	0757-0942		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A8R16	0757-0961	3	RESISTOR 13K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1302-G
1A8R17	0757-0948		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A8R18	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A8R19	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A8R20	0757-0955	1	RESISTOR 20K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2002-G
1A8R21	2100-2216	1	RESISTOR-TRMR 5K 10% C TOP ADJ 1-TRN	73138	62-208-1
1A8R22	2100-2030	1	RESISTOR-TRMR 20K 10% C TOP ADJ 1-TRN	73138	62-210-1
1A8R23	0698-3101	1	RESISTOR 2.87K 1% .5W F TC=0+-100	91637	MFF-1/2-10
1A8R24	0757-0836	1	RESISTOR 7.5K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-7501-F
1A8R25	0761-0007	1	RESISTOR 27K 5% 1W MO TC=0+-200	11502	RG32

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
1A8R26	0684-2201		RESISTOR 22 10% .25W FC TC=-400/+500	01121	CB2201
1A8R27	0684-4731		RESISTOR 47K 10% .25W FC TC=-400/+800	01121	CB4731
1A8R28	0684-4731		RESISTOR 47K 10% .25W FC TC=-400/+800	01121	CB4731
1A8R29	0757-0832	1	RESISTOR 4.75K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-4751-F
1A8R30	0684-8201	1	RESISTOR 82 10% .25W FC TC=-400/+500	01121	CB8201
1A8R31	0757-0976		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A8R32	0760-0009	1	RESISTOR 20K 2% 2W MO TC=0+-200	11502	RG42
1A8R33	0757-0976		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A8R34	0684-1021		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
1A8R35	0698-4937	1	RESISTOR 45.3K 1% .5W F TC=0+-100	91637	MFF-1/2-10
1A8R36	0757-0464	1	RESISTOR 90.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-9092-F
1A8R37	0757-0933	1	RESISTOR 2.4K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2401-G
1A8R38	0698-3263	1	RESISTOR 500K 1% .125W F TC=0+-100	91637	MFF-1/8, T-1
1A8R39	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A8R40	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A8R41	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A8R42	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A8R43	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A8R44	0757-0948		RESISTOR 10K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A8R45	0757-0954		RESISTOR 18K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1802-G
1A8R46	0757-0951		RESISTOR 13K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1302-G
1A8R47	0757-0976		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A8R48	0758-0046	1	RESISTOR 6.2K 5% .25W F TC=0+-100	27167	CS
1A8R49	2100-0983	1	RESISTOR-TRMR MLTSECT 3 SECT	71590	70-3
1A8R50	0757-0972		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A8R51	0757-0972		RESISTOR 100K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1002-G
1A8R52	0757-0930		RESISTOR 1.8K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1801-G
1A8R53	0757-0934	1	RESISTOR 2.7K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2701-G
1A8R54	0757-0957	1	RESISTOR 24K 2% .125W F TC=0+-100	24546	C4-1/8-T0-2402-G
1A8R55	2100-2695	1	RESISTOR-TRMR MLTF CT 3 SECT	71590	70-3
1A8R56	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A8R57	0684-2741	1	RESISTOR 270K 10% .25W FC TC=-800/+900	01121	CB2741
1A8R58	0684-4741		RESISTOR 470K 10% .25W FC TC=-800/+900	01121	CB4741
1A8R59	0684-8231	1	RESISTOR 82K 10% .25W FC TC=-400/+800	01121	CB8231
1A8R60	0684-4731		RESISTOR 47K 10% .25W FC TC=-400/+800	01121	CB4731
1A8R61	0684-4731		RESISTOR 47K 10% .25W FC TC=-400/+800	01121	CB4731
1A8R62	0757-0951		RESISTOR 13K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1302-G
1A8R63	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A8R64	0811-1671	1	RESISTOR 2.7 5% 2W PW TC=0+-400	75042	BWH2-2R7-J
1A8R65	0684-6821	1	RESISTOR 6.8K 10% .25W FC TC=-400/+700	01121	CB6821
1A8R66	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A8R67	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	24546	C4-1/8-T0-10R0-F
1A8R68	0757-0976		RESISTOR 150K 2% .125W F TC=0+-100	24546	C4-1/8-T0-1502-G
1A8R69	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5621-F
1A8R70	0757-0450		RESISTOR 22.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2212-F
1A8R71	0684-2221	1	RESISTOR 2.2K 10% .25W FC TC=-400/+700	01121	CB2221
1A8R72	0684-4701		RESISTOR 47 10% .25W FC TC=-400/+500	01121	CB4701
1A8R73	0767-0014	1	RESISTOR 1.5K 5% 3W MO TC=0+-250	27167	FP3-3-250-1501-J
1A8R74	0764-0033	1	RESISTOR 33 5% 2W MO TC=0+-200	11502	RG42
1A8R75	0684-1021		RESISTOR 1K 10% .25W FC TC=-400/+600	01121	CB1021
1A8R76	0684-2241		RESISTOR 220K 10% .25W FC TC=-800/+900	01121	CB2241
1A8R77	0684-3321		RESISTOR 3.3K 10% .25W FC TC=-400/+700	01121	CB3321
1A8R78	0757-0388	1	RESISTOR 30.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-30R1-F
1A8R79	0684-1041		RESISTOR 100K 10% .25W FC TC=-400/+800	01121	CB1041
1A8R80	0698-3423		RESISTOR 46.4K 1% .5W F TC=0+-100	91637	MFF-1/2-10
1A8R81	0757-0451	1	RESISTOR 43.2K 1% .5W F TC=0+-100	19701	MF7C1/2-T0-4322-F
1A8R82	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-5112-F
1A8R83	0684-1231		RESISTOR 12K 10% .25W FC TC=-400/+800	01121	CB1231
1A8R84	0684-1531		RESISTOR 15K 10% .25W FC TC=-400/+800	01121	CB1531
1A8R85	0684-2231		RESISTOR 22K 10% .25W FC TC=-400/+800	01121	CB2231
1A8R86	0684-1841	1	RESISTOR 180K 10% .25W FC TC=-800/+900	01121	CB1841
1A8SCR1	1884-0070	1	THYRISTOR-SCR JEDEC 2N5060	04713	2N5060
1A8VR1	1902-3203	1	DIODE-ZNR 14.7V 5% DO-7 PD=.4W TC=+.057%	28480	1902-3203
1A8VR2	1902-3323	1	DIODE-ZNR 42.2V 5% DO-7 PD=.4W TC=+.08%	04713	SZ 10939-362
1A8VR3	1902-0172	1	DIODE-ZNR 17.8V 10% DO-7 PD=.4W	04713	SZ 10939-253
1A8VR4	1902-3393	1	DIODE-ZNR 75V 5% DO-7 PD=.4W TC=+.077%	28480	1902-3393
1A8VR5	1902-3108	1	DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.01%	15818	CD 35624
1A9	01201-66501		BOARD ASSEMBLY, STORAGE SWITCH	28480	01201-66501
1A9C1	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
1A9C2	0160-0162		CAPACITOR-FXD .022UF +-10% 200WVDC POLYE	56289	292P22392
1A9C3	0160-0162		CAPACITOR-FXD .022UF +-10% 200WVDC POLYE	56289	292P22392
1A9R1	0684-3901	1	RESISTOR 39 10% .25W FC TC=-400/+500	01121	CB3901
1A9R2	0684-1031		RESISTOR 10K 10% .25W FC TC=-400/+700	01121	CB1031
1A9R3	0684-3311	1	RESISTOR 330 10% .25W FC TC=-400/+600	01121	CB3311
1A9R4	0684-1011		RESISTOR 100 10% .25W FC TC=-400/+500	01121	CB1011

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
1A8A1	3101-1374	1	SWITCH ASSY, DPDT, INCL S1	28480	3101-1374
1A8A2	3101-1372	1	SWITCH ASSY, DPDT, INCL S2A, S3A, S4, S5	28480	3101-1372
1A8A3	3101-1373	1	SWITCH ASSY, DPDT, INCL S2B, S3B	28480	3101-1373
1A10	01201-61103		ASSEMBLY, HIGH VOLTAGE TRIPLER (NON-REPAIRABLE)	28480	01201-61103
1A10MP1	00180-41214	1	CLAMP, CRT LEAD	28480	00180-41214
1A10MP2	01201-25202	1	HOUSING, HIGH VOLTAGE SUPPLY	28480	01201-25202
1A10MP3	01201-27601	1	COVER, HIGH VOLTAGE CONNECTOR	28480	01201-27601
1A10W1	01201-61603	1	LEAD, POST ACCELERATOR	28480	01201-61603
1A11	01201-66509		BOARD ASSEMBLY, DEFLECTION	28480	01201-66509
1A11C1	0160-2306	1	CAPACITOR-FXD 27PF +-5% 300WVDC MICA	28480	0160-2306
1A11CR1	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A11CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A11CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A11CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A11CR5	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
1A11Q1	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A11Q2	1853-0062	1	TRANSISTOR PNP SI PD=300MW FT=200MHZ	28480	1853-0062
1A11Q3	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A11Q4	1854-0215		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	SPS 3611
1A11R1	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
1A11R2	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
1A11R3	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
1A11R4	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
1A11R5	0757-0730	1	RESISTOR 750 1% .25W F TC=0+-100	19701	MF52C-1
1A11R6	0757-0749	1	RESISTOR 6.19K 1% .25W F TC=0+-100	19701	MF52C-1
1A11R7	0764-0003	1	RESISTOR 3.3K 5% 2W MO TC=0+-200	11502	RG42
1A11R8	0684-4711		RESISTOR 470 10% .25W FC TC=-400/+600	01121	CB4711
			OPTION 008		
1J201	1250-0083	1	CONNECTOR: RF BNC FEM SGL HOLE, HORIZ	24931	28JR-130-1
1J202	1251-0038	2	CONNECTOR: 3-PIN FEM VERT A	04486	CA-3106A10SL-3S-A105
1J203	1251-0038		CONNECTOR: 3-PIN FEM VERT B	04486	CA-3106A10SL-3S-A105
1J204	1251-0039	2	CONNECTOR: 3-PIN MALE EXTERNAL MATING FOR J202 AND J203	04486	CA-3102A10SL-3P-A105
1J205	1251-0039		CONNECTOR: 3-PIN MALE EXTERNAL MATING FOR J202 AND J203	04486	CA3102A10SL-3P-A105
1MP201	1250-0083	2	HOOD, SERIES UHF PANEL MTG RECEPT	28480	1250-0083
1MP202	1251-0236	2	CABLE CLAMP-CIRC STD CONNECTOR	04486	CA3057-4A-A105
1W201	01200-61620	1	CABLE ASSY, HORIZONTAL	28480	01200-61620
1W202	01200-61621	1	CABLE ASSY: VERT A (INCLUDES MP201 AND J204)	28480	01200-61621
1W203	01200-61622	1	CABLE ASSY: VERT B (INCLUDES MP201 AND J205)	28480	01200-61622
			OPTION 009		
1A8	01201-66507	1	BOARD ASSY: STORAGE PULSE	28480	01201-66507
1A8A1	01201-66502	1	BOARD ASSY: STANDARD	28480	01201-66502
1A8CR901	1901-0025	1	DIODE-GEN PRP 100V 200NA DO-7	28480	1901-0025
1A8K901L1	0490-0191	1	COIL: RELAY 600 OHM NOM 12 VDC	04501	U-12P
1A8K901S1	0490-0199	1	SWITCH-MAG REED FORM A 12 VA 0.5A 300V	28480	0490-0199
J807	1510-0087	1	BINDING POST SGL 6-32 JGK/BLK THD STD	28480	1510-0087
MP901	7120-0254	1	NAMEPLATE, HEWLETT-PACKARD COMPANY	28480	7120-0254
			OPTION 580		
MP501	5955-0123	1	LABEL, OPTION 580	28480	5955-0123
MP502	7120-4835	1	LABEL, CSA CERTIFICATION	28480	7120-4835
			OPTION 631		
V1	5083-2575	1	CRT: P31 PHOSPHOR, NON ALUMINIZED, NON GRATICULE	28480	5083-2575

Table 6-3. List of Manufacturers' Codes

Mfr Code	Manufacturer Name	Address	Zip Code
00327	WELWYN INTERNATIONAL INC	WESTLAKE OH	44091
01121	ALLEN BRADLEY CO	MILWAUKEE WI	53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75231
02440	THOMPSON BREMER DIV VAR	CHICAGO IL	60630
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE NJ	08876
03508	GE CO SEMICONDUCTOR PROD DEPT	SYRACUSE NY	13201
03888	KDI PYROFILM CORP	WHIPPANY NJ	07981
04486	ITT CANNON ELECTRIC	SANTA ANA, CA	92711
04501	COTO COIL CO INC	PROVIDENCE RI	02940
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94040
07716	TRW INC BURLINGTON DIV	BURLINGTON IA	52601
10582	CTS OF ASHVILLE INC	SKYLAND NC	28776
11236	CTS OF BERNE INC	BERNE IN	46711
11502	TRW INC BOONE DIV	BOONE NC	28607
12697	CLAROSTAT MFG CO INC	DOVER NH	03820
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW CA	94040
19701	MEPCO/ELECTRA CORP	MINERAL WELLS TX	76067
24226	GOWANDA ELECTRONICS CORP	GOWANDA NY	14070
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
24931	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS IN	46227
27167	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON NC	28401
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
30983	MEPCO/ELECTRA CORP	SAN DIEGO CA	92121
32997	SPECTRUM CONTROL INC	FAIRVIEW PA	16415
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
71400	BUSSMAN MFG DIV OF MCGRAW EDISON CO	ST LOUIS MO	63017
71590	CENTRALAB ELEK DIV GLOBE-UNION INC	MILWAUKEE WI	53201
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC CT	06226
72982	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE PA	16512
72983	ESSEX INTERNATIONAL INC	FORT WAYNE IN	46804
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
73734	FEDERAL SCREW PRODUCTS CO	CHICAGO IL	60618
73743	FISCHER SPECIAL MFG CO	CINCINNATI OH	45206
74276	SIGNALITE INC	NEPTUNE NJ	07753
74970	JOHNSON E F CO	WASECA MN	56093
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTLEFUSE INC	DES PLAINES IL	60016
76854	OAK IND INC SW DIV	CRYSTAL LAKE IL	60014
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN IL	60126
82389	SWITCHCRAFT INC	CHICAGO IL	60630
84411	TRW CAPACITOR DIV	OGALLALA NE	69153
91637	DALE ELECTRONICS INC	COLUMBUS NE	68601
91802	INDUSTRIAL DEVICES INC	EDGEWATER NJ	07020

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 instruments having the same serial prefix shown on the manual title page. If the serial prefix of your instrument is not the same as the one on the title page, find your serial prefix in table 7-1 and make all changes to the manual that are listed for that serial prefix. When making changes listed in table 7-1, make the change with the highest number first. For 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
901- (1201A)	1-9, 12-16
901- (1201B)	1-8, 10-16
922- (1201A)	2-9, 12-16
922- (1201B)	2-8, 10-16
924- (1201A)	3-9, 12-16
924- (1201B)	3-8, 10-16
976- (1201A)	4-9, 12-16
977- (1201B)	4-8, 10-16
977- (1201A)	5-9, 12-16
978- (1201B)	5-8, 10-16
1117A (1201A)	6-9, 12-16
1120A (1201B)	6-8, 10-16
1128A (1201A)	7-9, 12-16
1130A (1201B)	7, 8, 10-16
1141A (1201A)	8, 9, 12-16
1144A (1201B)	10-16
1201A (1201A)	12-16
1201A (1201B)	11-16
1216A (1201A)	13-16
1209A (1201B)	12-16
1234A (1201A)	14-16
00917, 00919, 00921-00923, 00926, 00929, 00931, 00933-00938, 00941 and above	
1234A (all other 1201A)	13-16
1251A (1201A)	14-16
1216A (1201B)	13-16
1245A, 1250A (1201B)	14-16
1311A (1201A)	15, 16
1306A, 1311A (1201B)	15, 16
1331A (1201A)	16
1330A (1201B)	16

CHANGE 1

Table 6-2,
Change HP Part No. 01200-40503 to 01200-40501.
1A8C7: Change to HP Part No. 0180-0049, C: fxd al elect 20 UF —10 +75% 50 wVdc.
1A8C9: Change to HP Part No. 0180-1746, C: fxd tant elect 15 UF 10% 20 wVdc.
Delete: 1A8C18.
1A8R38: Change to HP Part No. 0757-0482, R: fxd metflm 511K ohms 1% 1/8W.
Figure 8-39,
1A8C7: Change value to 20 UF.
1A8C9: Change value to 15 UF.

CHANGE 2

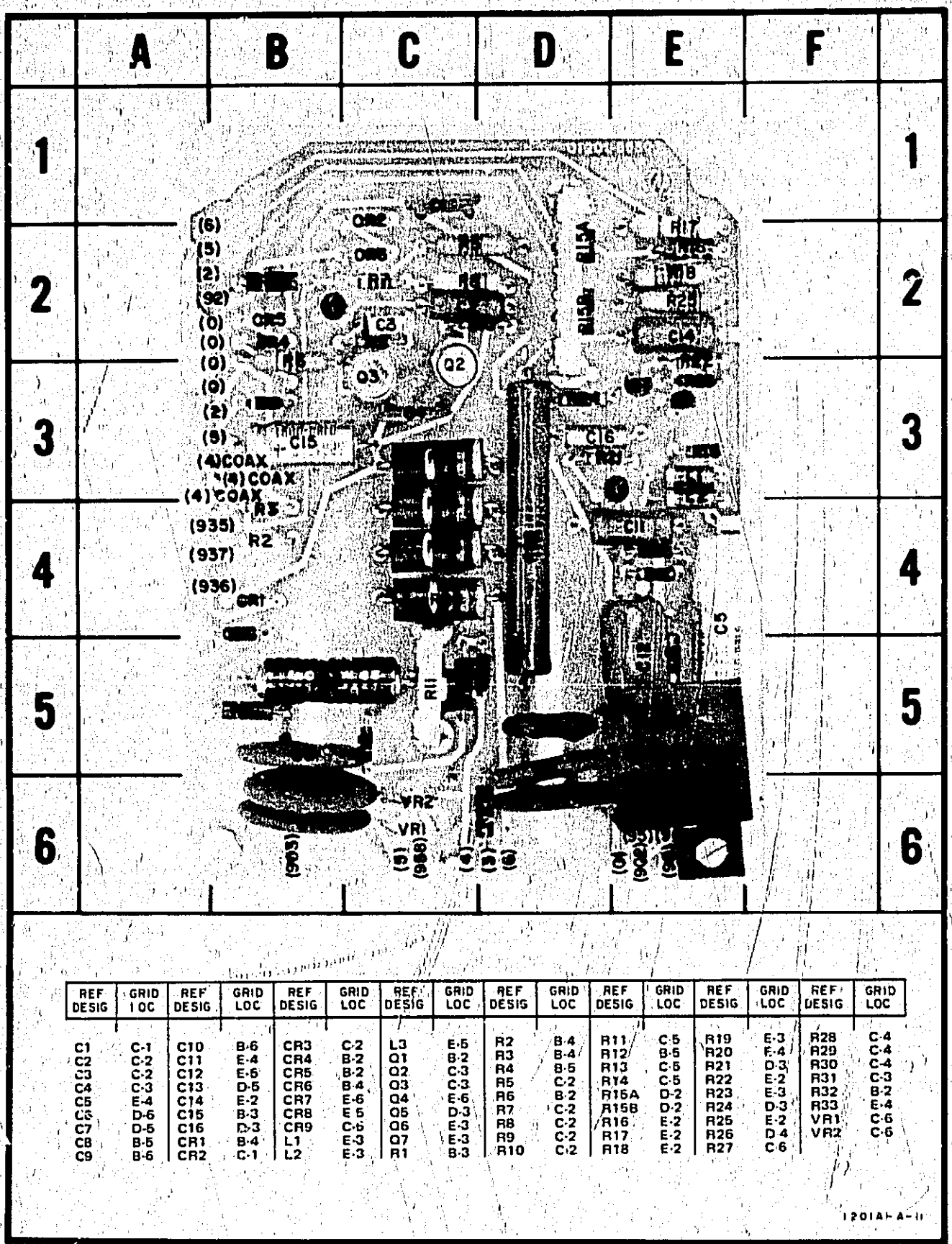
Table 1-1,
Change erase time to approximately 1 sec.
Table 6-2,
1A1A1: Change to HP Part No. 01200-66501.

CHANGE 3

Table 6-2,
1A6: Change to HP Part No. 01201-66503.
Add: 1A6Q5, HP Part No. 1854-0071, Q: Si npn.
Delete: 1A6C17, 1A6CR10, and 1A6CR11.
Add: 1A6R21, 0757-0280, R: fxd metflm 1000 ohms 1% 1/8W.
Add: 1A6R23, 0698-3451, R: fxd metflm 133 k ohms 1% 1/8W.
Delete: 1A6R34.
Figure 8-45,
Replace with figure 7-1.
Figure 8-46,
Modify schematic according to figure 7-2.

CHANGE 4

Table 6-2,
1W1: Change to HP Part No. 8120-1202, W: power cable.
Delete: 1W2.



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-1	C10	B-6	CR3	C-2	L3	E-5	R2	B-4	R11	C-5	R19	E-3	R28	C-4
C2	C-2	C11	E-4	CR4	B-2	Q1	B-2	R3	B-4	R12	B-5	R20	F-4	R29	C-4
C3	C-2	C12	E-5	CR5	B-2	Q2	C-3	R4	B-5	R13	C-5	R21	D-3	R30	C-4
C4	C-3	C13	D-5	CR6	B-4	Q3	C-3	R5	C-2	R14	C-5	R22	E-2	R31	C-3
C5	E-4	C14	E-2	CR7	E-6	Q4	E-6	R6	B-2	R15A	D-2	R23	E-3	R32	B-2
C6	D-6	C15	B-3	CR8	E-5	Q5	D-3	R7	C-2	R15B	D-2	R24	D-3	R33	E-4
C7	D-5	C16	D-3	CR9	C-6	Q6	E-3	R8	C-2	R16	E-2	R25	E-2	VR1	C-6
C8	B-5	CR1	B-4	L1	E-3	Q7	E-3	R9	C-2	R17	E-2	R26	D-4	VR2	C-6
C9	B-6	CR2	C-1	L2	E-3	R1	B-3	R10	C-2	R18	E-2	R27	C-6		

Figure 7-1. Replacement for Figure 8-45 (High-voltage Regulator 1A6)

CHANGE 4 (Cont'd)

Table 6-2 (Cont'd),
Add: HP Part No. 01201-20501, Frame: Cabinet rear (Model 1201A only).
Delete: HP Part No. 01201-20503.
Delete: HP Part No. 01201-60503.
Delete: 1J10 and 1S3.
Figure 8-43,
Modify primary wiring portion of LVPS schematic according to figure 7-3.

CHANGE 5

Table 6-2,
1A7: Change to HP Part No. 01201-66504.
1A10: Change to HP Part No. 01201-61101.
Change HP Part No. 01201-27601 to HP Part No. 00180-04101.
Change HP Part No. 01201-25202 to HP Part No. 01201-25201.

CHANGE 6

Table 6-2,
1DS1: Change to HP Part No. 1450-0048.
Add: 1R9, E: 1000 ohm flexible circuit NSR p/o 5083-2100.
Add: 1R10, E: 1000 ohm flexible circuit NSR p/o 5083-2100.
Figure 8-39,
Add: 1R9, 1000 ohms in series with (946) wire from CR8.
Add: 1R10, 1000 ohms in series with (945) wire from CR8.

CHANGE 7

Table 6-2,
Delete: 1W3.

CHANGE 8

Table 6-2,
Delete: 1A11, 1A11C1, 1A11CR1 - CR5, 1A11Q1 - Q4, 1A11R1 - R8.
Delete: Figures 8-47 and 8-48.

CHANGE 9

Table 6-2,
1V1: Change to HP Part No. 5083-2100, TQ1, V: CRT.
1W3: Change to HP Part No. 01201-61624, W: main, 1201A only.
Change HP Part No. 01200-04114 to HP Part No. 01200-04013.
Change HP Part No. 01200-64105 to HP Part No. 01200-64104.
Change HP Part No. 01201-00205 to HP Part No. 01201-00203.
Change HP Part No. 01200-04113; TQ 1; Cover, CRT, 1201A only; to HP Part No. 01200-04105; TQ1; Cover, CRT.

CHANGE 10

Table 6-2,
Change HP Part No. 01701-04108; TQ 1; Cover: CRT, 1201B only; to HP Part No. 01200-04105; TQ 1; Cover, CRT.
Change HP Part No. 01201-00206 to HP Part No. 01201-00201.

CHANGE 11

Table 6-2,
1V1: Change to HP Part No. 5083-2100.
Delete: 1W4.

CHANGE 12

Table 6-2, Chassis Miscellaneous,
Delete: HP Part No. 5060-0548; TQ 1; Kit, contrast filter.

CHANGE 13

Table 6-2,
1V1: Change to HP Part No. 5083-9182.
Delete: 1A8R83, 1A8R84, and 1A8R85.
Figure 8-39,
Modify circuit as shown in figure 7-4.

CHANGE 14

Table 6-2,
1A6: Change to HP Part No. 01201-66508.
1A6R11: Change to HP Part No. 2100-0981; R: var 1 megohm 20% 1/2W.

CHANGE 15

Table 6-2,
Add: 1A8CR3; HP Part No. 1901-0026; CR: Si.
Delete: 1A8R86.
Figure 8-37,
Change R86 to CR3.
Figure 8-39,
Add: 1A8CR3, anode to ground, in place of 1A8R86.

CHANGE 16

Table 6-2,
1A1, 1A2: Change HP Part No. to 01200-63504.
1A1A1, 1A2A1: Change HP Part No. to 01200-66516.
1A1A1C3, 1A1A1C15, 1A2A1C3, 1A2A1C15: Change to HP Part No. 0160-3127, C: fxd mylar 0.022 µF 5% 400 wVdc.
1A1A1C7, 1A1A1C8, 1A2A1C7, 1A2A1C8: Change to HP Part No. 0150-0084, C: fxd cer 0.1 µF +80-20% 100 wVdc.

CHANGE 16 (Cont'd)

Table 6-2 (Cont'd),

1A1A1R3, 1A1A1R30, 1A2A1R3, 1A2A1R30: Change to HP Part No. 0757-0342, R: fxd metflm 100 k ohms 1% 1/4 W.

Add: 1A1A1R15, 1A1A1R17, 1A2A1R15, 1A2A1R17: HP Part No. 0757-0433, R: fxd metflm 3320 ohms 1% 1/8 W.

Delete: 1A1A1VR4, 1A1A1VR5, 1A2A1VR4, 1A2A1VR5.

Page 8-13, figure 8-13,

1A1A1C3 and 1A1A1C15: Change value to .022 UF.

1A1A1R3 and 1A1A1R30: Change value to 100K.

1A1A1C7 and 1A1A1C8: Change value to 0.1 UF.

1A1A1VR5: Change symbol to resistor. Designate 1A1A1R15 (3320 ohms).

1A1A1VR4: Change symbol to resistor. Designate 1A1A1R17 (3320 ohms).

Page 8-17, figure 8-19,

1A2A1C3 and 1A2A1C15: Change value to .022 UF.

1A2A1R3 and 1A2A1R30: Change value to 100K.

1A2A1C7 and 1A2A1C8: Change value to 0.1 UF.

1A2A1VR5: Change symbol to resistor. Designate 1A2A1R15 (3320 ohms).

1A2A1VR4: Change symbol to resistor. Designate 1A2A1R17 (3320 ohms).

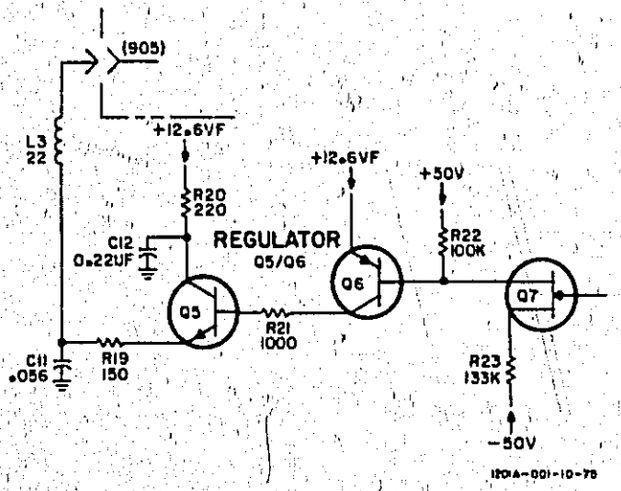


Figure 7-2. High-voltage Power Supply, Modified

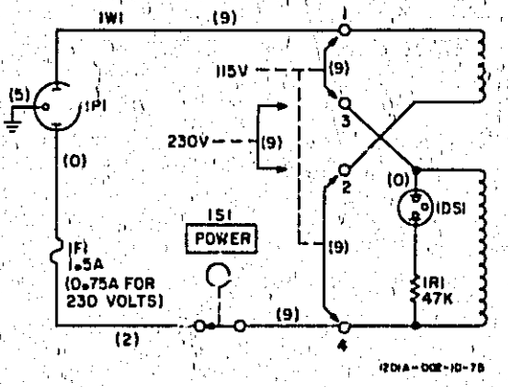


Figure 7-3. Primary Wiring for LVPS Schematic

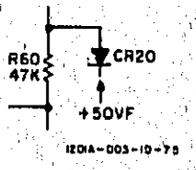


Figure 7-4. Pulse Circuit Modified

SECTION VIII

SCHEMATICS AND TROUBLESHOOTING

8-1. INTRODUCTION.

8-2. This section contains detailed information on repair and replacement, component identification, voltage and waveform measurement conditions, and troubleshooting. This information is all keyed to the appropriate schematic diagram. In this way, all data concerning any specific circuit is located in one place.

8-3. SCHEMATIC DIAGRAMS.

8-4. All schematic diagrams for the Model 1201A/B are in this section. (Refer to the List of Illustrations to find a circuit by description.) All schematic diagrams are drawn to show the electronic function of the circuitry and a given schematic may contain parts of several different physical assemblies. Table 8-1 contains general notes concerning the symbols and conventions used. Schematic diagrams also contain waveform test points and typical DC voltages; waveform and voltage measurement conditions are located adjacent to the appropriate circuit schematic. Note that all schematic diagrams are printed so the entire schematic unfolds outside the right-hand edge of the manual to facilitate reference from text to schematic. Main signal paths may be followed from one circuit to another, in regular sequence, by lining up the right margin of one diagram with the left margin of the next.

8-5. REFERENCE DESIGNATIONS.

8-6. The unit system of reference designations used in this manual is in accordance with the provisions of the American Standard Electrical and Electronics Reference Designations, dated August 1965, published by American Standards Association, Inc. Minor variations, due to design and manufacturing practices not specifically covered by the standard, may be noted. A brief explanation is presented here for those unfamiliar with the unit designation system.

8-7. Each component is identified by a class letter and number. This letter-number combination is the basic designation for each component. Components which are separately replaceable and are a part of an assembly or sub-assembly, have, in addition to the basic designation, a prefix designation which identifies the assembly or sub-assembly on which the basic component is physically located.

8-8. Components not physically located on an assembly or sub-assembly, have their basic reference designation prefixed by the unit designator "1". This has been done to prevent confusion in cases where components, not physically located on an assembly or sub-assembly, are functionally shown on that assembly. The unit "1" prefix indicates a component that is mounted on the chassis and is not a physical part of any module.

8-9. All components shown on the shaded areas of the schematic diagrams are physically located on an etched circuit board and should be prefixed with the assembly number assigned to that circuit board(e.g., resistor R2 on the 1A2 assembly is referred to as 1A2R2). There may also be an R2 on several other schematics but the assembly designation will be different (1A3R2, 1A4R2, etc.); therefore, each component in the instrument has its own unique reference designation.

8-10. In general, the numerical designation of assemblies is based on the physical location of the assemblies in the complete instrument. Assemblies are numbered consecutively, beginning with one. If an assembly number is assigned and later deleted, this number is not reused and is shown in the Replaceable Parts list as "deleted". Schematics also list deleted reference designations.

8-11. COMPONENT IDENTIFCATION.

8-12. Section V contains photographs showing and identifying locations of the adjustments for each of the modules. Components located on etched circuit boards are identified, along with a grid location index, in pictures opposite the applicable schematic diagram. In cases where circuitry appears on more than one schematic, refer to grid index to determine which figure identifies the component of interest.

8-13. TROUBLESHOOTING.

8-14. GENERAL.

8-15. The most important requirement for systematic troubleshooting is a good understanding of the instrument circuits and their operation. Refer to Figure 8-1 for a block diagram and to Section IV for principles of circuit operation. To isolate a trouble to either the oscilloscope mainframe circuits or the vertical or horizontal amplifiers, use the basic operating procedures of Section III to isolate a trouble to a circuit associated with a front panel control. Also check for proper output from low and high voltage power supplies because these voltages affect the CRT display and operation of the amplifiers.

8-16. VISUAL INSPECTION.

8-17. It is recommended that prior to using waveforms and DC voltage checks for troubleshooting, a thorough

visual inspection of the instrument be made. Check for burned or loose components, loose wire connections, faulty switch contacts, cold solder joints, or any other similar condition that would suggest a source of the trouble. If faulty operation persists, proceed to the electrical checkout.

8-18. ELECTRICAL CHECKOUT.

8-19. Typical waveforms are located near the schematic diagram concerned. Before attempting waveform measurements, refer to the table of measurement conditions shown near their respective waveforms. Check waveforms in proper signal flow sequence; an incorrect waveform (or none at all) indicates circuitry likely to be at fault. Test points given on schematic diagrams are shown at an electrical point easily reached on the circuit board at the electrical/physical point of connection. Check typical DC voltages (shown on the schematic) in the suspected circuit to further isolate the trouble to a specific component. Conditions for measuring DC voltages are given adjacent to the appropriate schematic. Always allow time for a stable DC voltage level to be reached before noting a reading. When locating test points on the board assemblies, note that small dots etched on the board identify emitter leads of transistors and cathode leads of diodes.

CAUTION

When measuring DC voltages, use extreme care not to short any supply voltages or components.

Note

Where two DC voltages are shown on schematics (one in parentheses), check carefully for the two different measurements conditions described opposite the schematic. When only one voltage is given, either set of measurement conditions applies.

8-20. REPAIR AND REPLACEMENT.

8-21. Nearly all electrical components are accessible from the component side of the etched circuit boards. Component identification is summarized in Paragraph 8-11. Section VI provides a detailed parts list in Table 6-2 to allow ordering replacements either from Hewlett-Packard or a manufacturer recommended by your Hewlett-Packard Sales/Service Office. Where suitable, transistors in the Model 1201A/B are replaceable by 2N-numbers shown in the Replaceable Parts List. In cases where no 2N-number is listed, the transistor has been manufactured to meet design parameter specifications. These transistors should be ordered through your Hewlett-Packard Sales/Service Office giving the Model and Serial Number of your instrument and the HP Part Number needed.

8-22. Mechanical and miscellaneous electrical parts are also listed in Table 6-2. If satisfactory operation or repair cannot be accomplished, contact the nearest Hewlett-Packard Sales/Service Office shown in the list at the back of this manual. If shipment for repair is recommended, see Section II for repackaging information.

8-23. SERVICING CIRCUIT BOARDS.

8-24. Etched circuit boards in this instrument have components mounted on one side of the board, conductive surfaces on both sides, and plated-through component mounting holes. Hewlett-Packard Service Note M-20E contains useful information on servicing etched circuit boards. Some important considerations are:

a. Use low-heat (37 to 47.5 watts, less than 800°F idling temperature), slightly bent chisel-type (1/16 to 1/8 inch diameter) soldering iron, and small diameter rosin-core solder.

b. Components may be removed by placing the soldering iron on the component lead on either side of the board, and pulling up on the lead. If heat is applied to the component side of the board, greater care is required to avoid damage to the component (especially true for semiconductors). If heat damage is apt to occur, grip the lead (between the component and the soldering iron) with a pair of pliers to provide a heat sink.

c. If a component is obviously damaged or faulty, clip the leads close to the component and then unsolder the leads from the board.

d. Large components such as potentiometers may be removed by rotating the soldering iron from lead to lead and applying steady pressure to lift the part free. The alternative is to clip the leads from a damaged part.

e. Since the conductor portion of the etched circuit board is a metal-plated surface covered with solder, use care to avoid overheating which causes the conductor to lift away from the board. A lifted conductor may be cemented back in place with a quick-drying acetate-base cement (use sparingly) having good insulating qualities. Another method of repair is to solder a section of good conducting wire along the damaged surface.

f. Clear solder from the component hole before inserting a new component lead. Heat the solder in the hole, remove the iron, and quickly insert a pointed, non-metallic object such as a tooth-pick.

g. Shape the new component leads and clip to proper length. Insert the leads into the holes, apply heat, and solder (preferably on the side opposite to the component).

CAUTION

Due to its extreme sensitivity to leakage currents, the 100 uV preamplifier module circuit is covered with Dryfilm. After changing components on this board, be sure all parts of the board are clean.

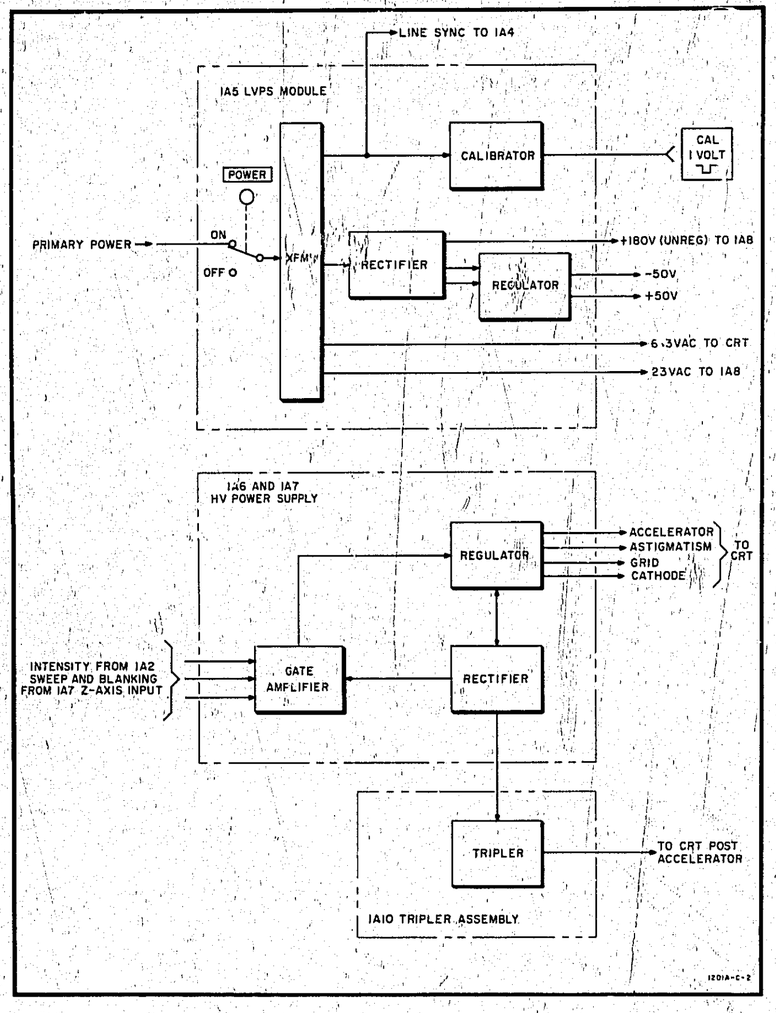


Figure 8-1. Block Diagram, Power Supplies

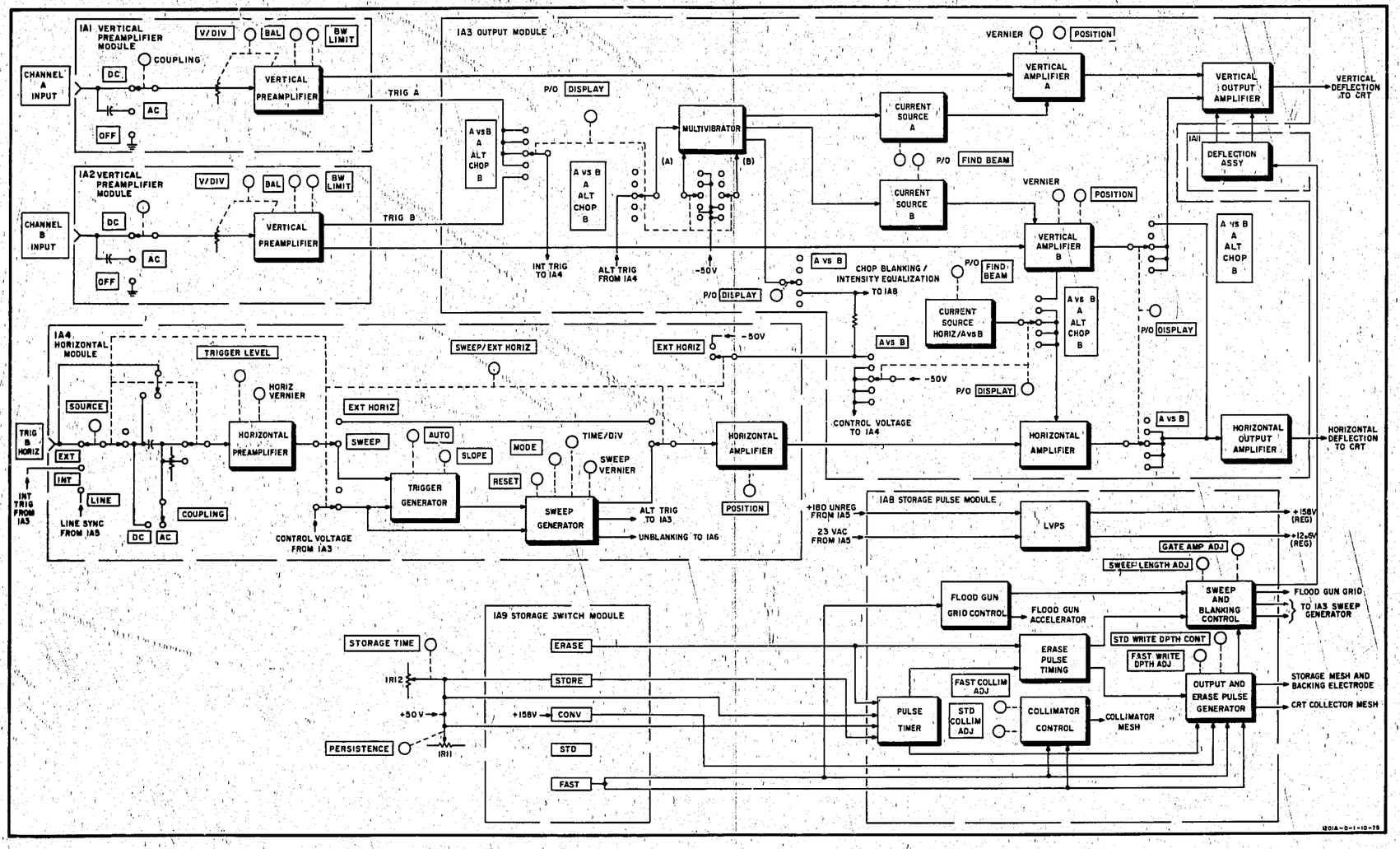


Figure 8-2.
Overall Block Diagram

Table 8-1. Schematic Notes

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

= Etched circuit board

= Front panel marking

= Rear panel marking

= Front panel control

= Screwdriver adjustment

P/O = Part of

CW = Clockwise end of variable resistor

N C = No connection

= Waveform test point (with number)

= Common electrical point (with letter) not necessarily ground

= Single pin connector on board

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

= Main signal path

= Primary feedback path

= Secondary feedback path

* = Optimum value selected at factory, average value shown; part may have been omitted.

= Field effect transistor (N-channel)

= Breakdown diode

= Tunnel diode

= Step recovery diode

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

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

Wire colors are given by numbers in parentheses using the resistor color code [(925) is wht-red-grn].

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

Switch wafers are identified as follows:

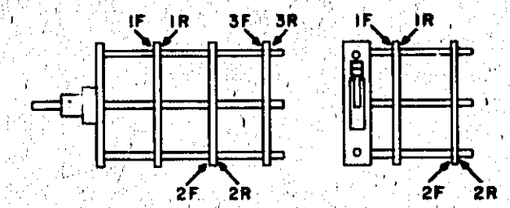


Table 8-2. Troubleshooting Tree Control Settings.

TROUBLESHOOTING TREE CONTROL SETTINGS

VERTICAL:

POSITION A	Center Control
POSITION B	Center Control
DISPLAY	CHOP
+Coupling (A and B)	AC
–Coupling (A and B)	AC
Volts/Division (A and B)	0.2 V/DIV
VERNIER (A and B)	CAL

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	5 MSEC/DIV
SOURCE	INT
SLOPE	+
MODE	NORM
COUPLING	DC
TRIGGER LEVEL/AUTO	AUTO
POSITION	Center Control

INPUT:

1 volt square wave from CAL 1 VOLT ⊓⊔ jack on front panel.

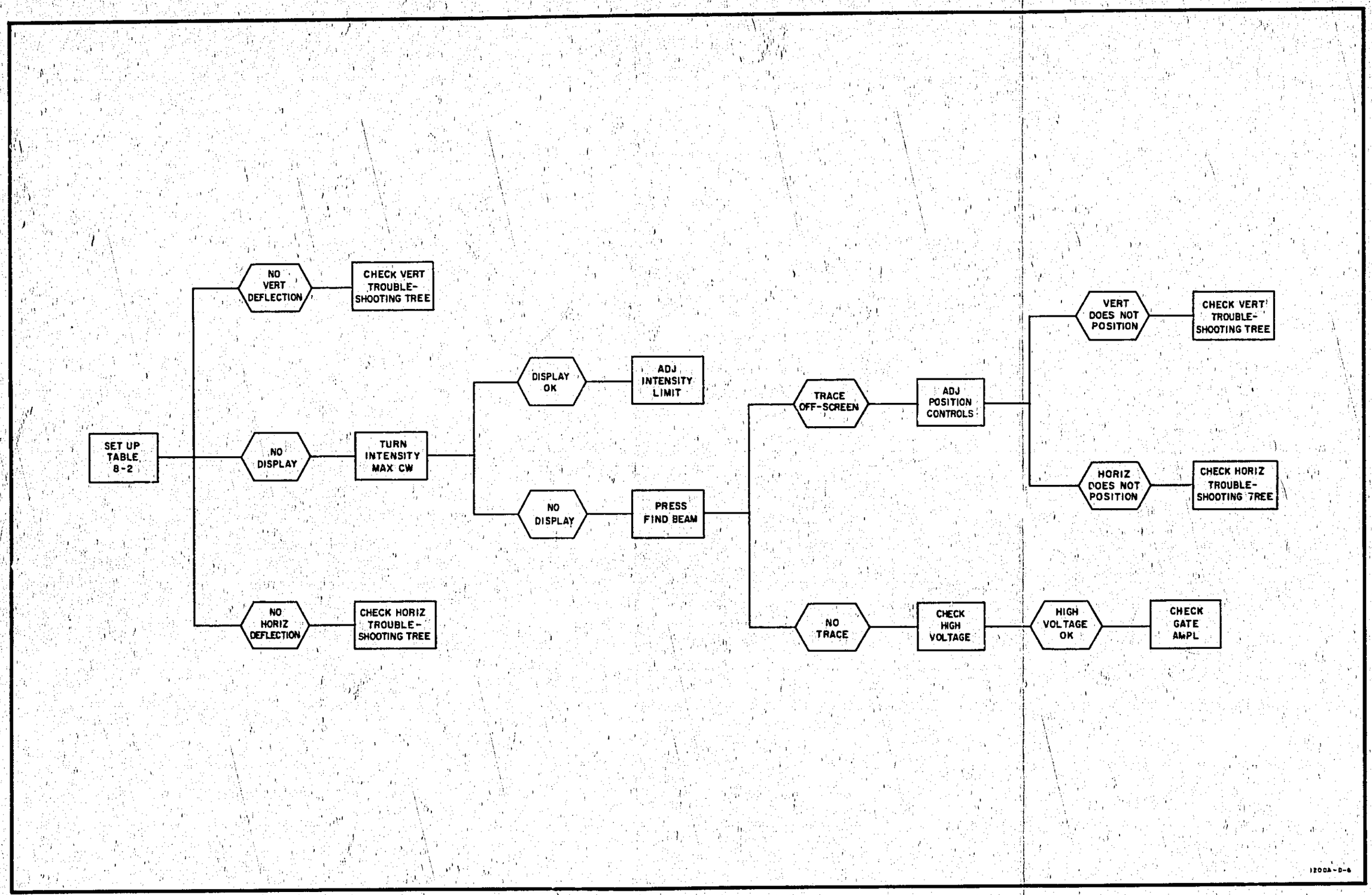


Figure 8-3.
Overall Troubleshooting Tree

Table 8-2. Troubleshooting Tree Control Settings.

TROUBLESHOOTING TREE CONTROL SETTINGS

VERTICAL:

POSITION A	Center Control
POSITION B	Center Control
DISPLAY	CHOP
+Coupling (A and B)	AC
–Coupling (A and B)	AC
Volts/Division (A and B)	0.2 V/DIV
VERNIER (A and B)	CAL

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	5 MSEC/DIV
SOURCE	INT
SLOPE	+
MODE	NORM
COUPLING	DC
TRIGGER LEVEL/AUTO	AUTO
POSITION	Center Control

INPUT:

1 volt square wave from CAL 1 VOLT ⊓⊔ jack on front panel.

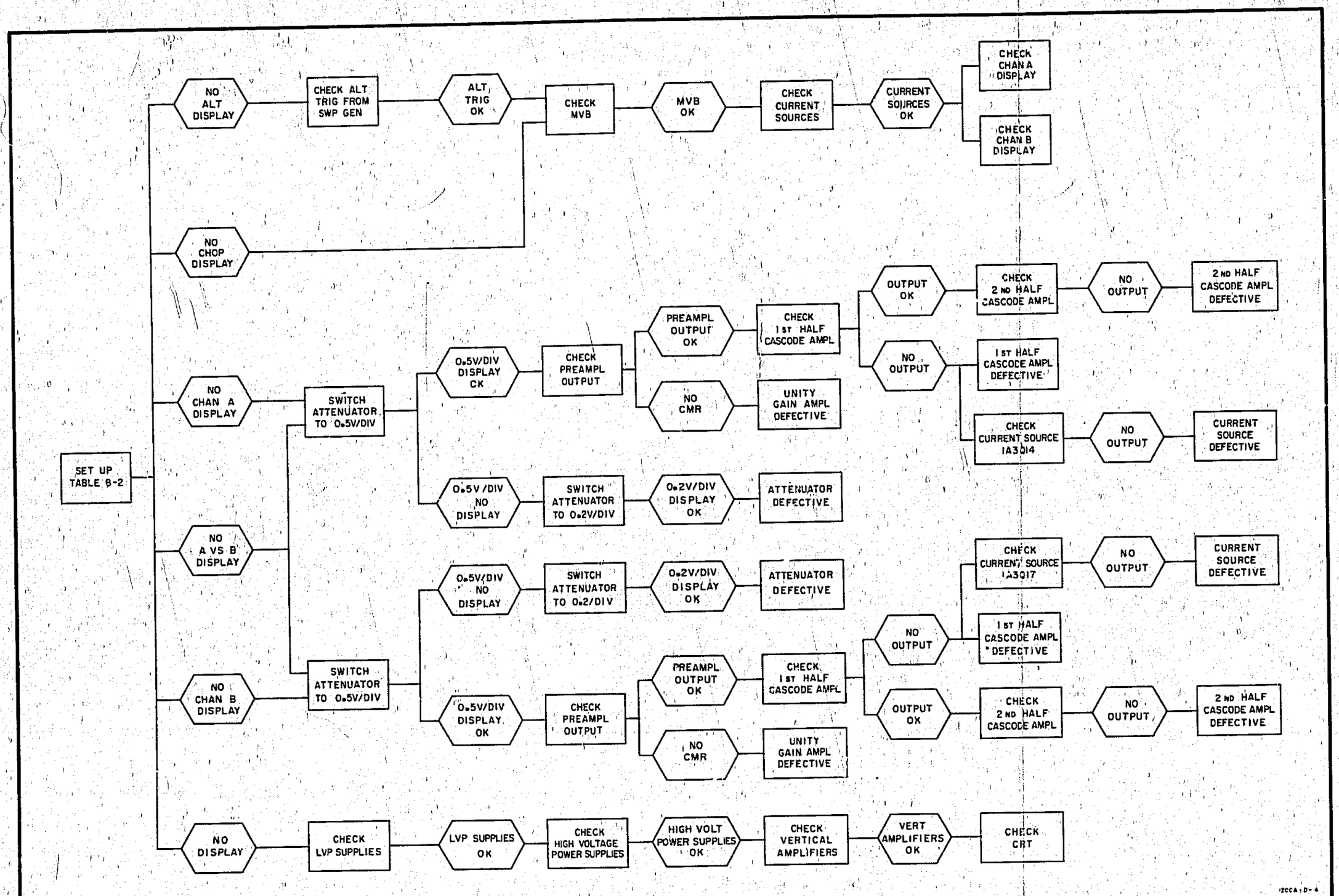


Figure 8-4.
Vertical Troubleshooting Tree

Table 8-2. Troubleshooting Tree Control Settings.

TROUBLESHOOTING TREE CONTROL SETTINGS

VERTICAL:

POSITION A	Center Control
POSITION B	Center Control
DISPLAY	CHOP
+Coupling (A and B)	AC
–Coupling (A and B)	AC
Volts/Division (A and B)	0.2 V/DIV
VERNIER (A and B)	CAL

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	5 MSEC/DIV
SOURCE	INT
SLOPE	+
MODE	NORM
COUPLING	DC
TRIGGER LEVEL/AUTO	AUTO
POSITION	Center Control

INPUT:

1 volt square wave from CAL 1 VOLT ⊓⊔ jack on front panel.

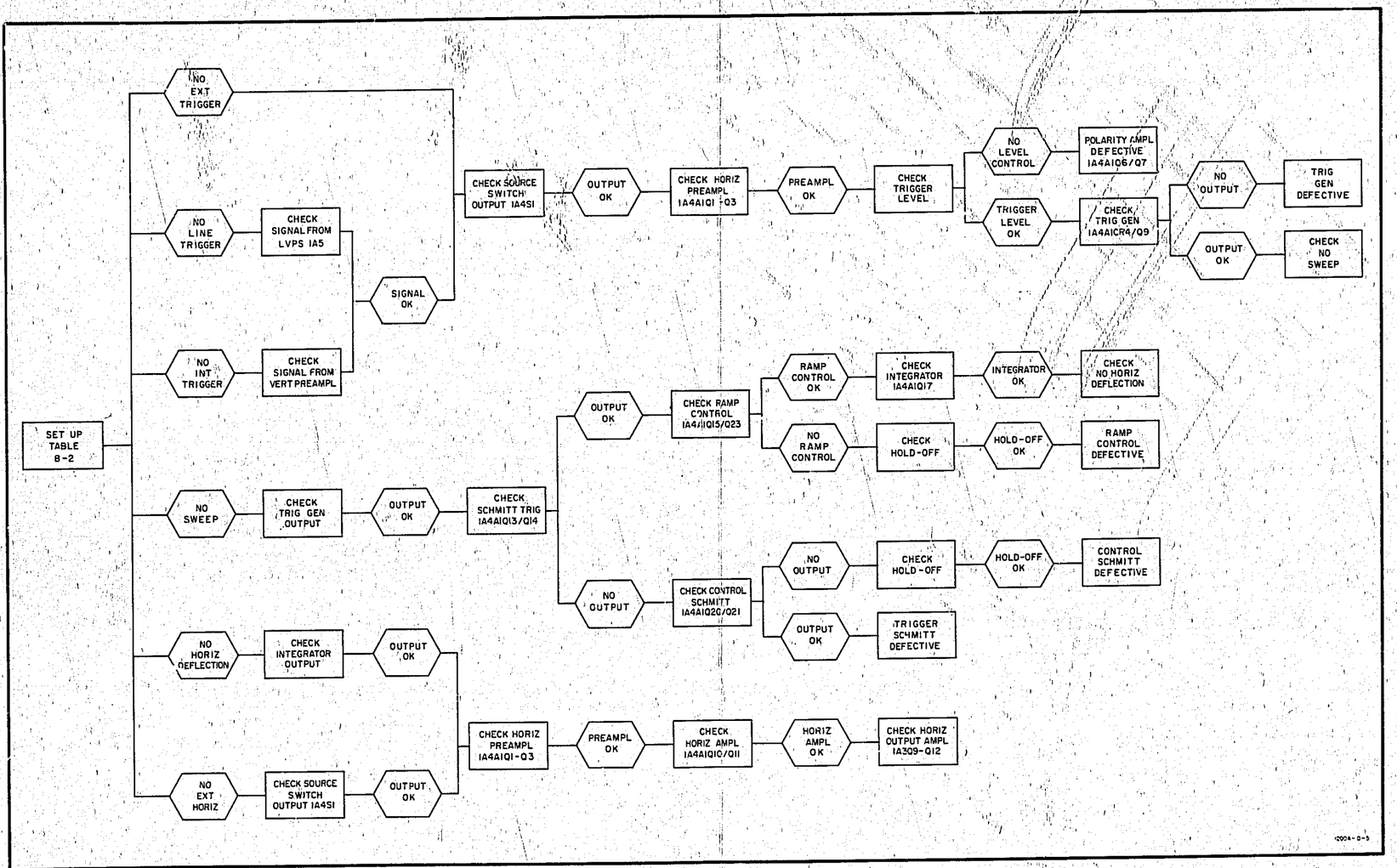


Figure 8-5. Horizontal Troubleshooting Tree

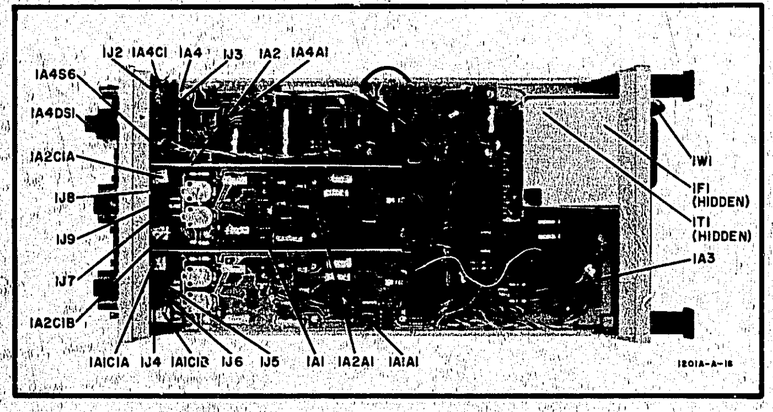


Figure 8-6. Assembly Locations

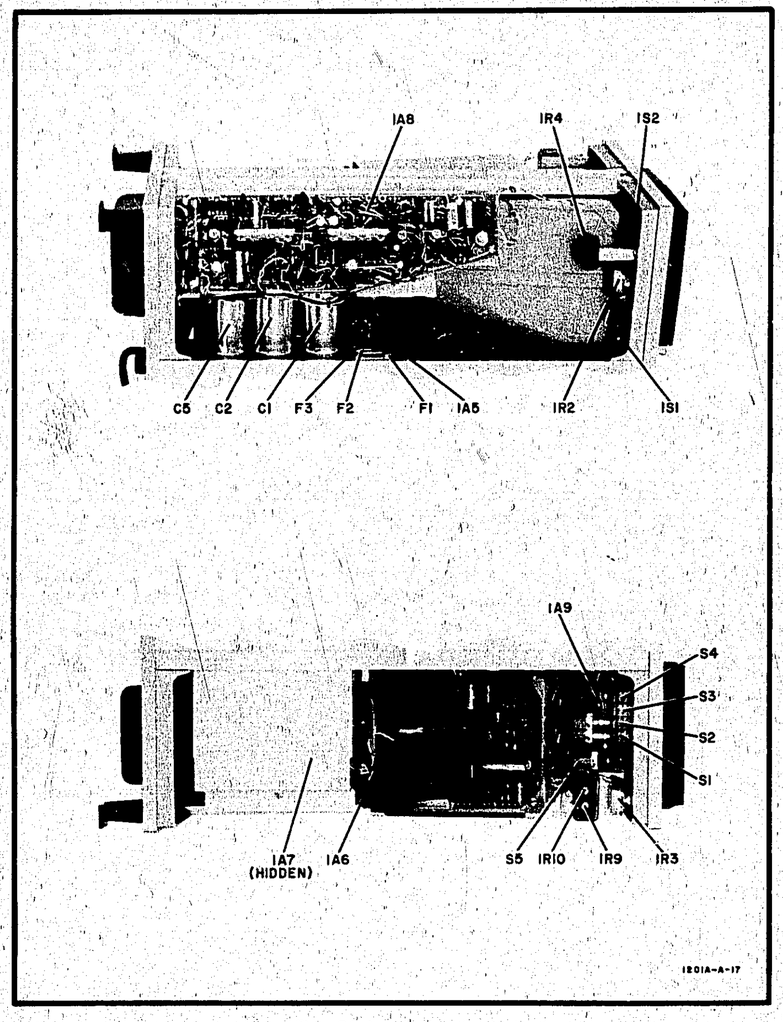


Figure 8-7. Assembly Locations

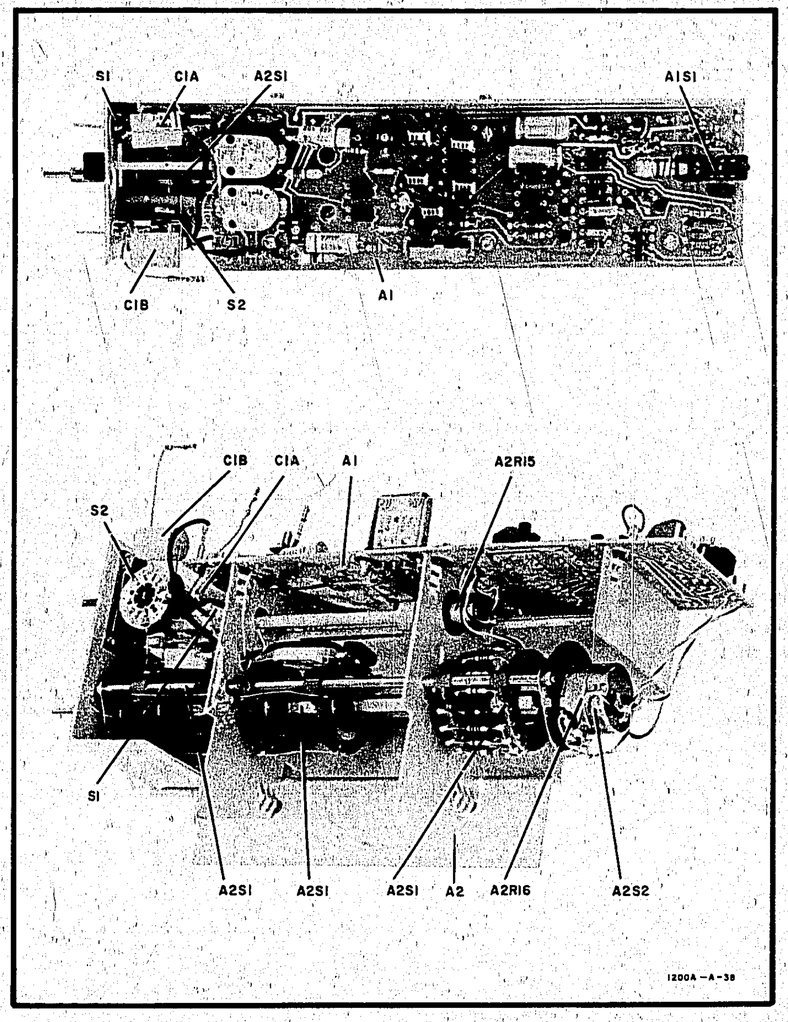


Figure 8-8. 100 uV Preamplifier, 1A1, Assembly Locations

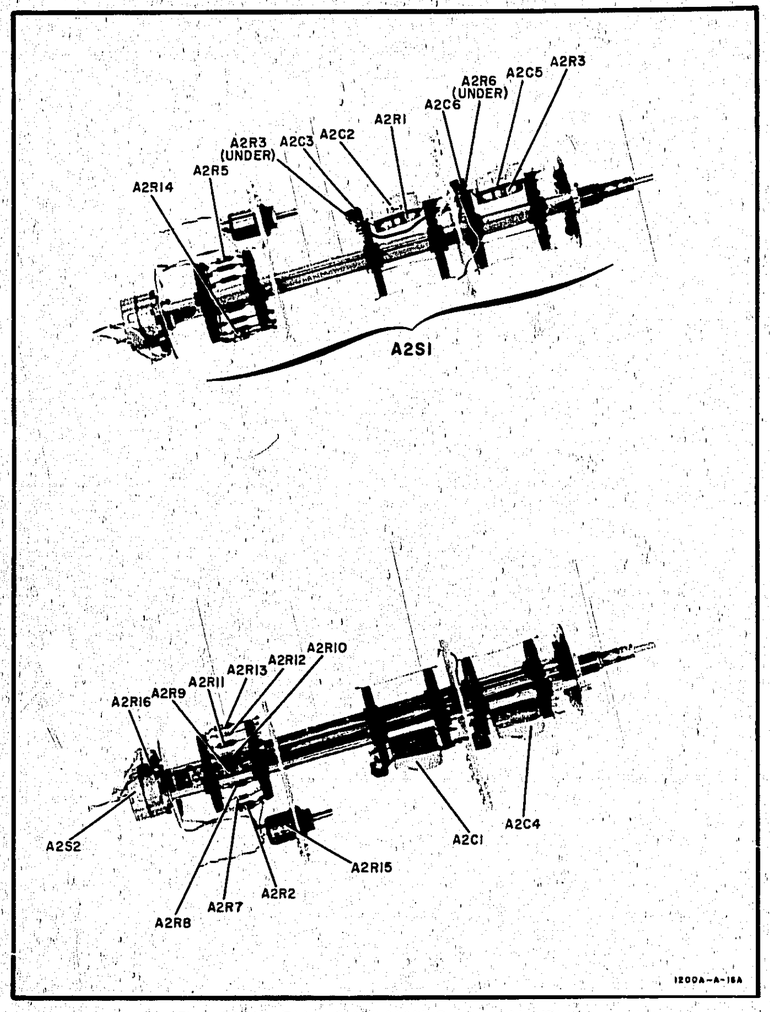
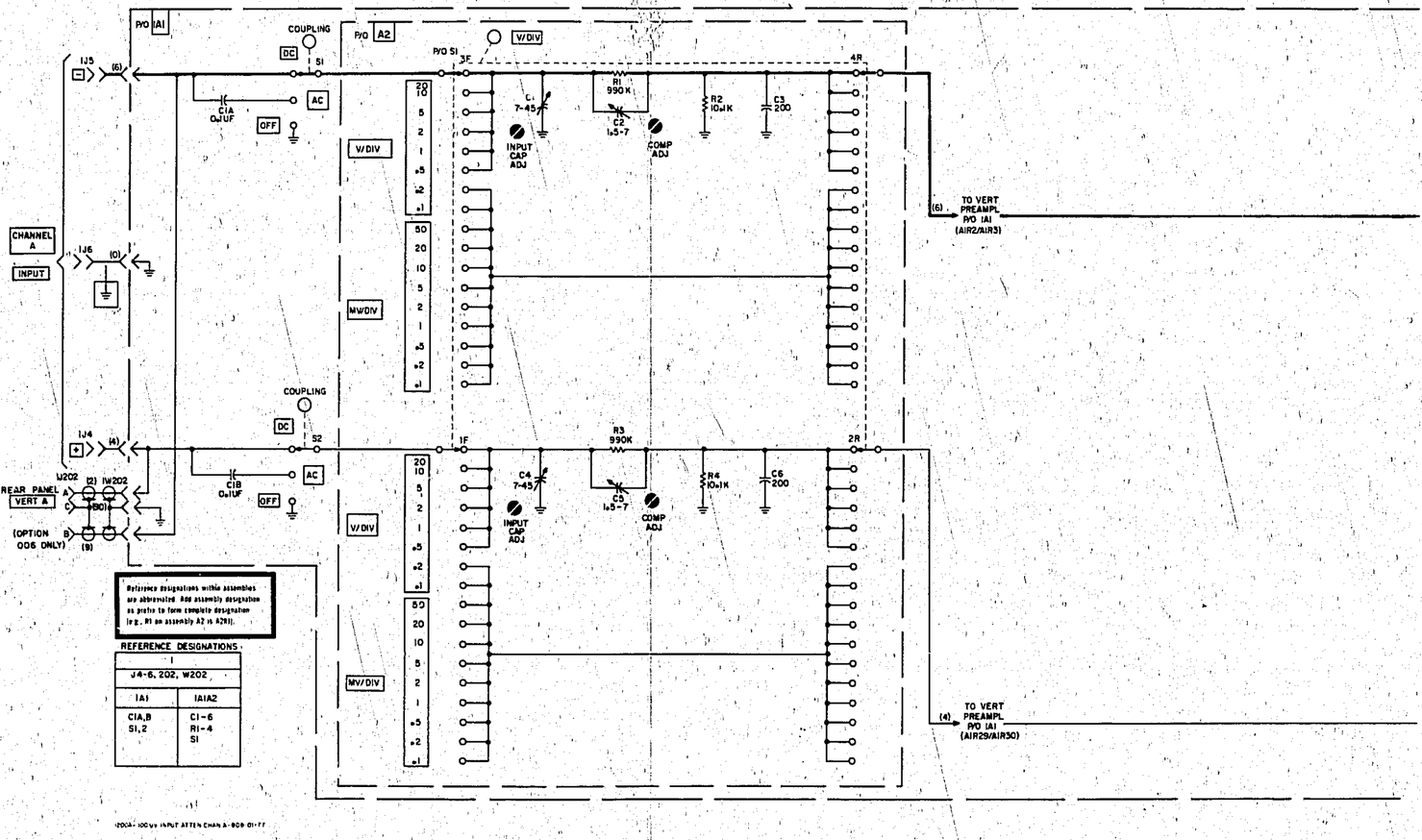
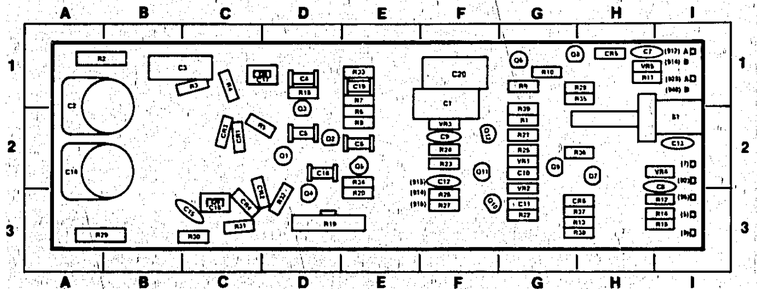


Figure 8-9. Volts/Division Switch, 1A1A2, Component Identification



1200A-100V/V INPUT ATTEN CHAN A-BOB 01-77

Figure 8-10. Input Attenuator, p/o 1A1, Schematic Diagram



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C1	F-1	C11	G-3	CR1	C-2	Q5	E-2	R3	C-1	R13	H-3	R25	G-2	R35	H-1
C2	A-1	C12	F-2	CR2	C-3	Q6	G-1	R4	C-1	R14	I-3	R26	F-3	R36	H-2
C3	B-1	C13	I-2	CR3	C-2	Q7	H-2	R5	D-2	R16	I-3	R27	F-3	R37	H-3
C4	D-1	C14	A-2	CR4	C-3	Q8	G-1	R6	E-2	R18	D-1	R28	H-1	R38	H-3
C5	D-2	C15	C-3	CR5	H-1	Q9	G-2	R7	E-1	R19	D-3	R29	A-3	R39	G-2
C6	E-2	C16	C-3	CR6	H-3	Q10	F-3	R8	E-2	R20	E-3	R30	C-3	S1	I-2
C7	H-1	C17	D-1	Q1	D-2	Q11	F-2	R9	G-1	R21	G-2	R31	C-3	VR1	G-2
C8	I-2	C18	D-2	Q2	D-2	Q12	F-2	R10	G-1	R22	G-3	R32	D-3	VR2	G-3
C9	F-2	C19	E-1	Q3	D-2	R1	G-2	R11	H-1	R23	F-2	R33	E-1	VR3	F-2
C10	G-2	C20	F-1	Q4	D-3	R2	A-1	R12	H-3	R24	F-2	R34	E-2	VR4 VR5	I-2 H-1

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Figure 8-11. Vertical Preamplifier, 1A1A1, Component Identification

Table 8-3. Channel A Vertical Preamplifier Measurement Conditions.

DC VOLTAGE MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	OFF
–Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	EXT HORIZ
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

WAVEFORM MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	AC
–Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	0.2 MSEC/DIV
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

INPUT SIGNAL:

CHANNEL A	1 kHz Sine Wave 5 volts peak-to-peak
CHANNEL B	NONE

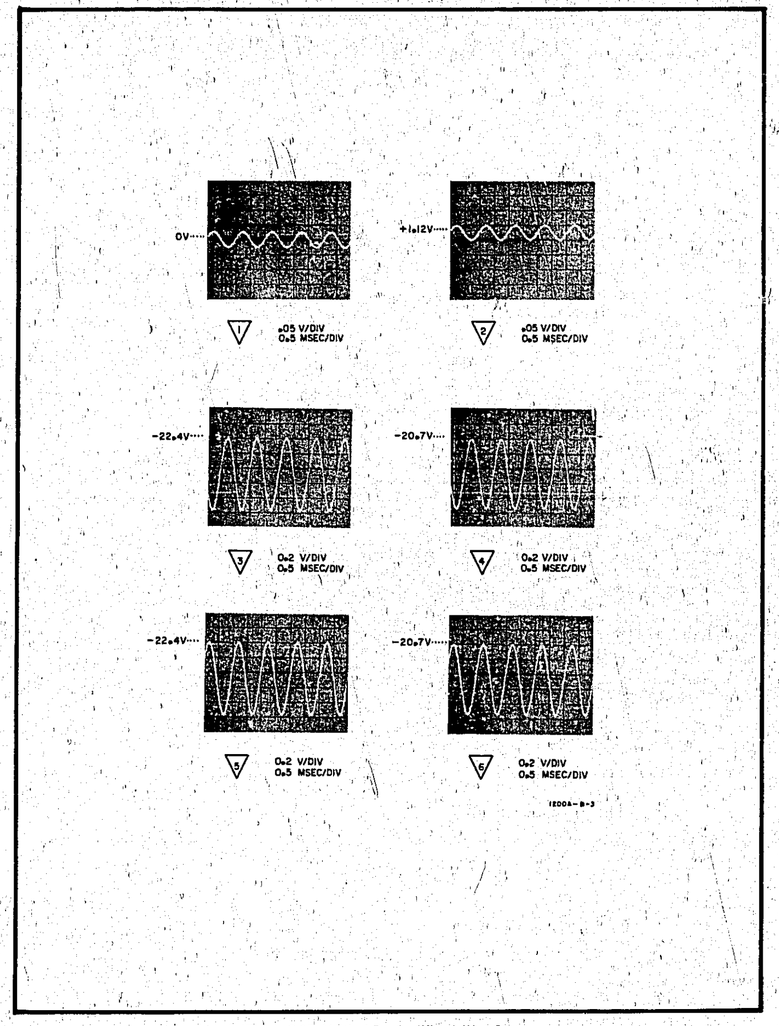


Figure 8-12. Vertical Preamplifier A Waveforms

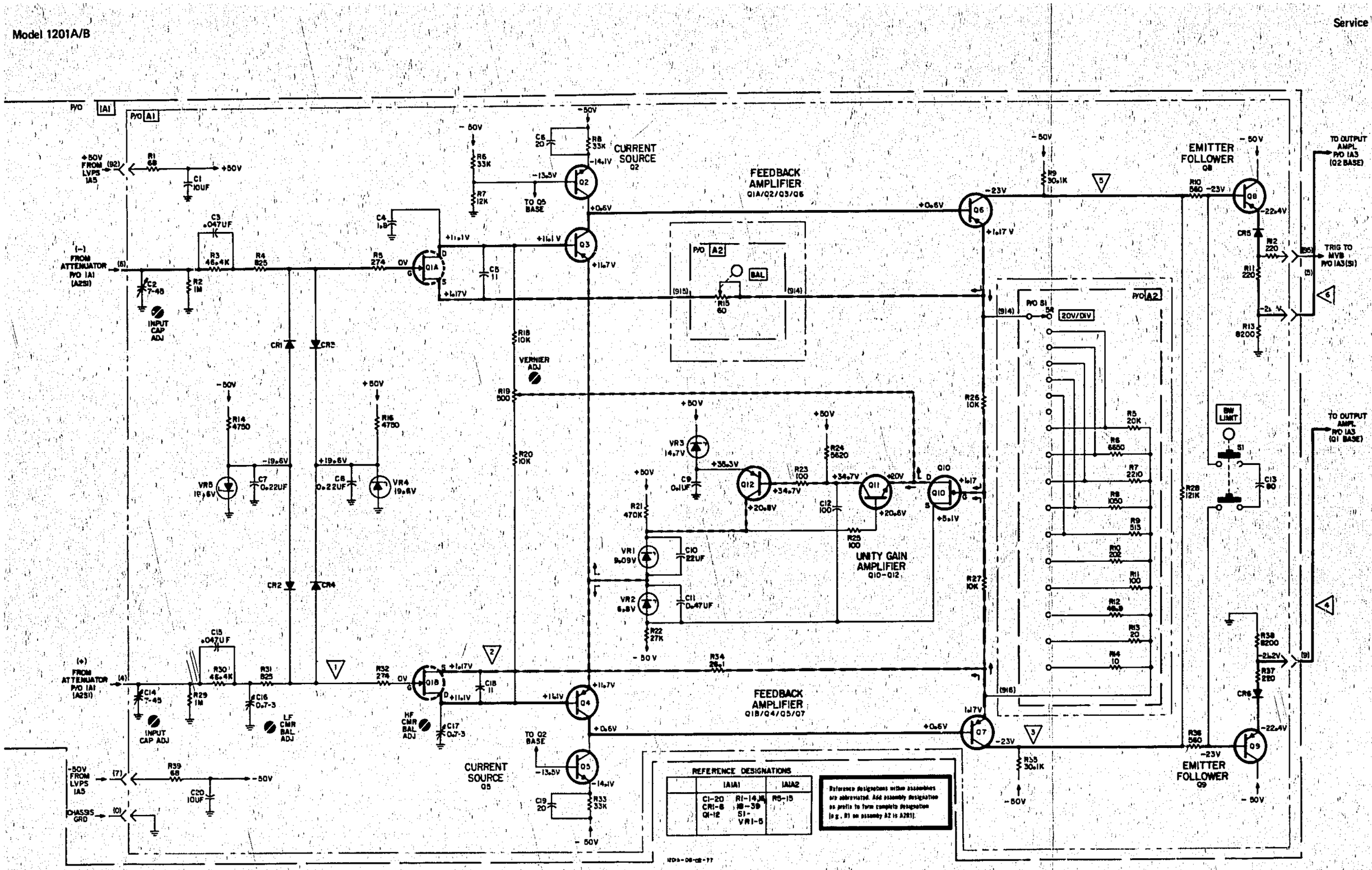


Figure 8-13.
Vertical Preamplifier A, p/o 1A1, Schematic Diagram

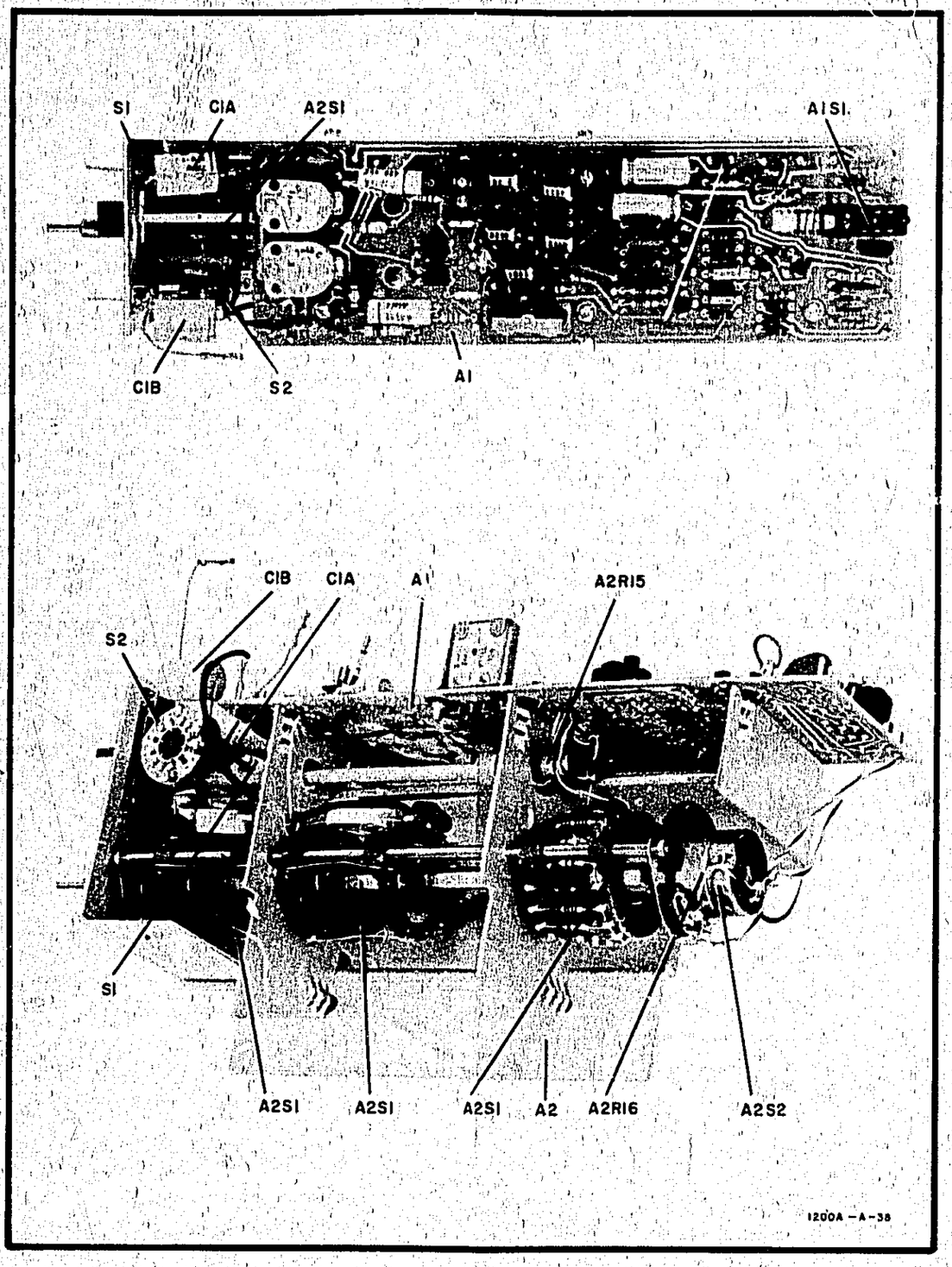


Figure 8-14. 100 uV Preamplifier, p/o 1A2, Assembly Locations

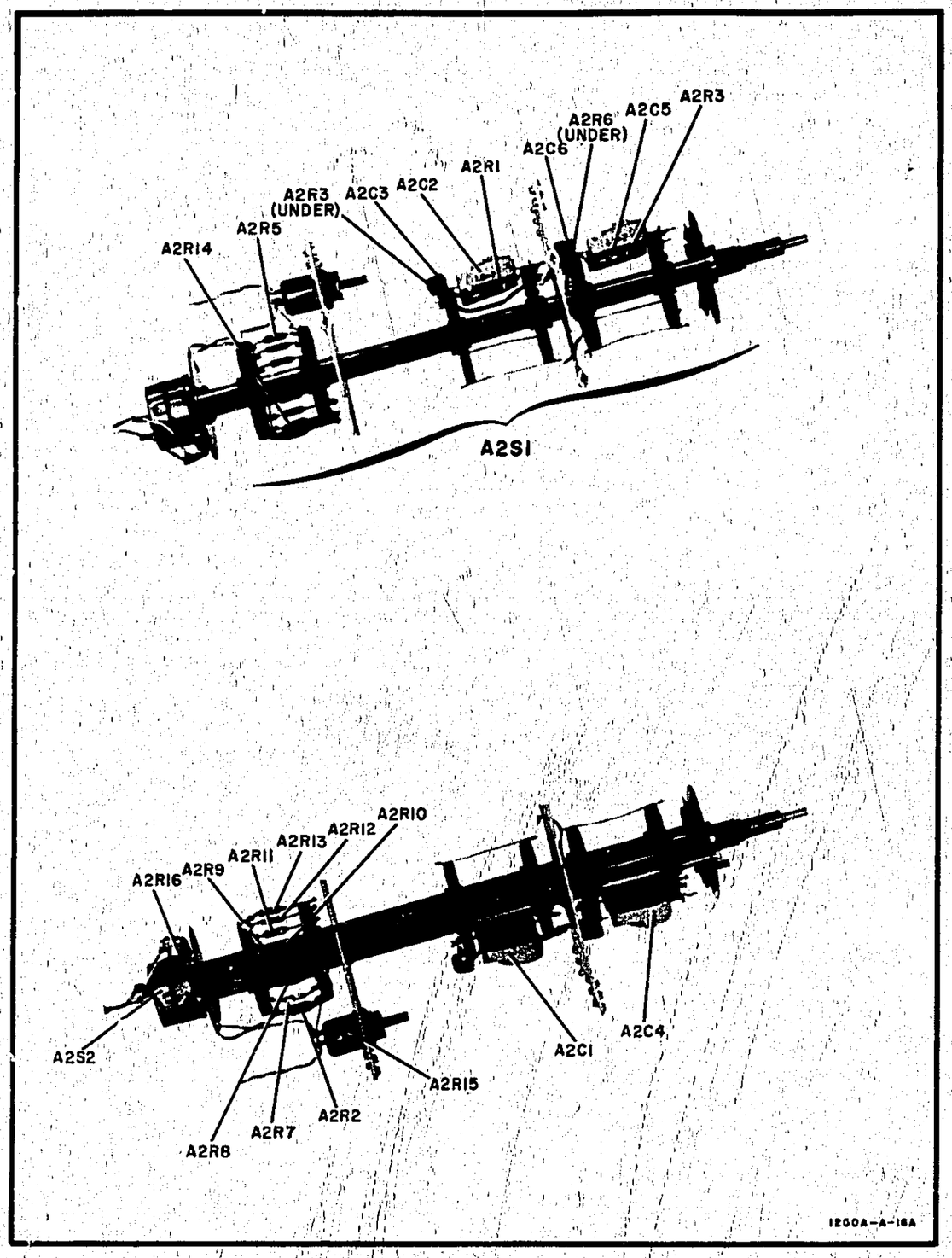


Figure 8-15. Volts Division Switch, p/o 1A2A2, Component Identification

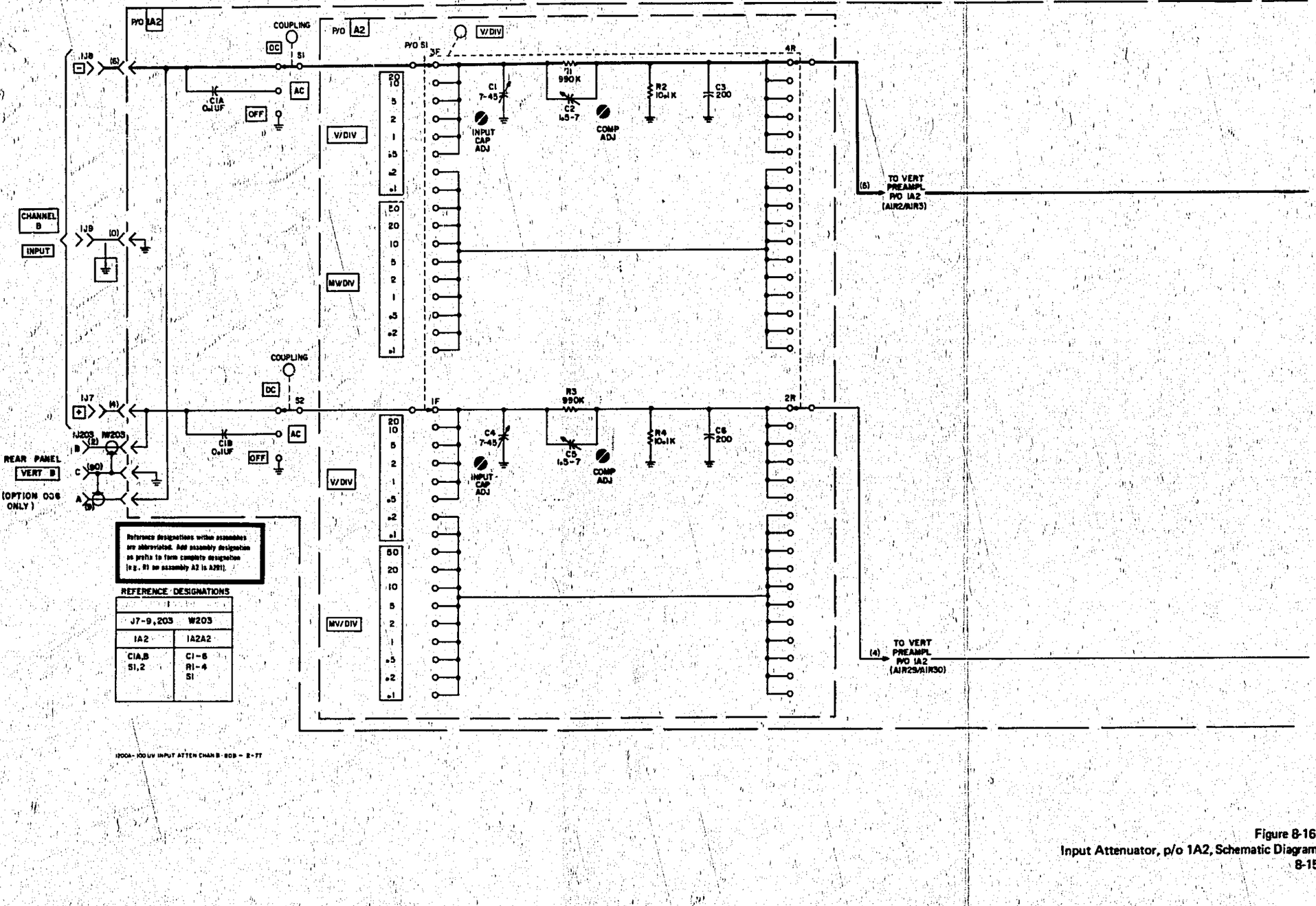
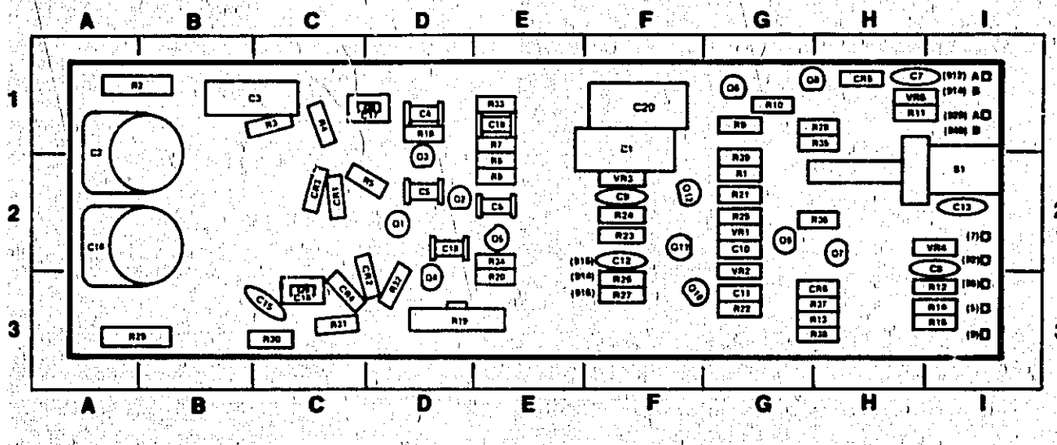


Figure 8-16.
Input Attenuator, p/o 1A2, Schematic Diagram



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
										R13	H-3	R25	G-2	R35	H-1
C1	F-1	C11	G-3	CR1	C-2	Q5	E-2	R3	C-1	R14	I-3	R26	F-3	R36	H-2
C2	A-1	C12	F-2	CR2	C-3	Q6	G-1	R4	C-1	R16	I-3	R27	F-3	R37	H-3
C3	B-1	C13	I-2	CR3	C-2	Q7	H-2	R5	D-2	R18	D-1	R28	H-1	R38	H-3
C4	D-1	C14	A-2	CR4	C-3	Q8	G-1	R6	E-2	R19	D-3	R29	A-3	R39	G-2
C5	D-2	C15	C-3	CR5	H-1	Q9	G-2	R7	E-1	R20	E-3	R30	A-3	S1	I-2
C6	E-2	C16	C-3	CR6	H-3	Q10	F-3	R8	E-2	R21	G-2	R31	C-3	VR1	G-2
C7	H-1	C17	D-1	Q1	D-2	Q11	F-2	R9	G-1	R22	G-3	R32	D-3	VR2	G-3
C8	I-2	C18	D-2	Q2	D-2	Q12	F-2	R10	G-1	R23	F-2	R33	E-1	VR3	F-2
C9	F-2	C19	E-1	Q3	D-2	R1	G-2	R11	H-1	R24	F-2	R34	E-2	VR4	I-2
C10	G-2	C20	F-1	Q4	D-3	R2	A-1	R12	H-3					VR5	H-1

1201A-007-02-77

Figure 8-17. Vertical Preamplifier, 1A2A1, Component Identification

Table 8-4. Channel B Vertical Preamplifier Measurement Conditions.

DC VOLTAGE MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION B	Trace Centered
DISPLAY	B
+Coupling B	OFF
–Coupling B	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	EXT HORIZ
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

WAVEFORM MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION B	Trace Centered
DISPLAY	B
+Coupling B	AC
–Coupling B	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	0.2 MSEC/DIV
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

INPUT SIGNAL:

CHANNEL A	NONE
CHANNEL B	1 kHz Sine Wave 5 Volts Peak-to-Peak

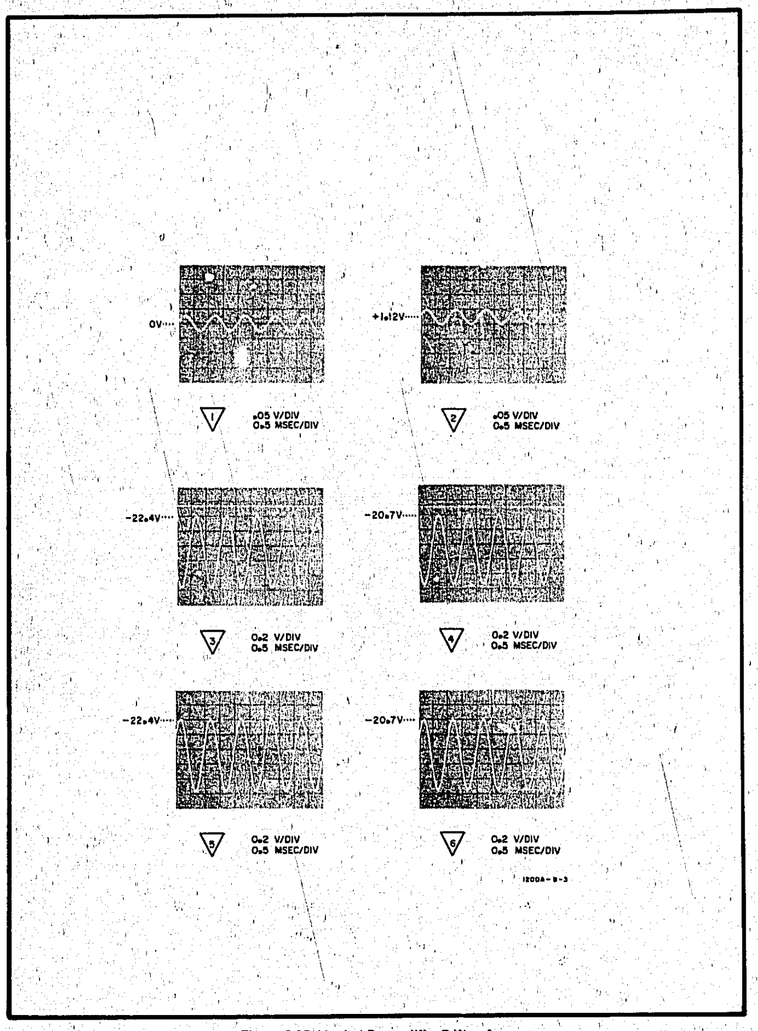


Figure 8-18. Vertical Preamplifier B Waveforms

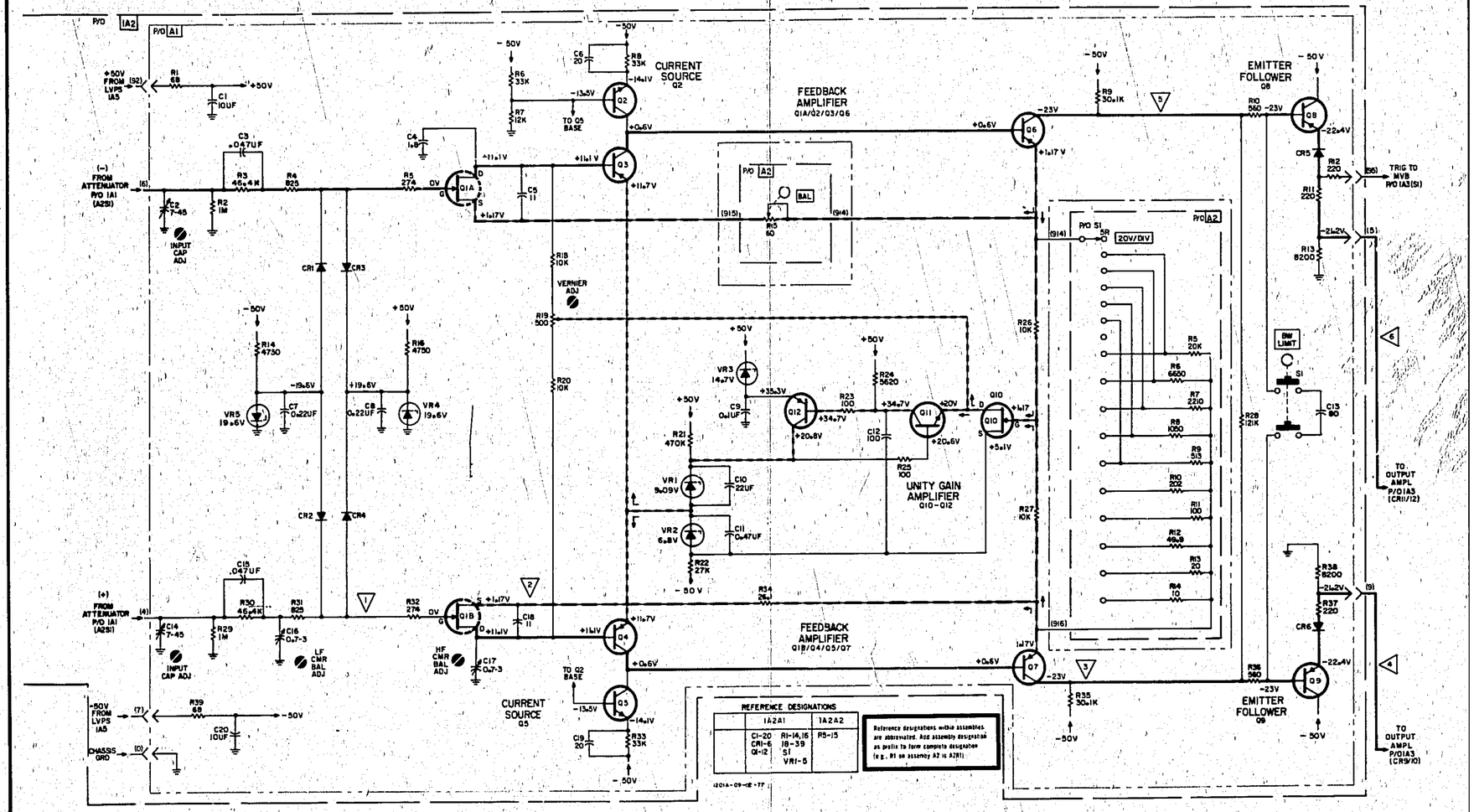
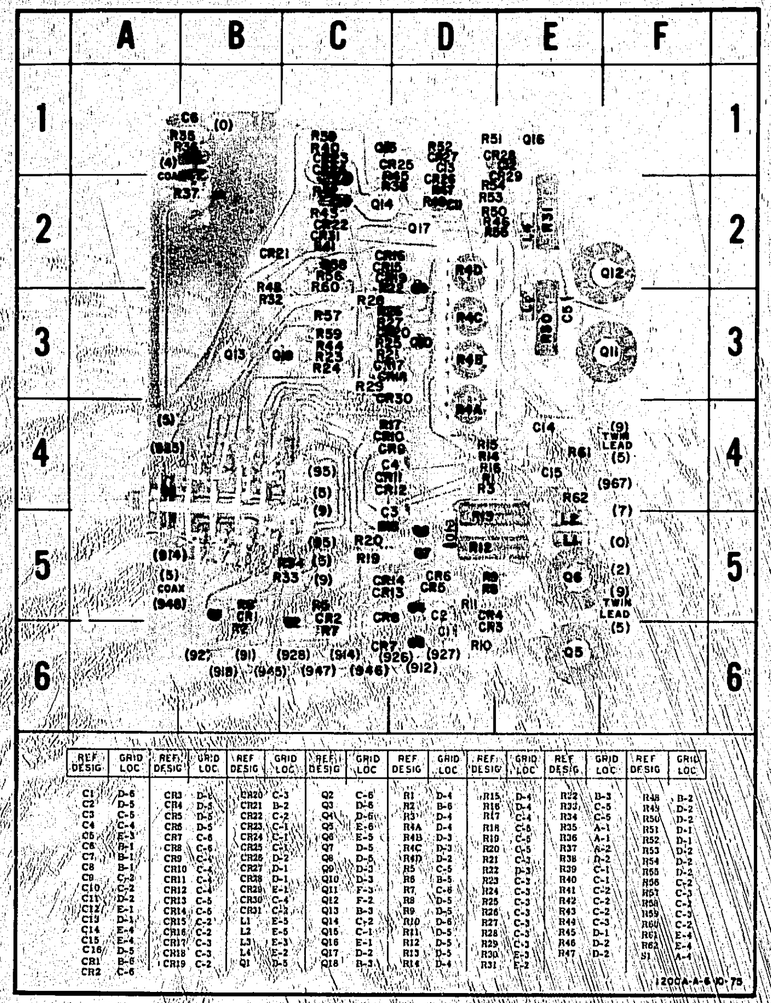


Figure 8-19.
Vertical Preamplifier B, P/O 1A2, Schematic Diagram



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C1	B-5	CR3	D-5	CR20	C-3	Q2	C-6	R1	D-4	R15	D-4	R22	B-3	R48	B-2
C2	B-5	CR4	D-5	CR21	B-2	Q3	D-5	R2	B-6	R16	D-4	R23	C-5	R49	D-2
C3	C-5	CR5	D-5	CR22	C-2	Q4	D-6	R3	D-4	R17	C-4	R24	C-5	R50	D-2
C4	C-4	CR6	D-5	CR23	C-1	Q5	E-6	R4A	D-4	R18	C-5	R35	A-1	R51	D-1
C5	B-1	CR7	C-6	CR24	C-1	Q6	E-5	R4B	D-3	R19	C-5	R36	A-1	R52	D-1
C6	B-1	CR8	C-6	CR25	C-1	Q7	D-5	R4C	D-3	R20	C-5	R37	A-2	R53	D-2
C7	B-1	CR9	C-6	CR26	D-2	Q8	D-5	R4D	D-2	R21	C-3	R38	D-2	R54	D-2
C8	B-1	CR10	C-4	CR27	D-1	Q9	D-3	R5	C-5	R22	D-3	R39	C-1	R55	D-2
C9	C-2	CR11	C-4	CR28	D-1	Q10	D-3	R6	B-5	R23	C-2	R40	C-1	R56	C-2
C10	C-2	CR12	C-5	CR29	D-1	Q11	F-2	R7	C-6	R24	C-3	R41	C-2	R57	C-3
C11	C-1	CR13	C-5	CR30	C-4	Q12	F-2	R8	D-5	R25	C-3	R42	C-2	R58	C-3
C12	E-1	CR14	C-6	CR31	C-2	Q13	B-3	R9	D-5	R26	C-3	R43	C-2	R59	C-3
C13	D-1	CR15	C-2	L1	E-3	Q14	C-2	R10	D-6	R27	C-3	R44	C-3	R60	C-2
C14	E-4	CR16	C-2	L2	E-3	Q15	E-1	R11	D-5	R28	C-3	R45	D-1	R61	E-4
C15	E-4	CR17	C-3	L3	E-3	Q16	E-1	R12	D-5	R29	C-3	R46	D-2	R62	E-4
C16	D-5	CR18	C-3	L4	E-2	Q17	D-2	R13	D-5	R30	E-3	R47	D-2	S1	A-4
CR1	B-6	CR19	C-2	Q1	B-5	Q18	B-3	R14	D-4	R31	E-2				
CR2	C-6														

1200A-A-6-10-75

Figure 8-20. Output Amplifier, 1A3, Component Identification

Table 8-5. Output Amplifier Measurement Conditions.

DC VOLTAGE MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	OFF
–Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP EXT HORIZ	EXT HORIZ
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

*NOTE: These voltages taken in A vs B, dot centered.

WAVEFORM MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	AC
–Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	0.2 MSEC/DIV
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

INPUT SIGNAL:

CHANNEL A	1 kHz Sine Wave
	5 Volts Peak-to-peak
CHANNEL B	NONE

▽ NOTE: These waveforms taken with the following exceptions:

CONTROL SETTINGS:

DISPLAY	A vs B
+ Coupling B	AC
–Coupling B	OFF
POSITION B	Centered

INPUT SIGNAL:

Channel A	1 kHz Sine Wave
	5 Volts Peak-to-Peak
Channel B	same as Channel A

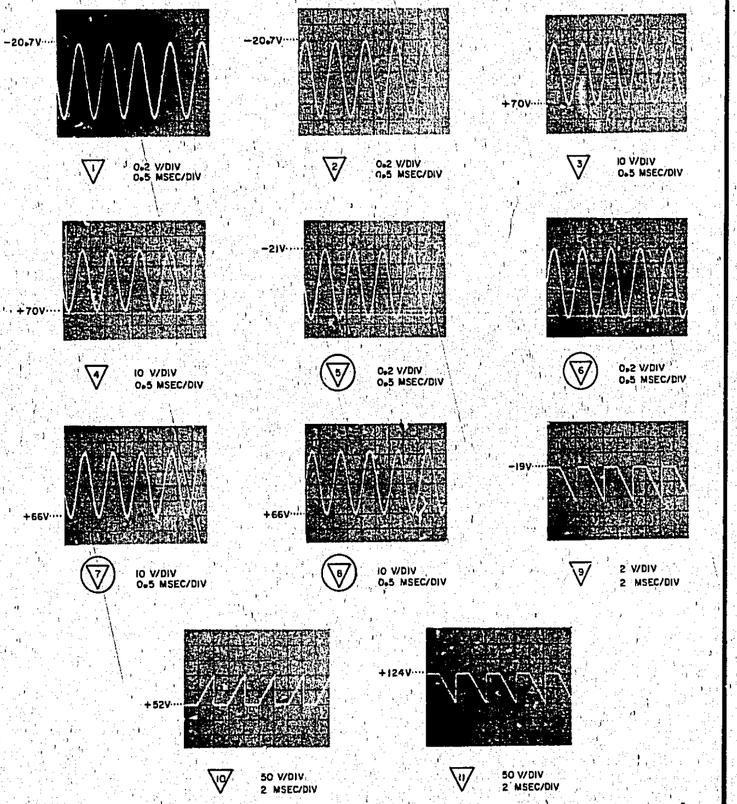
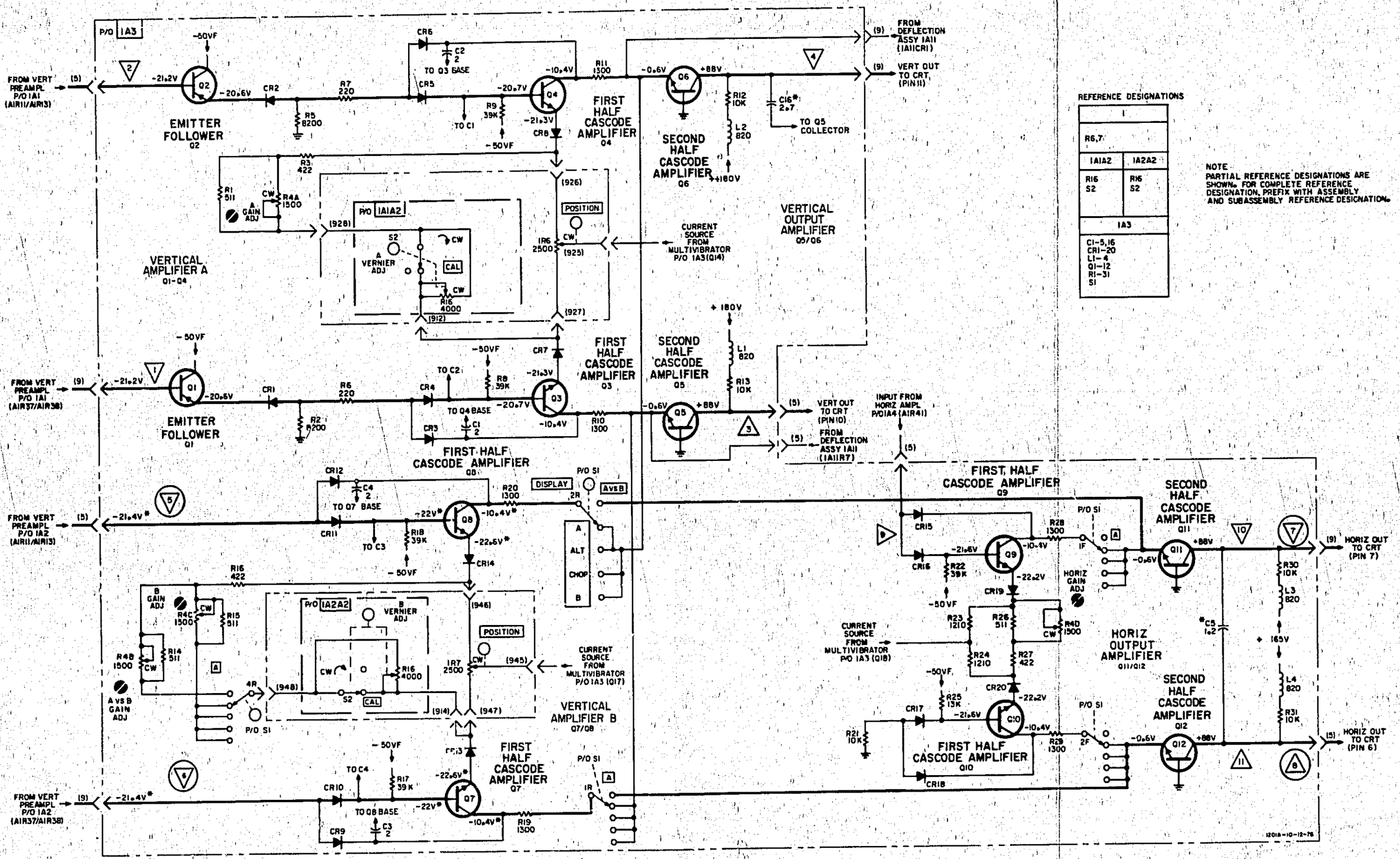


Figure 8-21. Output Amplifier Waveforms



REFERENCE DESIGNATIONS

1	
R6,7	
1A1A2	1A2A2
R16 S2	R16 S2
1A3	
C1-5,16 CR1-20 L1-4 Q1-12 R1-31 S1	

NOTE
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE REFERENCE DESIGNATION, PREFIX WITH ASSEMBLY AND SUBASSEMBLY REFERENCE DESIGNATION.

Figure 8-22.
Output Amplifier, p/o 1A3, Schematic Diagram

Table 8-6. Multivibrator Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	OFF
–Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	EXT HORIZ
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

WAVEFORM MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	CHOP
+Coupling A	AC
–Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	0.2 MSEC/DIV
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

INPUT SIGNAL:

CHANNEL A	1 kHz Sine Wave
	5 Volts Peak-to-Peak
CHANNEL B	NONE

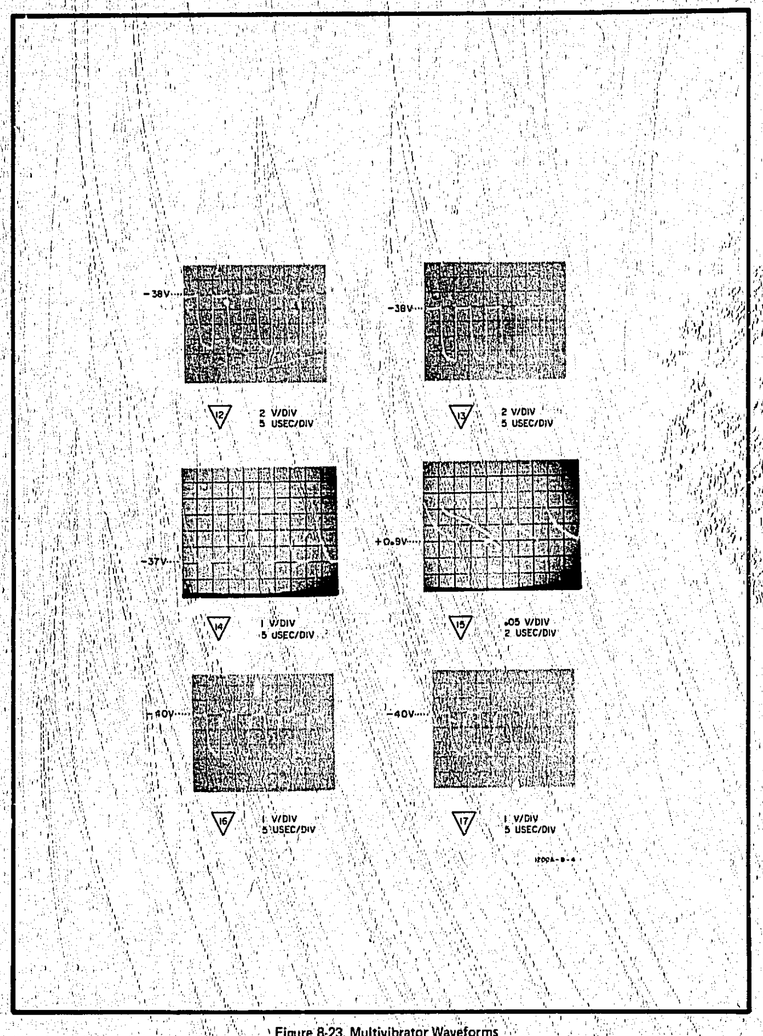


Figure 8-23. Multivibrator Waveforms

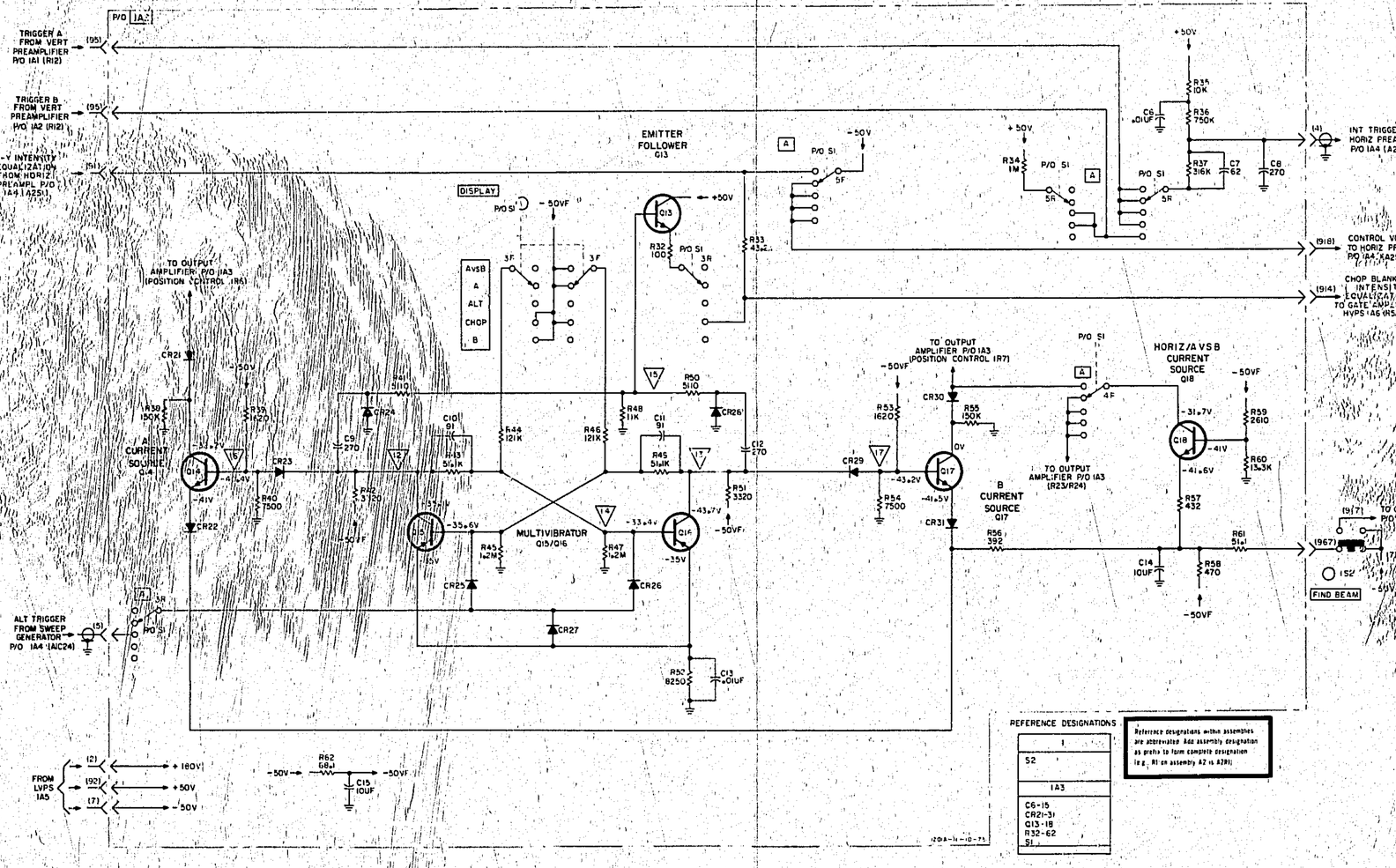
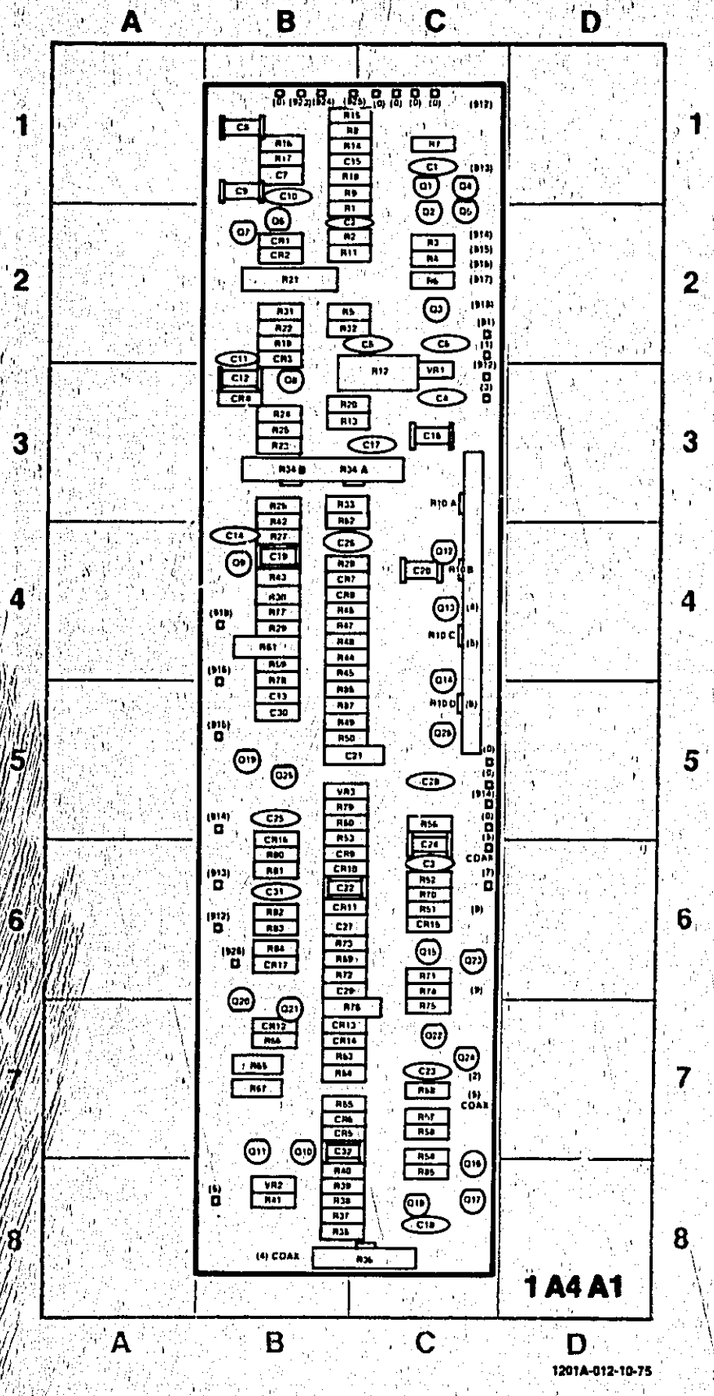


Figure 8-24.
Multivibrator, P/O 1A3, Schematic Diagram



REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-1	R10A	C-3
C2	B-2	R10B	C-4
C3	C-6	R10C	C-4
C4	C-3	R10D	C-5
C5	C-2	R11	B-2
C6	C-2	R12	C-3
C7	B-1	R13	C-3
C8	B-1	R14	B-1
C9	B-1	R15	B-1
C10	B-1	R16	B-1
C11	B-2	R17	B-1
C12	B-3	R18	B-1
C13	B-5	R19	B-2
C14	B-4	R20	C-3
C15	B-1	R21	B-2
C16	C-3	R22	B-2
C17	C-3	R23	B-3
C18	C-8	R24	B-3
C19	B-4	R25	B-3
C20	C-4	R26	B-3
C21	B-5	R27	B-4
C22	B-6	R28	B-4
C23	C-7	R29	B-4
C24	C-6	R30	B-4
C25	B-5	R31	B-2
C26	B-4	R32	B-2
C27	B-6	R33	B-3
C28	C-5	R34A	C-3
C29	B-6	R34B	B-3
C30	B-5	R35	B-8
C31	B-6	R36	C-8
C32	B-7	R37	B-8
CR1	B-2	R38	B-8
CR2	B-2	R39	B-8
CR3	B-2	R40	B-8
CR4	B-3	R41	B-8
CR5	B-7	R42	B-3
CR6	B-7	R43	B-4
CR7	B-4	R44	B-4
CR8	B-4	R45	B-4
CR9	B-6	R46	B-4
CR10	B-6	R47	B-4
CR11	B-6	R48	B-4
CR12	B-7	R49	B-5
CR13	B-7	R50	B-5
CR14	B-7	R51	C-6
CR15	C-6	R52	C-6
CR16	B-5	R53	B-6
CR17	B-6	R54	C-8
Q1	C-1	R55	B-7
Q2	C-2	R56	C-5
Q3	C-2	R57	C-7
Q4	C-1	R58	C-7
Q5	C-2	R59	B-4
Q6	B-2	R60	B-5
Q7	B-2	R61	B-4
Q8	B-3	R62	B-4
Q9	B-4	R63	B-7
Q10	B-7	R64	B-7
Q11	B-7	R65	B-7
Q12	C-4	R66	B-7
Q13	C-4	R67	B-7
Q14	C-4	R68	C-7
Q15	C-6	R69	B-6
Q16	C-8	R70	C-6
Q17	C-8	R71	C-6
Q18	C-8	R72	B-6
Q19	B-5	R73	B-6
Q20	B-7	R74	C-6
Q21	B-7	R75	C-7
Q22	C-7	R76	B-7
Q23	C-6	R77	B-4
Q24	C-7	R78	B-4
Q25	B-5	R79	B-5
Q26	C-5	R80	B-6
R1	B-2	R81	B-6
R2	B-2	R82	B-6
R3	C-2	R83	B-6
R4	C-2	R84	B-6
R5	B-2	R85	C-8
R6	C-2	R86	B-5
R7	C-1	R87	B-5
R8	B-1	VR1	C-3
R9	B-1	VR2	B-8
		VR3	B-5

Figure 8-25. Sweep Generator, 1A4A1, Component Identification

Table 8-7. Horizontal Preamplifier Measurement Conditions.

DC VOLTAGE MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	OFF
–Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	EXT HORIZ
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

WAVEFORM MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	AC
–Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	0.2 MSEC/DIV
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

INPUT SIGNAL:

CHANNEL A	1 kHz Sine Wave 5 Volts Peak-to-Peak
CHANNEL B	NONE

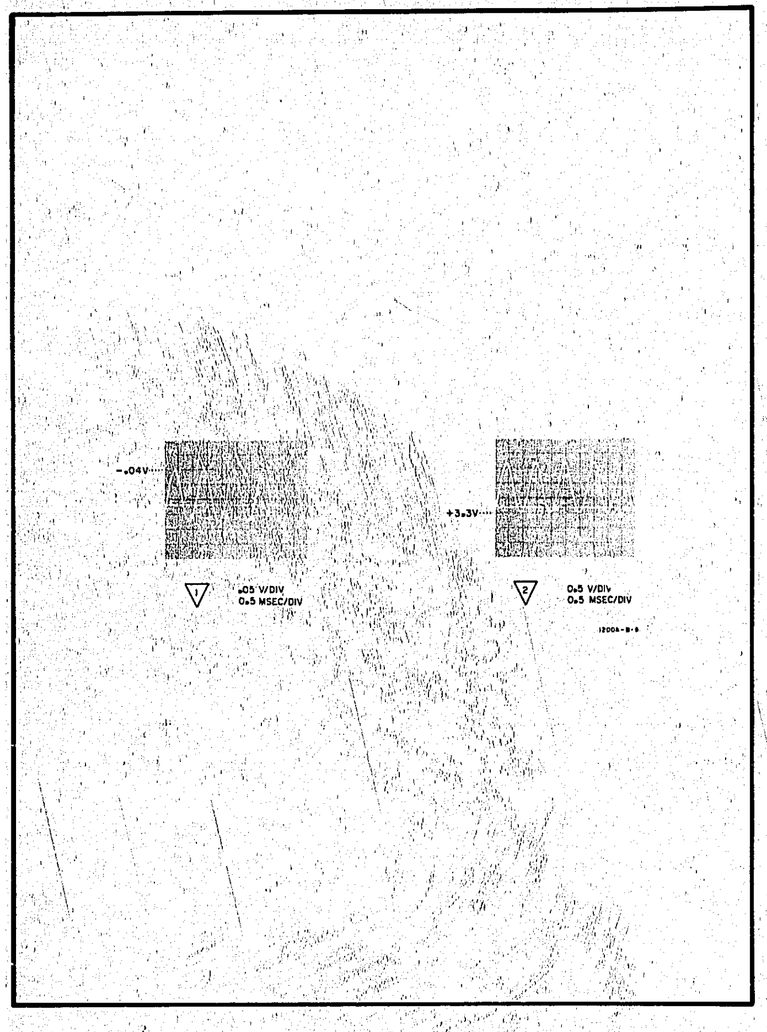


Figure 8-26. Horizontal Preamplifier Waveforms

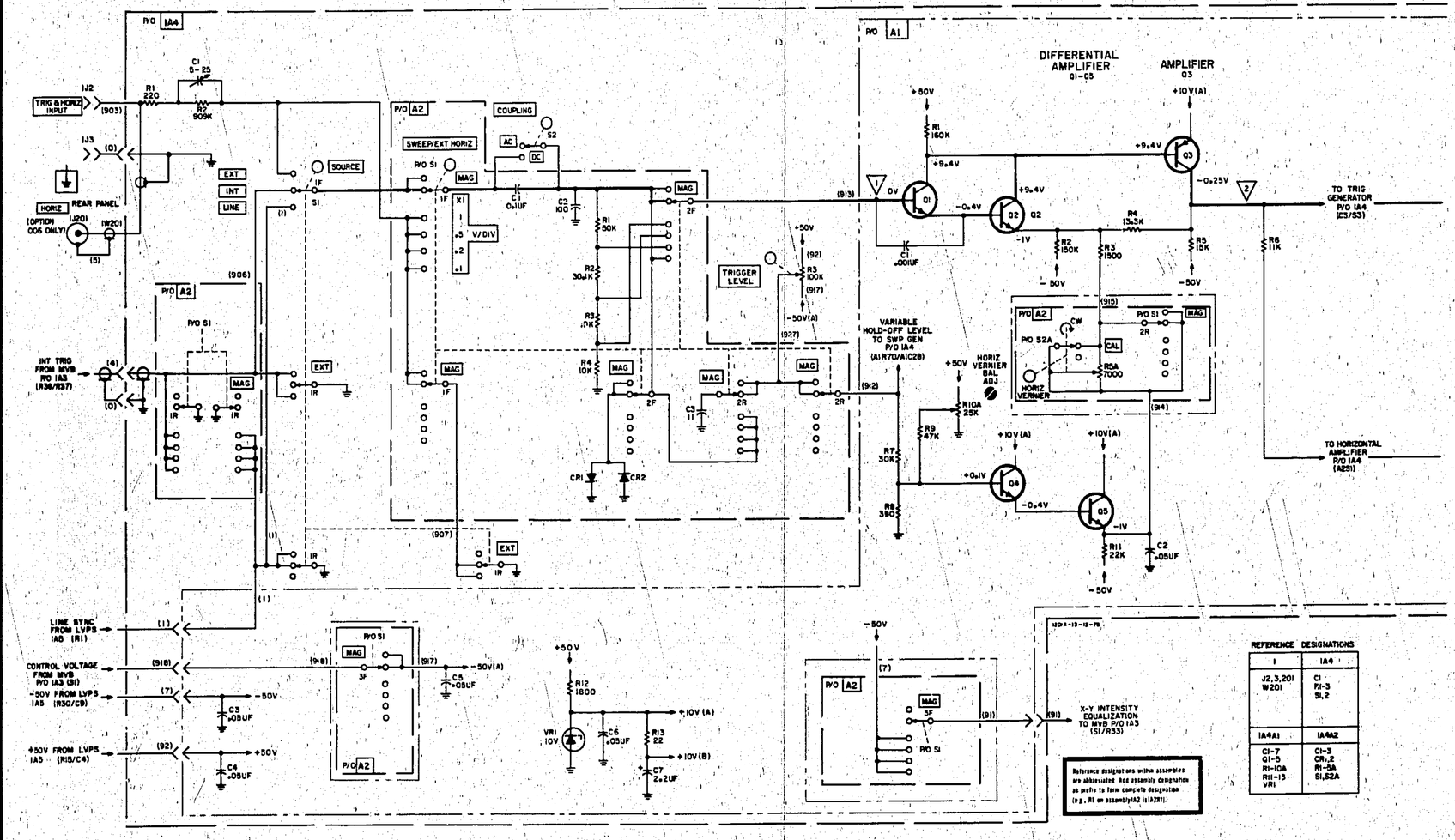


Figure 8-27.
Horizontal Preamplifier, P/O 1A4, Schematic Diagram

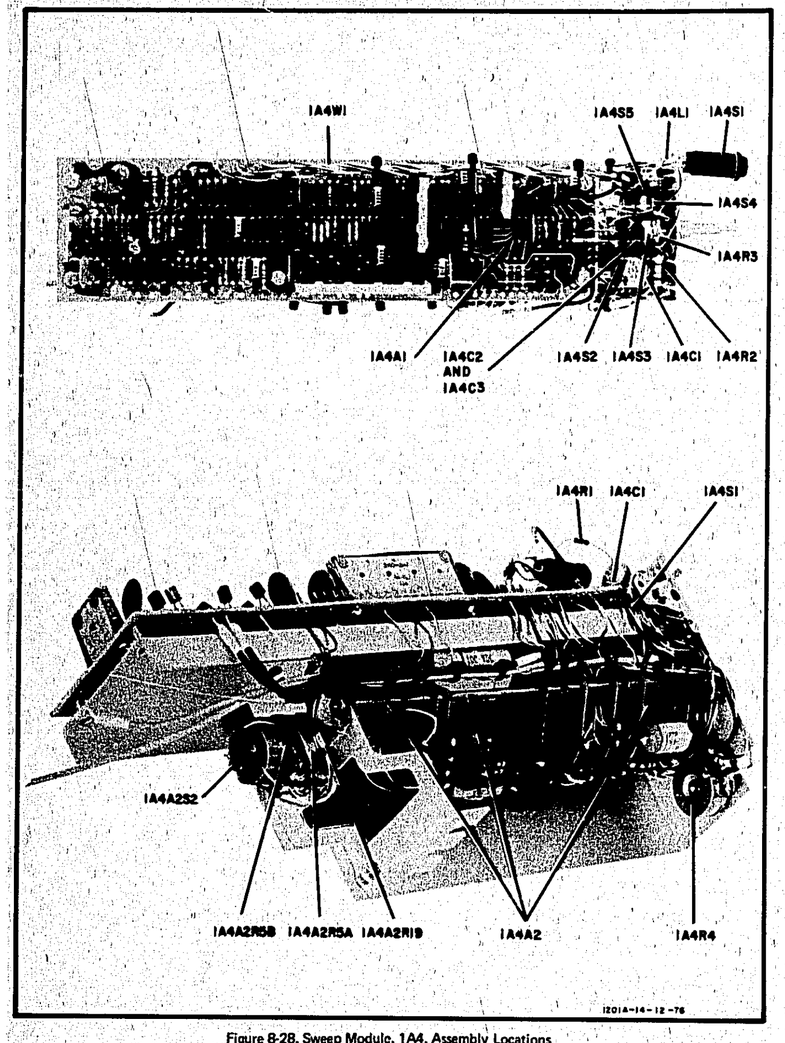


Figure 8-28. Sweep Module, 1A4, Assembly Locations

Table 8-8. Trigger Generator and Horizontal Amplifier Measurement Conditions.

DC VOLTAGE MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	OFF
−Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	EXT HORIZ
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	ccw (Not in Auto)

WAVEFORM MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling A	AC
−Coupling A	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	0.2 MSEC/DIV
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

INPUT SIGNAL:

CHANNEL A	1 kHz Sine Wave 5 Volts Peakto-Peak
CHANNEL B	NONE

▽ NOTE: This waveform taken with a 1 kHz Sine Wave, 5 volts peak-to-peak input to the TRIG & HORIZ INPUT.

SWEEP/EXT HORIZ . . . . . EXT HORIZ .5 V/DIV

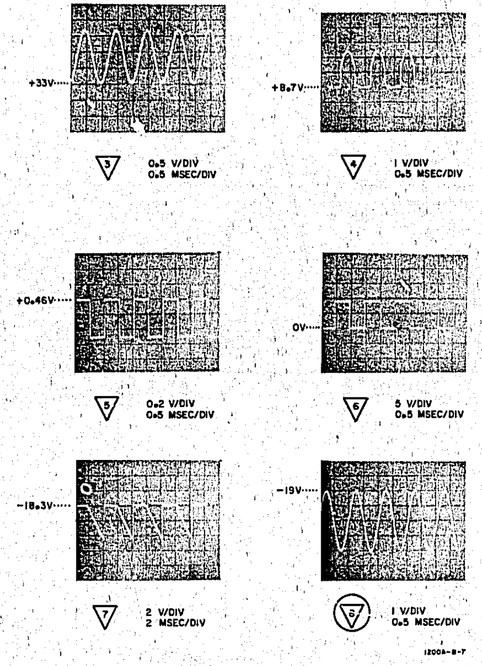
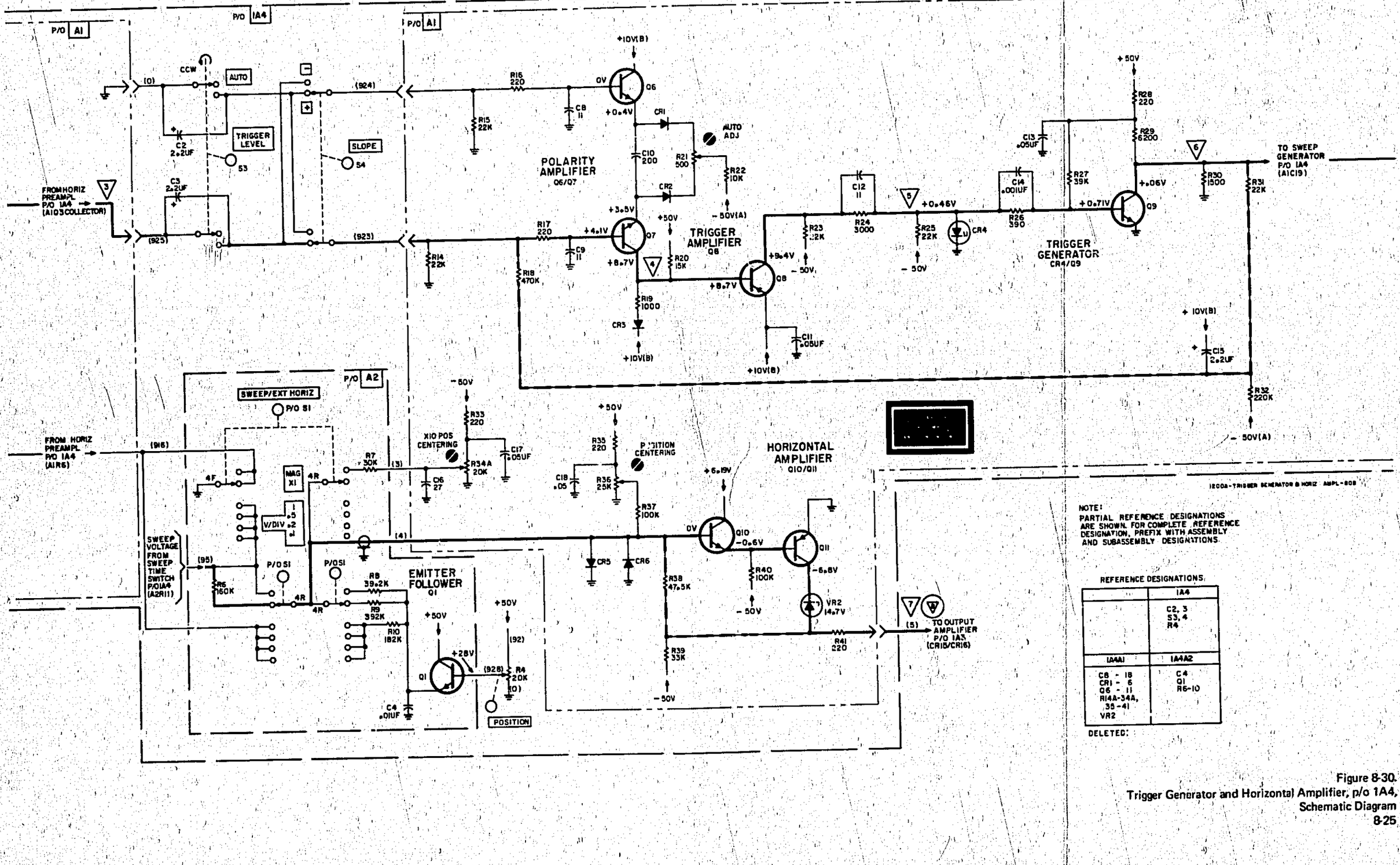


Figure 8-29. Trigger Generator and Horizontal Amplifier Waveforms



NOTE:
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE REFERENCE DESIGNATION, PREFIX WITH ASSEMBLY AND SUBASSEMBLY DESIGNATIONS.

REFERENCE DESIGNATIONS

	1A4
	C2, 3 S3, 4 R4
1A4A1	1A4A2
C8 - 18 CR1 - 5 Q6 - 11 R14A-34A, 35-41 VR2	C4 Q1 R6-10

DELETED:

Figure 8-30.
Trigger Generator and Horizontal Amplifier, p/o 1A4, Schematic Diagram

Table 8-9. Sweep Generator Measurement Conditions

DC VOLTAGE MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling	OFF
–Coupling	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	0.2 MSEC/DIV
MODE	SINGLE
RESET	Armed (light on)*
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	No Triggering

*NOTE: Voltages appearing encased [e.g.(+7.8 V)], were taken with RESET depressed. All other voltages were taken with the sweep generator armed (light on).

WAVEFORM MEASUREMENT CONDITIONS

CONTROL SETTINGS:

VERTICAL:

POSITION A	Trace Centered
DISPLAY	A
+Coupling	AC
–Coupling	OFF
Volts/Division	1 V/DIV

HORIZONTAL:

SWEEP/EXT HORIZ	SWEEP X1
Time/Division	0.2 MSEC/DIV
MODE	NORM
SLOPE	+
POSITION	Dot Centered
SOURCE	INT
COUPLING	DC
TRIGGER LEVEL	AUTO

INPUT SIGNAL:

CHANNEL A	1 kHz Sine Wave 5 Volts Peak-to-Peak
CHANNEL B	NONE

▽ NOTE: Change the Vertical Input to a 50 kHz Sine Wave, 5 volts peak-to-peak, for this testpoint only.

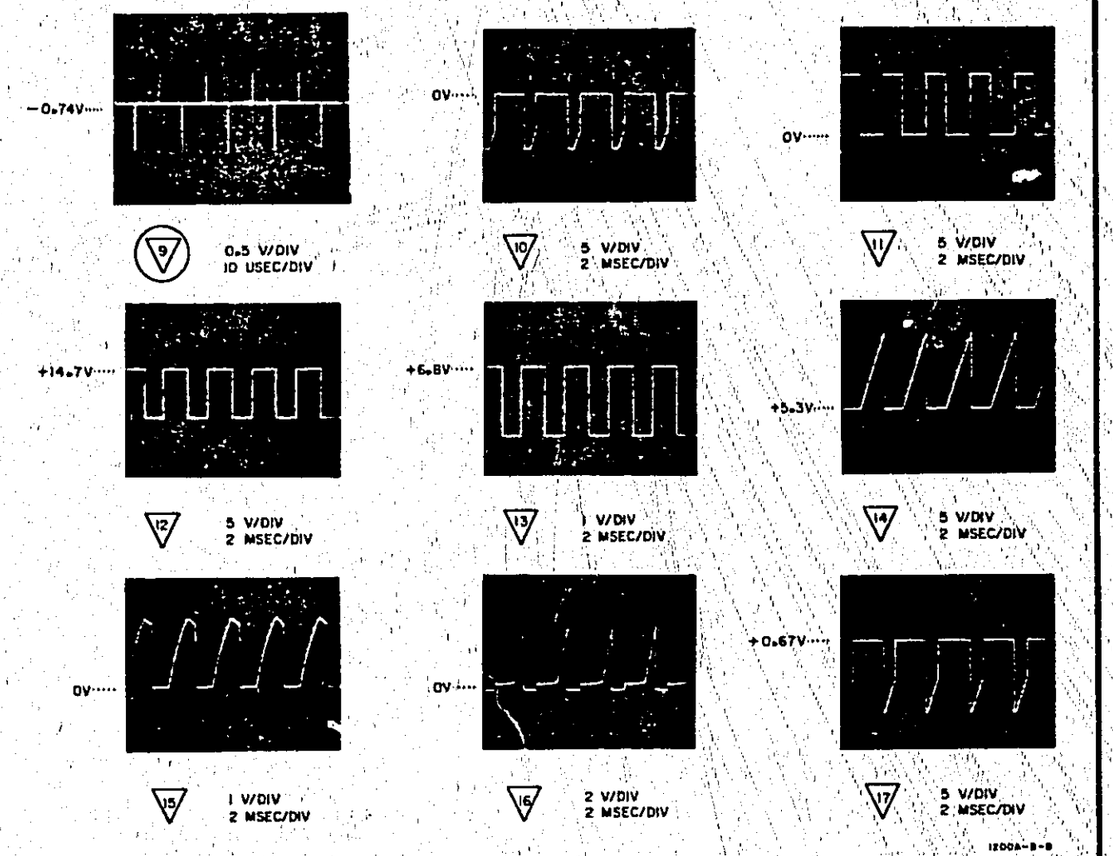


Figure 8-31. Sweep Generator, Waveforms

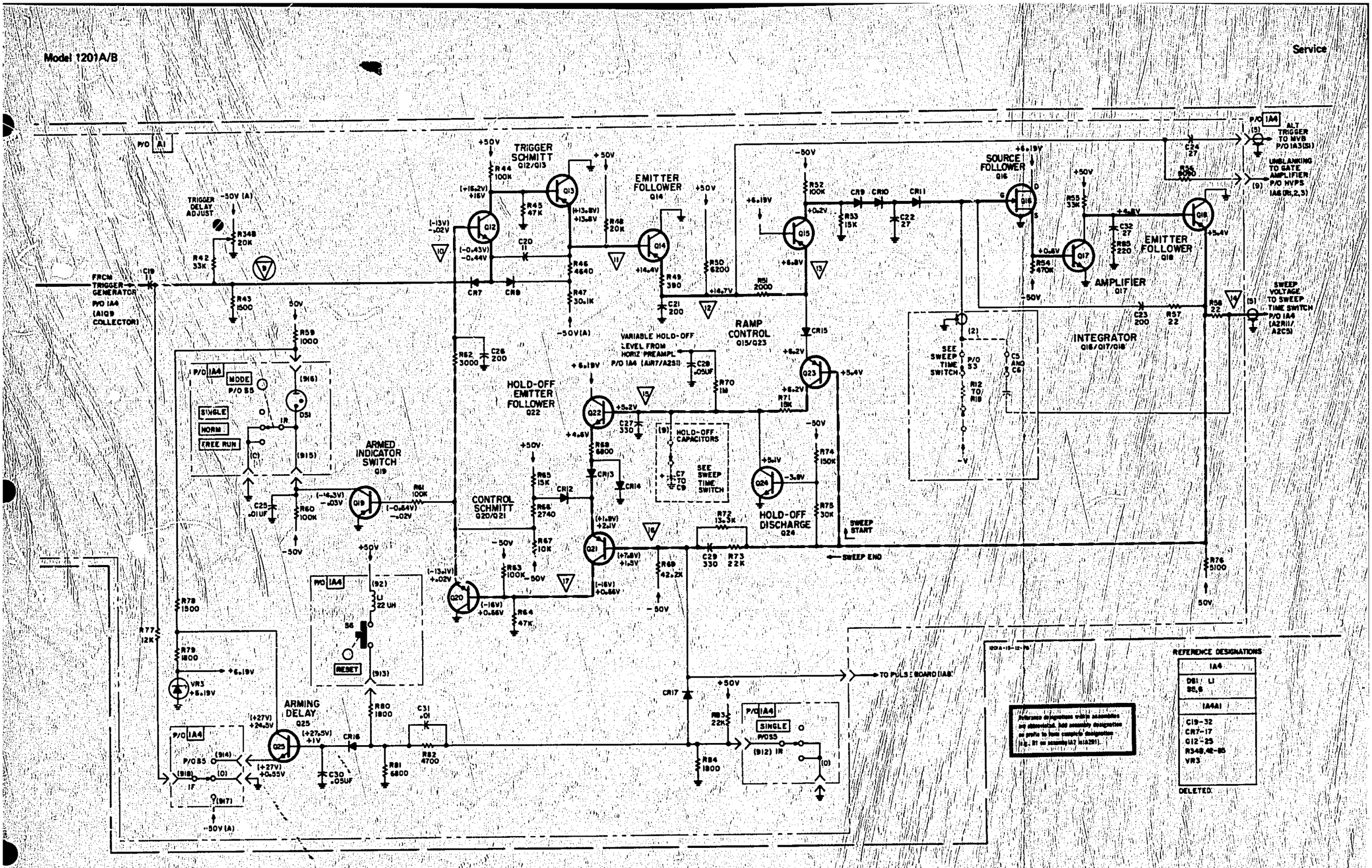


Figure 8-32.
Sweep Generator, p/o 1A4, Schematic Diagram
8-27

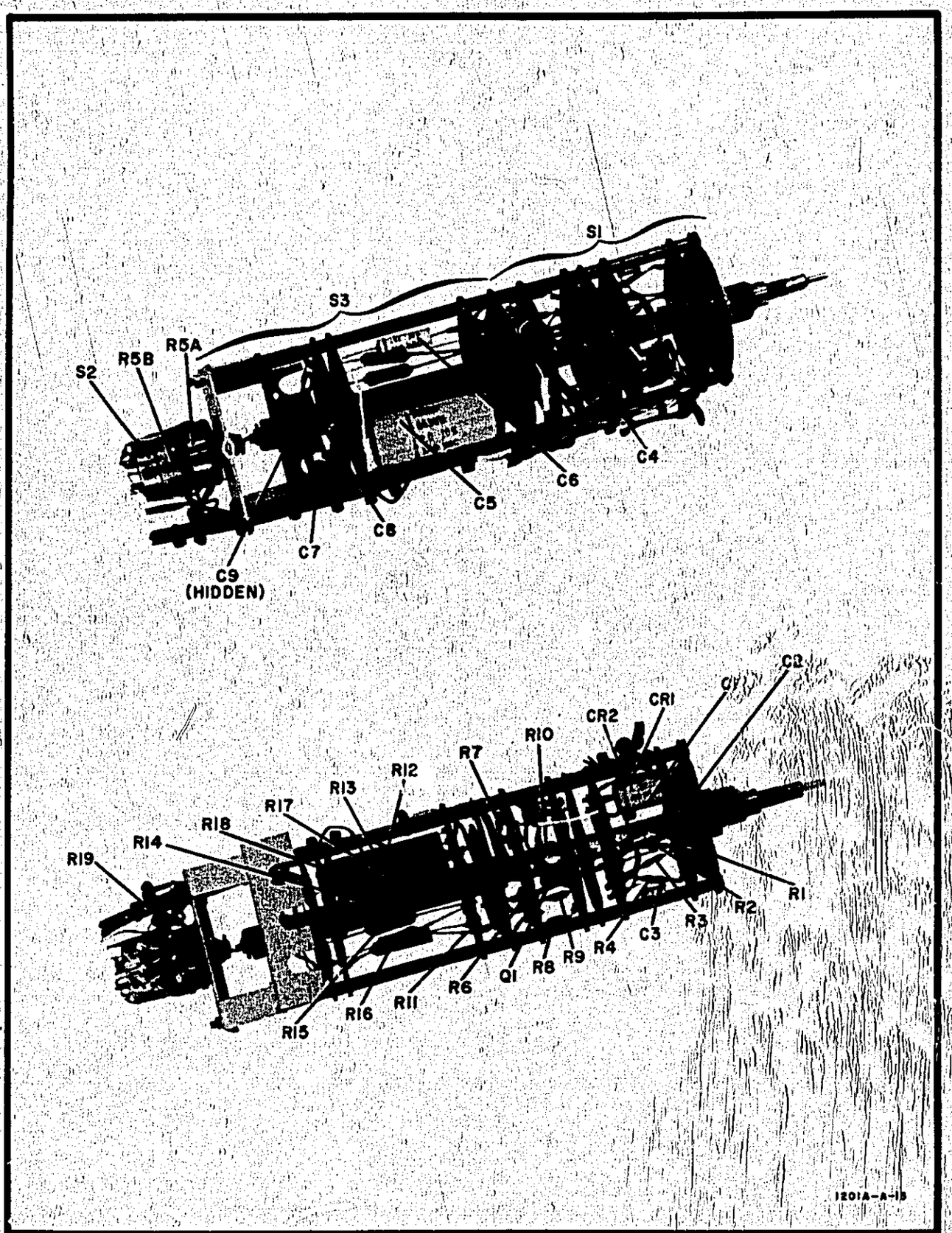


Figure 8-33. Time/Division Switch, 1A4A2, Component Identification

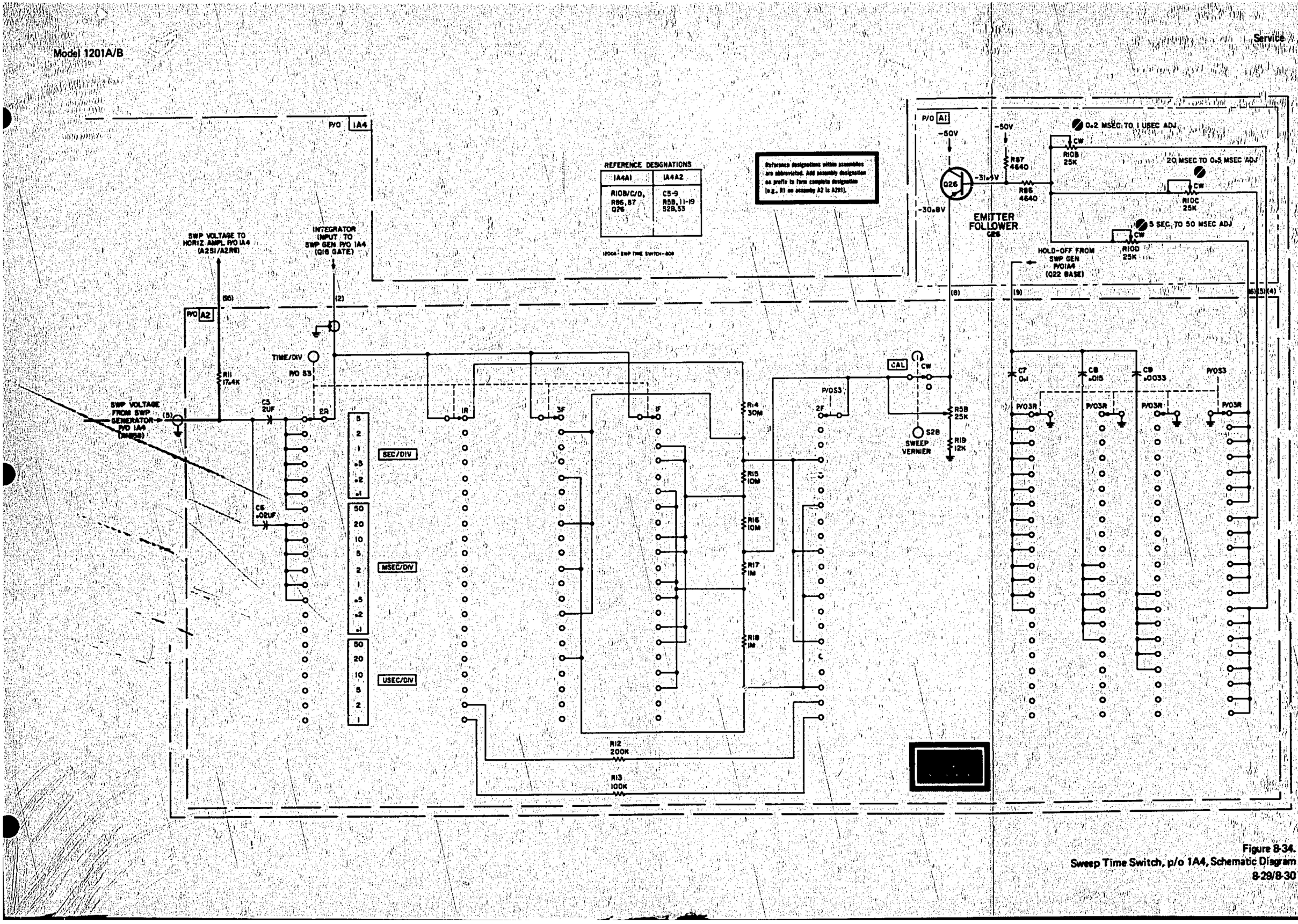
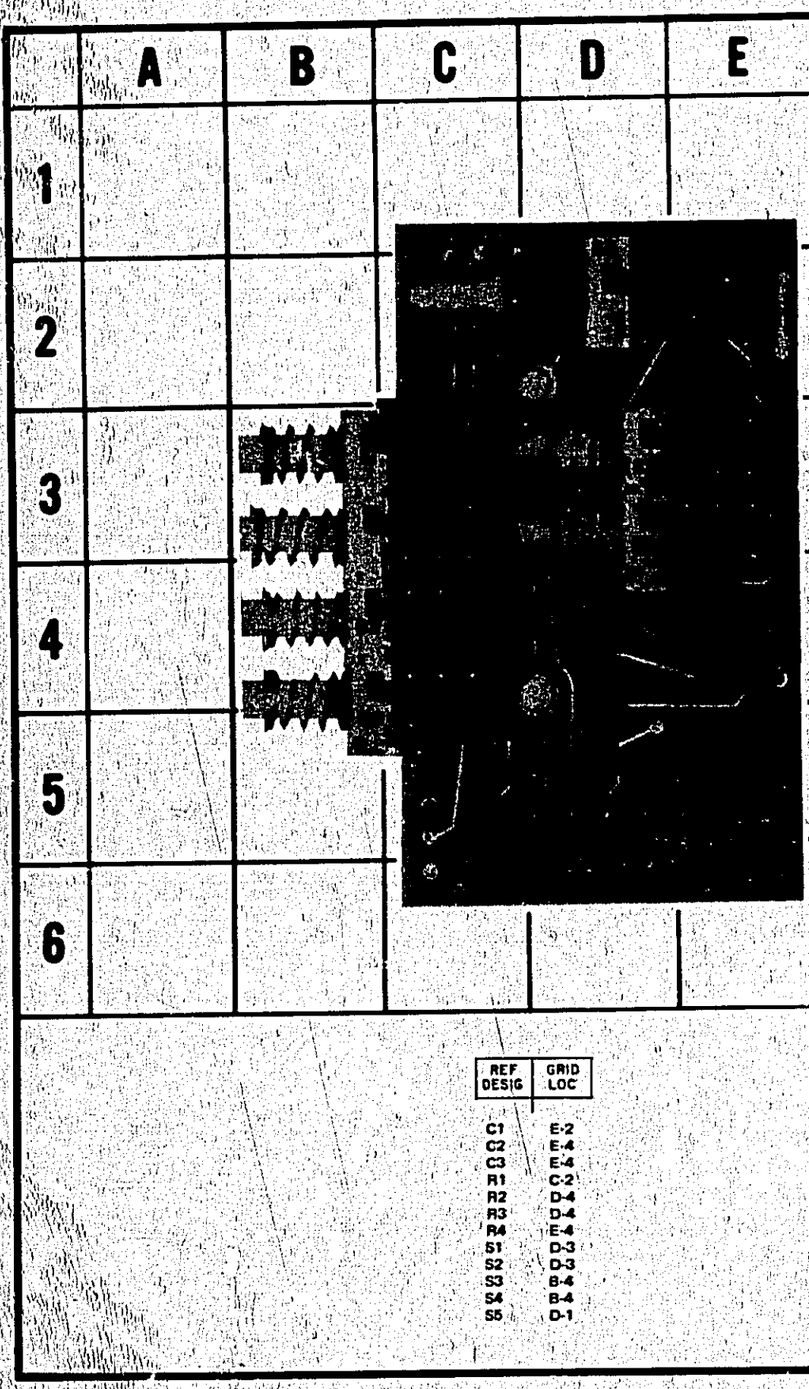


Figure 8-34.
Sweep Time Switch, p/o 1A4, Schematic Diagram
8-29/8-30



REF DESIG	GRID LOC
C1	E-2
C2	E-4
C3	E-4
R1	C-2
R2	D-4
R3	D-4
R4	E-4
S1	D-3
S2	D-3
S3	B-4
S4	B-4
S5	D-1

1201A-A-12

Figure 8-35. Pulse Switch Board, 1A9, Component Identification

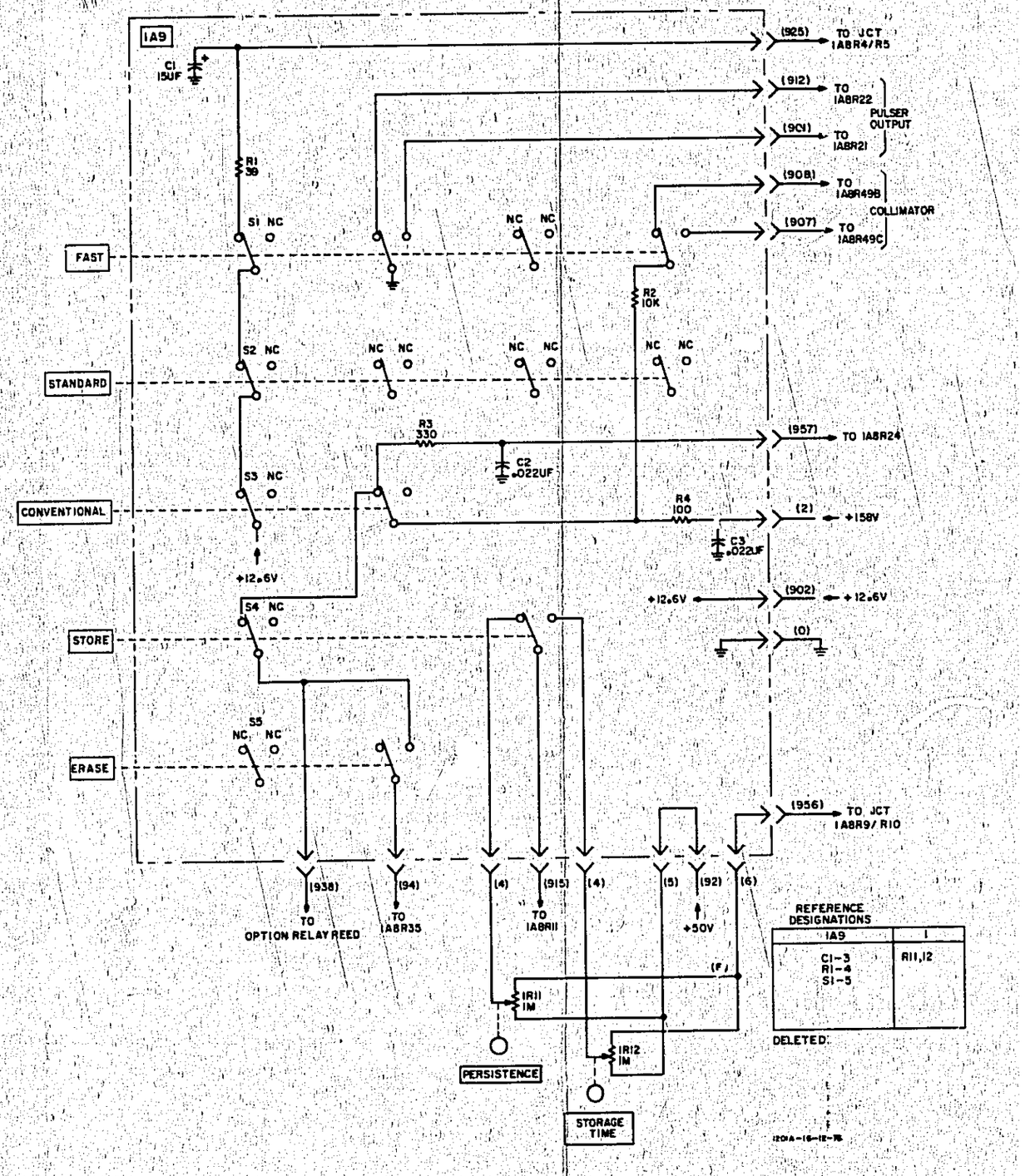
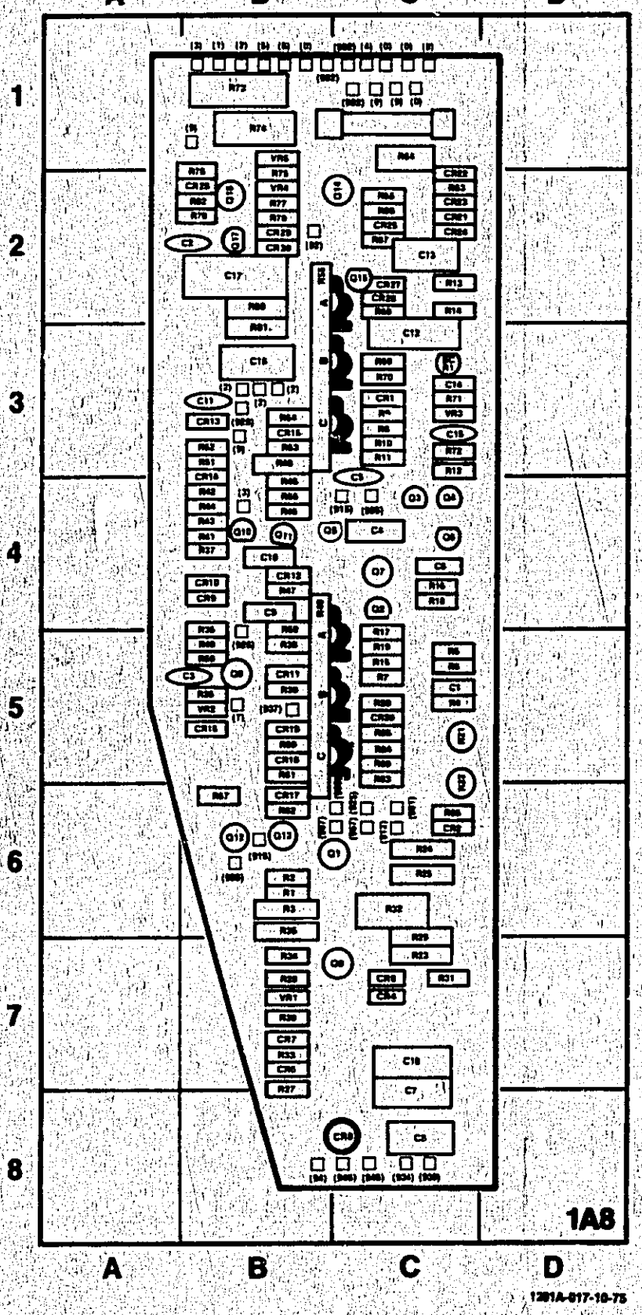


Figure 8-36. Pulse Switch Board, 1A9, Schematic Diagram



REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-5	R15	C-5
C2	B-2	R16	C-4
C3	B-5	R17	C-5
C4	C-4	R18	C-4
C5	C-4	R19	C-5
C6	C-4	R20	C-5
C7	C-8	R21	C-5
C8	C-8	R22	C-6
C9	B-4	R23	C-7
C10	B-4	R24	C-6
C11	B-3	R25	C-6
C12	C-3	R26	B-5
C13	C-2	R27	B-7
C14	C-3	R28	B-7
C15	C-3	R29	C-7
C16	B-3	R30	B-7
C17	B-2	R31	C-7
C18	C-7	R32	C-6
CR1	C-3	R33	B-7
CR2	C-6	R34	B-7
CR4	C-7	R35	B-6
CR5	B-7	R36	B-4
CR6	C-7	R37	B-4
CR7	B-7	R38	B-5
CR8	C-8	R39	B-5
CR9	B-4	R40	B-5
CR10	B-4	R41	B-4
CR11	B-5	R42	B-4
CR12	B-4	R43	B-4
CR13	B-3	R44	B-4
CR14	B-3	R45	B-4
CR15	B-3	R46	B-4
CR16	B-5	R47	B-4
CR17	B-6	R48	B-3
CR18	B-5	R49	B-4
CR19	B-5	R50	B-4
CR20	C-5	R51	B-5
CR21	C-2	R52	B-3
CR22	C-2	R53	B-3
CR23	C-2	R54	B-3
CR24	C-2	R55	B-2
CR25	C-2	R56	B-4
CR26	C-2	R57	B-6
CR27	C-2	R58	B-5
CR28	B-2	R59	B-5
CR29	B-2	R60	C-5
CR30	B-2	R61	B-5
Q1	C-6	R62	B-6
Q2	C-4	R63	C-2
Q3	C-4	R64	C-1
Q4	C-4	R65	C-2
Q5	B-4	R66	C-2
Q6	C-4	R67	C-2
Q7	C-4	R68	C-2
Q8	C-7	R69	C-3
Q9	B-5	R70	C-3
Q10	B-4	R71	C-3
Q11	B-4	R72	C-3
Q12	B-6	R73	B-1
Q13	B-6	R74	B-1
Q14	C-2	R75	B-2
Q15	C-2	R76	B-2
Q16	B-2	R77	B-2
Q17	B-2	R78	B-2
R1	B-6	R79	B-2
R2	B-6	R80	B-2
R3	B-6	R81	B-3
R4	C-5	R82	B-2
R5	C-5	R83	C-5
R6	C-5	R84	C-5
R7	C-5	R85	C-5
R8	C-3	R86	C-6
R9	C-3	SCR1	C-3
R10	C-3	VR1	B-7
R11	C-3	VR2	B-5
R12	C-3	VR3	C-3
R13	C-2	VR4	B-2
R14	C-2	VR5	B-1

Figure 8-37. Pulse Circuit Board, 1A8, Component Identification

	PRESENTATION MODE				MONITOR OSCILLOSCOPE
	FAST	STD	CONV	STORE	SPECIAL CONDITIONS
1	+8.5V, +1.5V, T_0	+8.5V, +1.5V, T_0	+8.5V, +1.5V, T_0	+8.5V, +1.5V, T_0	
2	+2.8V, 0V, T_0	+2.8V, 0V, T_0	+2.8V, 0V, T_0	+2.8V, 0V, T_0	
3	+4.6V, 0V, T_0	+4.6V, 0V, T_0	+4.6V, 0V, T_0	+4.6V, 0V, T_0	SET "SLOPE" TO − ●
4	+9V*, 0V, T_0	+15V*, 0V, T_0	(BASELINE)	(BASELINE)	* AMPLITUDE OF WAVEFORM VARIES WITH ATTENUATOR SETTINGS.
5	+12V*, +4V, T_0	+17V*, +4V, T_0	DC LEVEL CHANGE OF 25 VOLTS	+4V	* AMPLITUDE OF WAVEFORM VARIES WITH ATTENUATOR SETTINGS.
6	NO WAVEFORM	NO WAVEFORM	NO WAVEFORM	(64V)	
7	NO WAVEFORM	NO WAVEFORM	NO WAVEFORM	+44V, −8V	
8	(−6V), *	(−6V), *	NO WAVEFORM	NO WAVEFORM	* TIME IS 1 SEC PLUS TIME "ERASE" BUTTON IS HELD DEPRESSED SWEEP = 200 M/SEC CM
9	(+50V), *	(+50V), *	NO WAVEFORM	NO WAVEFORM	* TIME IS 1 SEC PLUS TIME "ERASE" BUTTON IS HELD DEPRESSED SWEEP = 200 M/SEC CM
10	(+24V), *	(+24V), *	NO WAVEFORM	NO WAVEFORM	* TIME IS 1 SEC PLUS TIME "ERASE" BUTTON IS HELD DEPRESSED SWEEP = 200 M/SEC CM
11	(+12.6V), *	(+12.6V), *	NO WAVEFORM	NO WAVEFORM	* TIME IS 1 SEC PLUS TIME "ERASE" BUTTON IS HELD DEPRESSED

MEASUREMENT CONDITIONS:
USED ON MONITOR OSCILLOSCOPE UNLESS CHANGE SPECIFIED IN SPECIAL CONDITIONS COLUMN.

VERT ATTENUATOR..... 2 V/CM

SWEEP SPEED ..... 20 MSEC/CM

SLOPE ..... POSITIVE

( ) VOLTAGES ARE ± 10%

1201A-C-1

Figure 8-38. Pulse Circuit Board Waveforms

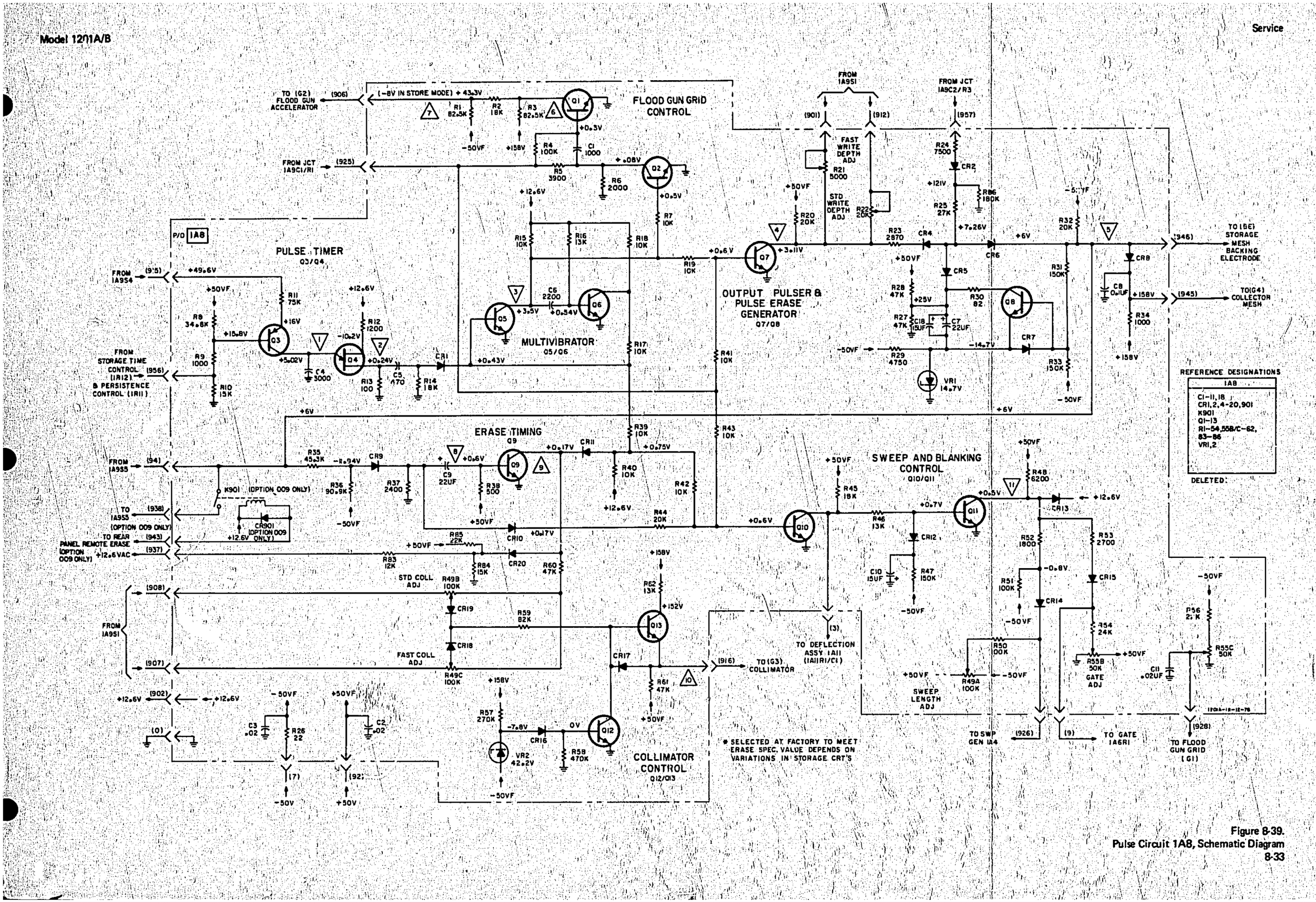
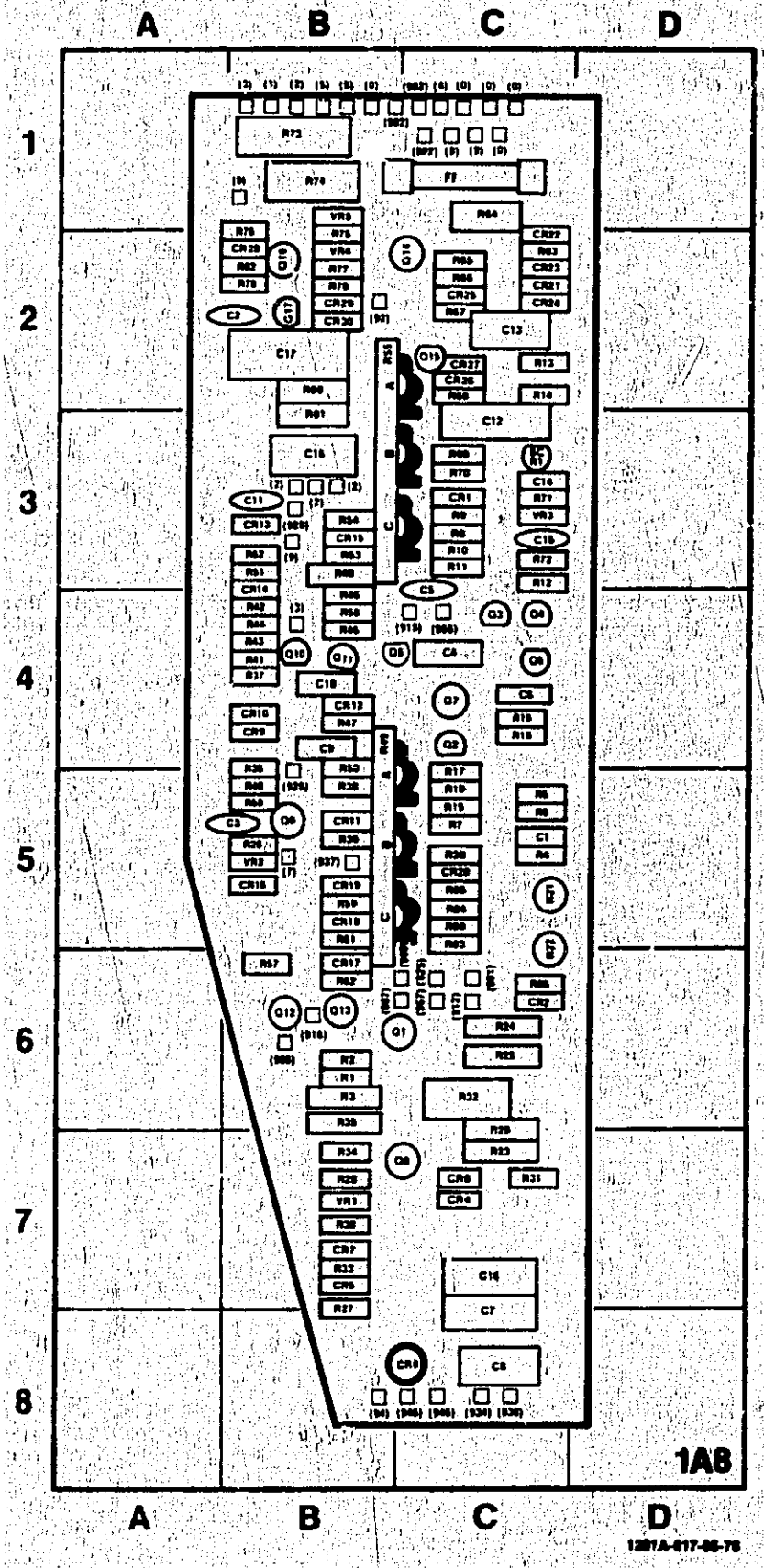
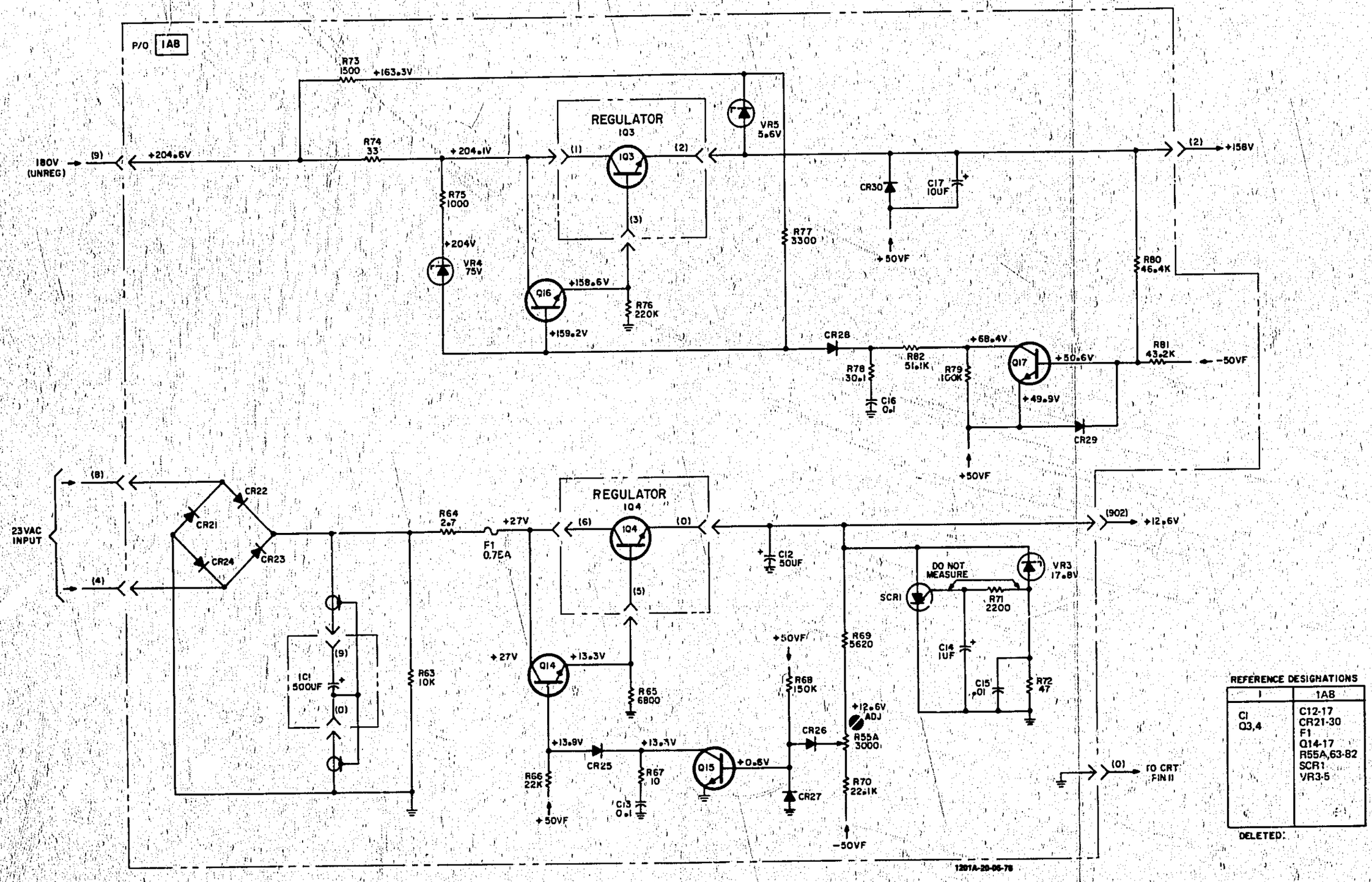


Figure 8-39.
Pulse Circuit 1A8, Schematic Diagram



REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-5	R15	C-5
C2	B-2	R16	C-4
C3	B-5	R17	C-5
C4	C-4	R18	C-4
C5	C-4	R19	C-5
C6	C-4	R20	C-5
C7	C-8	R21	C-5
C8	C-8	R22	C-6
C9	B-4	R23	C-7
C10	B-4	R24	C-6
C11	B-3	R25	C-6
C12	C-3	R26	B-5
C13	C-2	R27	B-7
C14	C-3	R28	B-7
C15	C-3	R29	C-7
C16	B-3	R30	B-7
C17	B-2	R31	C-7
C18	C-7	R32	C-6
CR1	C-3	R33	B-7
CR2	C-6	R34	B-7
CR4	C-7	R35	B-6
CR5	B-7	R36	B-4
CR6	C-7	R37	B-4
CR7	B-7	R38	B-5
CR8	C-8	R39	B-5
CR9	B-4	R40	B-5
CR10	B-4	R41	B-4
CR11	B-5	R42	B-4
CR12	B-4	R43	B-4
CR13	B-3	R44	B-4
CR14	B-3	R45	B-4
CR15	B-3	R46	B-4
CR16	B-5	R47	B-4
CR17	B-6	R48	B-3
CR18	B-5	R49	B-4
CR19	B-5	R50	B-4
CR20	C-5	R51	B-3
CR21	C-2	R52	B-3
CR22	C-2	R53	B-3
CR23	C-2	R54	B-3
CR24	C-2	R55	B-2
CR25	C-2	R56	B-4
CR26	C-2	R57	B-5
CR27	C-2	R58	B-5
CR28	B-2	R59	B-5
CR29	B-2	R60	C-5
CR30	B-2	R61	B-5
F1	C-1	R62	B-6
Q1	C-6	R63	C-2
Q2	C-4	R64	C-1
Q3	C-4	R65	C-2
Q4	C-4	R66	C-2
Q5	B-4	R67	C-2
Q6	C-4	R68	C-2
Q7	C-4	R69	C-3
Q8	C-7	R70	C-3
Q9	B-5	R71	C-3
Q10	B-4	R72	C-3
Q11	B-4	R73	B-1
Q12	B-6	R74	B-1
Q13	B-6	R75	B-2
Q14	C-2	R76	B-2
Q15	C-2	R77	B-2
Q16	B-2	R78	B-2
Q17	B-2	R79	B-2
R1	B-6	R80	B-2
R2	B-6	R81	B-3
R3	B-6	R82	B-2
R4	C-5	R83	C-5
R5	C-5	R84	C-5
R6	C-5	R85	C-5
R7	C-5	R86	C-6
R8	C-3	SCR1	C-3
R9	C-3	VR1	B-7
R10	C-3	VR2	B-5
R11	C-3	VR3	C-3
R12	C-3	VR4	B-2
R13	C-2	VR5	B-1
R14	C-2		

Figure 8-40. Pulse Circuit Board, 1A8, Component Identification

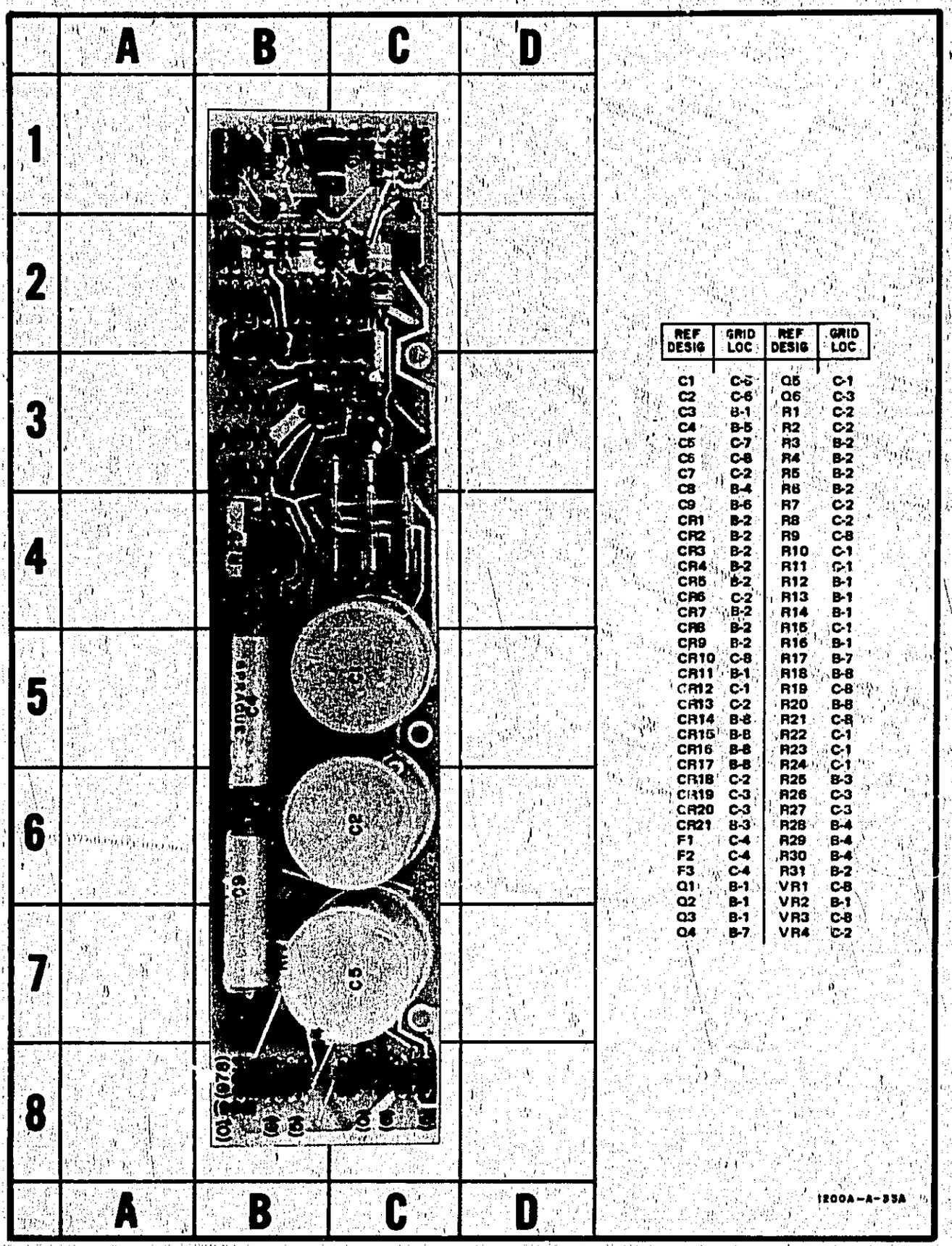


REFERENCE DESIGNATIONS

I	1A8
C1	C12-17
Q3,4	CR21-30
	F1
	Q14-17
	R55A,63-82
	SCR1
	VR3-5

DELETED:

Figure 8-41.
Pulse Circuit, p/o 1A8, Power Supply, Schematic Diagram



REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-5	Q5	C-1
C2	C-6	Q6	C-3
C3	B-1	R1	C-2
C4	B-5	R2	C-2
C5	C-7	R3	B-2
C6	C-8	R4	B-2
C7	C-2	R5	B-2
C8	B-4	R6	B-2
C9	B-6	R7	C-2
CR1	B-2	R8	C-2
CR2	B-2	R9	C-8
CR3	B-2	R10	C-1
CR4	B-2	R11	C-1
CR5	B-2	R12	B-1
CR6	C-2	R13	B-1
CR7	B-2	R14	B-1
CR8	B-2	R15	C-1
CR9	B-2	R16	B-1
CR10	C-8	R17	B-7
CR11	B-1	R18	B-8
CR12	C-1	R19	C-8
CR13	C-2	R20	B-8
CR14	B-8	R21	C-8
CR15	B-8	R22	C-1
CR16	B-8	R23	C-1
CR17	B-8	R24	C-1
CR18	C-2	R25	B-3
CR19	C-3	R26	C-3
CR20	C-3	R27	C-3
CR21	B-3	R28	B-4
F1	C-4	R29	B-4
F2	C-4	R30	B-4
F3	C-4	R31	B-2
Q1	B-1	VR1	C-8
Q2	B-1	VR2	B-1
Q3	B-1	VR3	C-8
Q4	B-7	VR4	C-2

Figure 8-42. Low Voltage Power Supply, 1A5, Component Identification

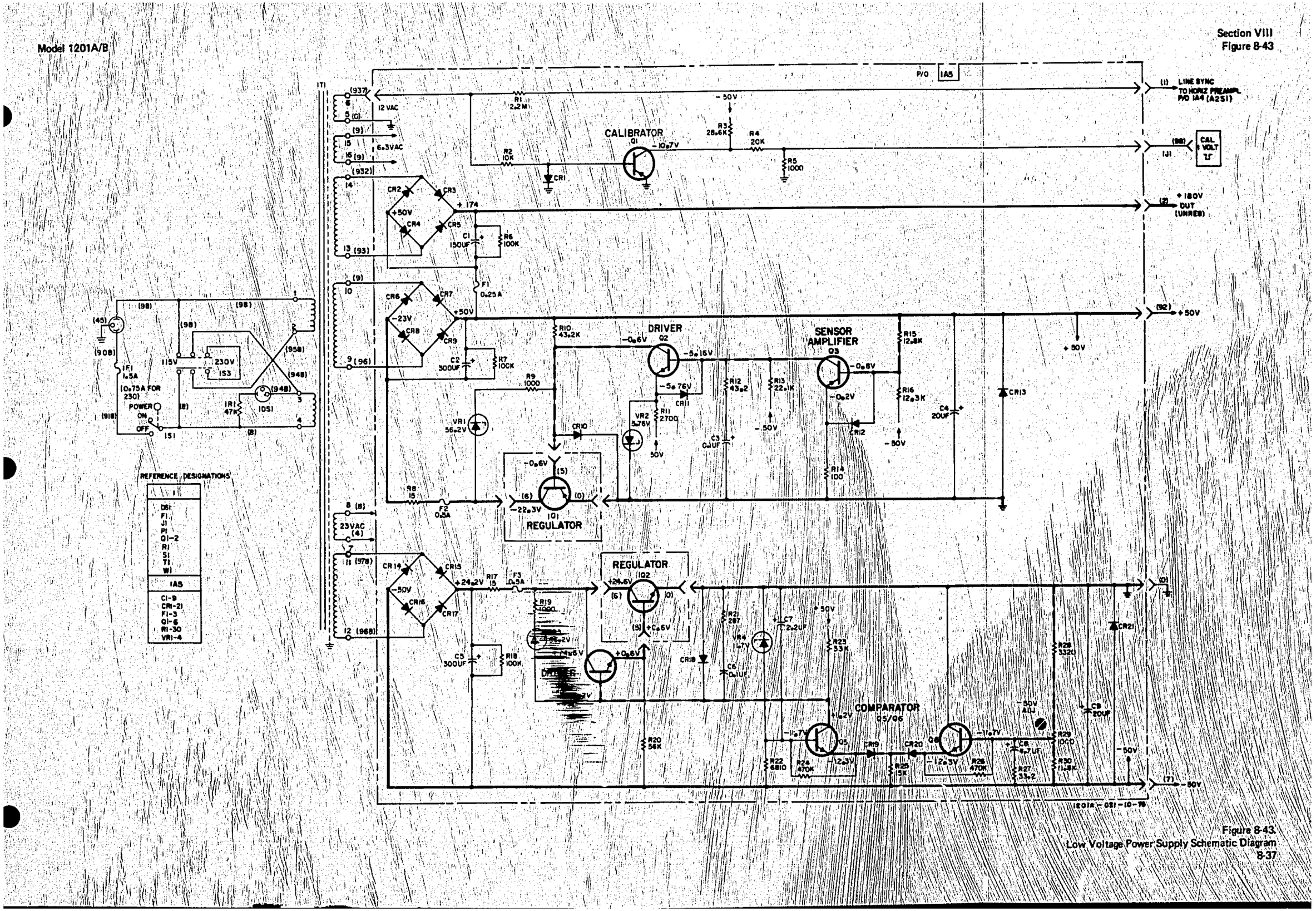
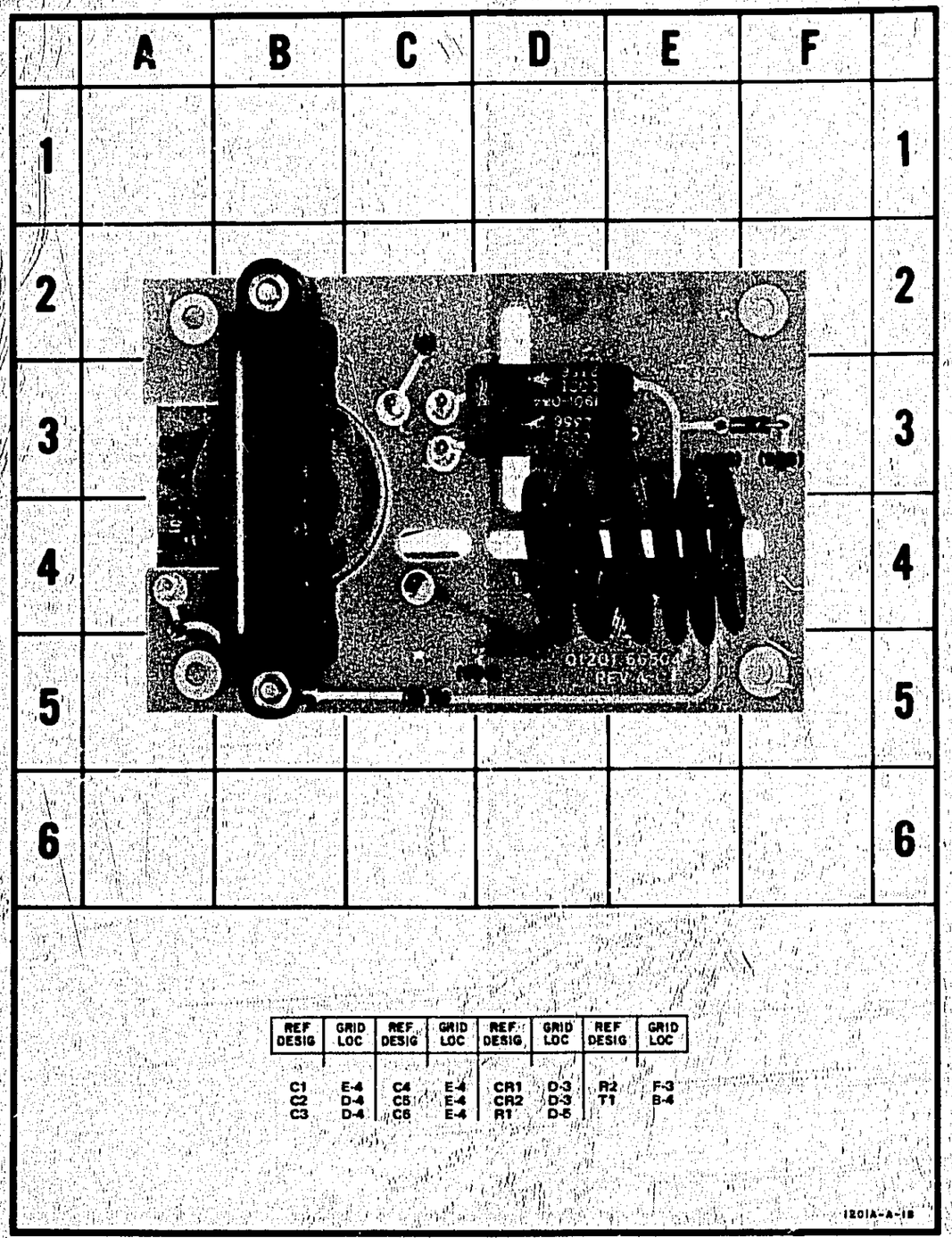
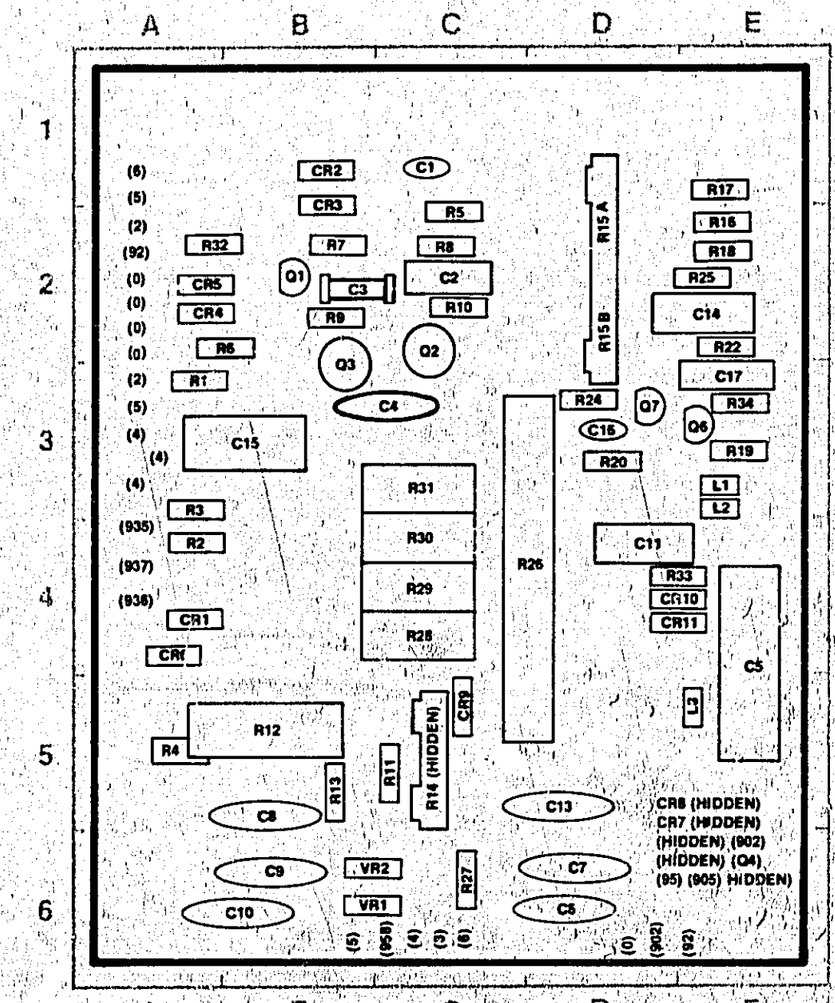


Figure 8-43.
Low Voltage Power Supply Schematic Diagram



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	E-4	C4	E-4	CR1	D-3	R2	F-3
C2	D-4	C5	E-4	CR2	D-3	T1	B-4
C3	D-4	C6	E-4	R1	D-5		

Figure 8-44. High Voltage Rectifier, 1A7, Component Identification



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-1	C11	D-4	CR5	A-2	Q1	B-2	R5	C-2	R15	D-2	R27	C-5
C2	C-2	C13	D-5	CR6	A-4	Q2	C-2	R6	B-2	R16	E-2	R28	C-4
C3	B-2	C14	E-2	CR7	E-5	Q3	B-2	R7	B-2	R17	E-1	R29	C-4
C4	C-3	C15	B-3	CR8	E-5	Q4	E-5	R8	C-2	R18	E-2	R30	C-4
C5	E-4	C16	D-3	CR9	C-5	Q6	E-3	R9	B-2	R19	E-3	R31	C-3
C6	D-5	C17	E-3	CR10	E-4	Q7	D-3	R10	C-2	R20	D-3	R32	A-2
C7	D-5	CR1	A-4	CR11	E-4	R1	A-3	R11	C-5	R22	E-2	R33	E-4
C8	B-5	CR2	B-1	L1	E-3	R2	A-4	R12	B-5	R24	D-3	R34	E-3
C9	B-5	CR3	B-1	L2	E-3	R3	A-3	R13	B-5	R25	E-2	VR1	B-6
C10	B-6	CR4	A-2	L3	E-5	R4	A-5	R14	C-5	R26	D-4	VR2	B-6

1201A-022-10-75

Figure 8-45. High Voltage Regulator, 1A6, Component Identification

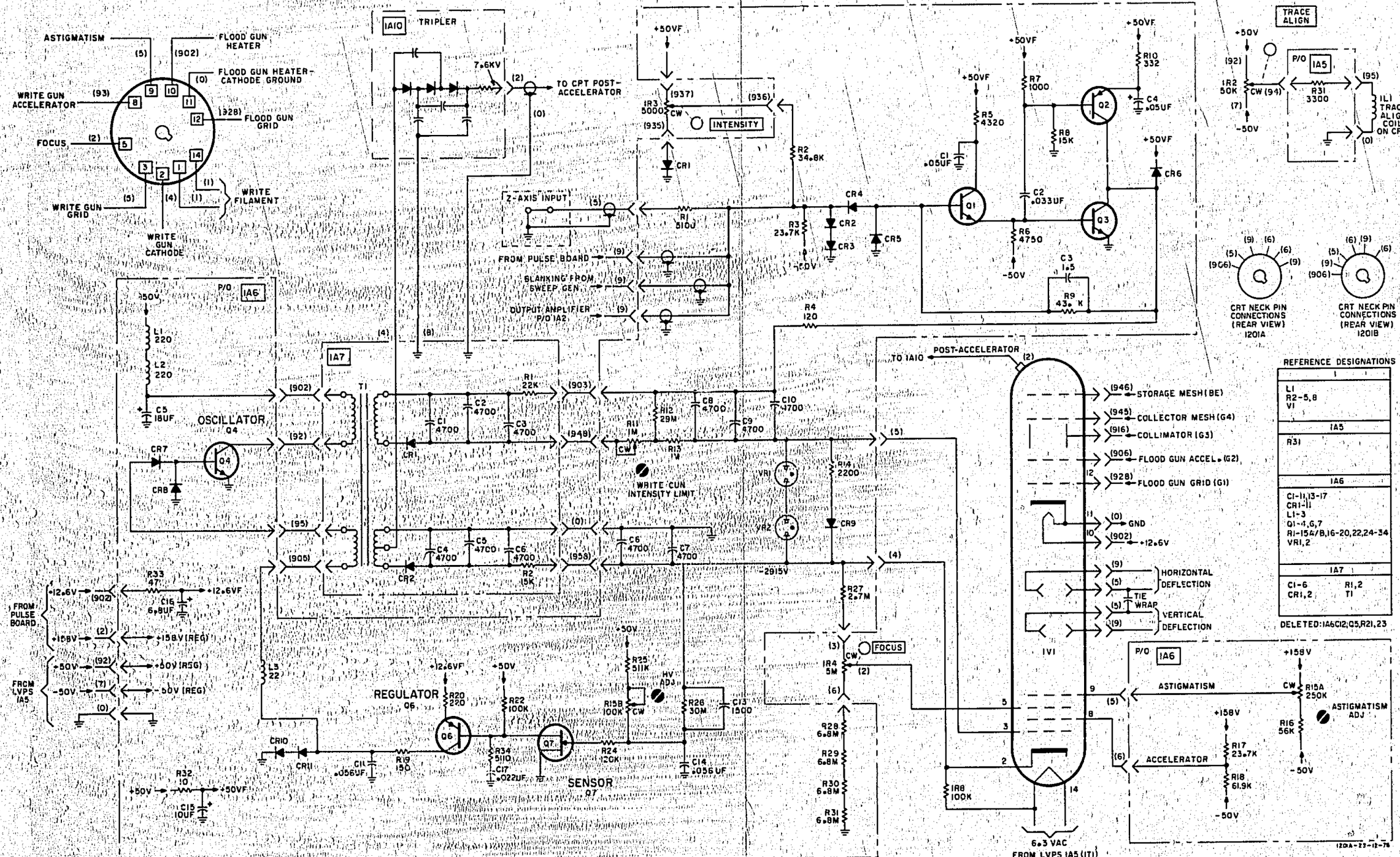


Figure 8-46.
High-Voltage Power Supply, Schematic Diagram

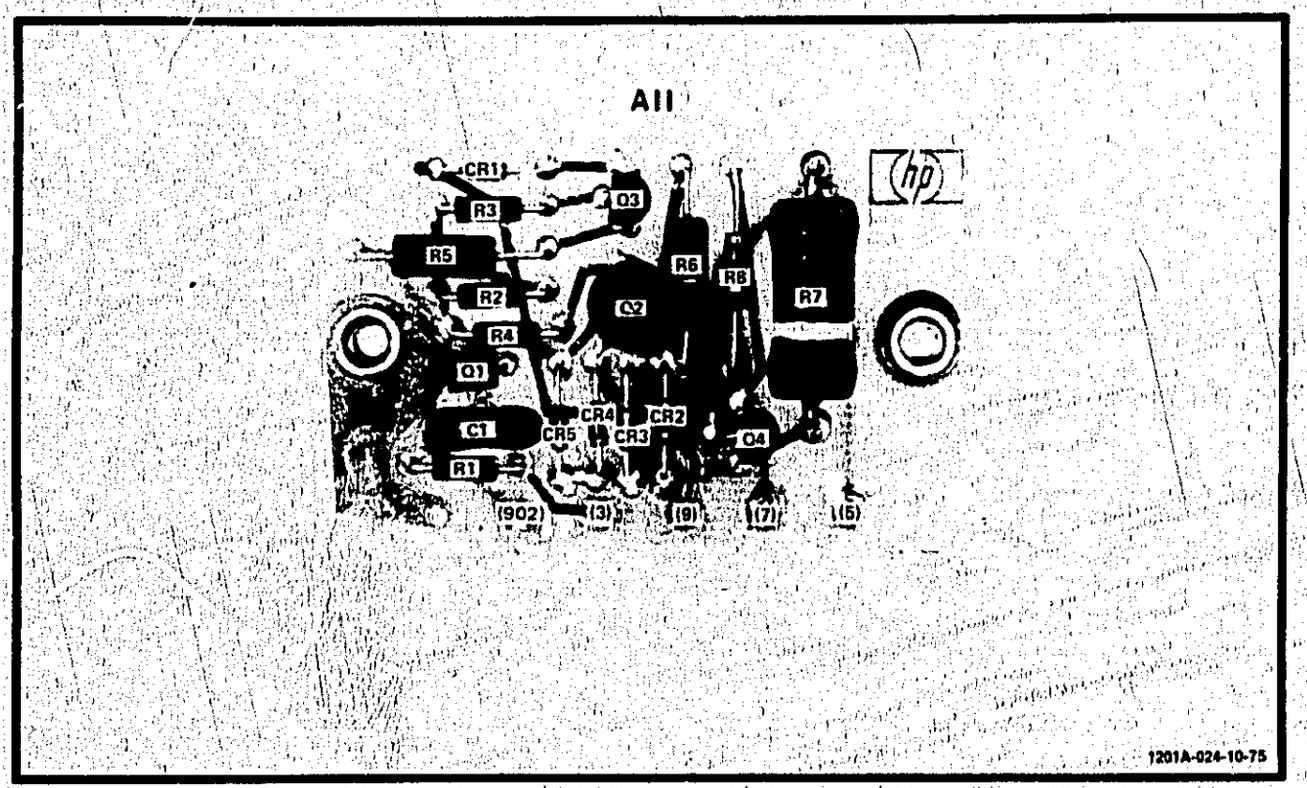


Figure 8-47. Deflection Board 1A11 Component Location

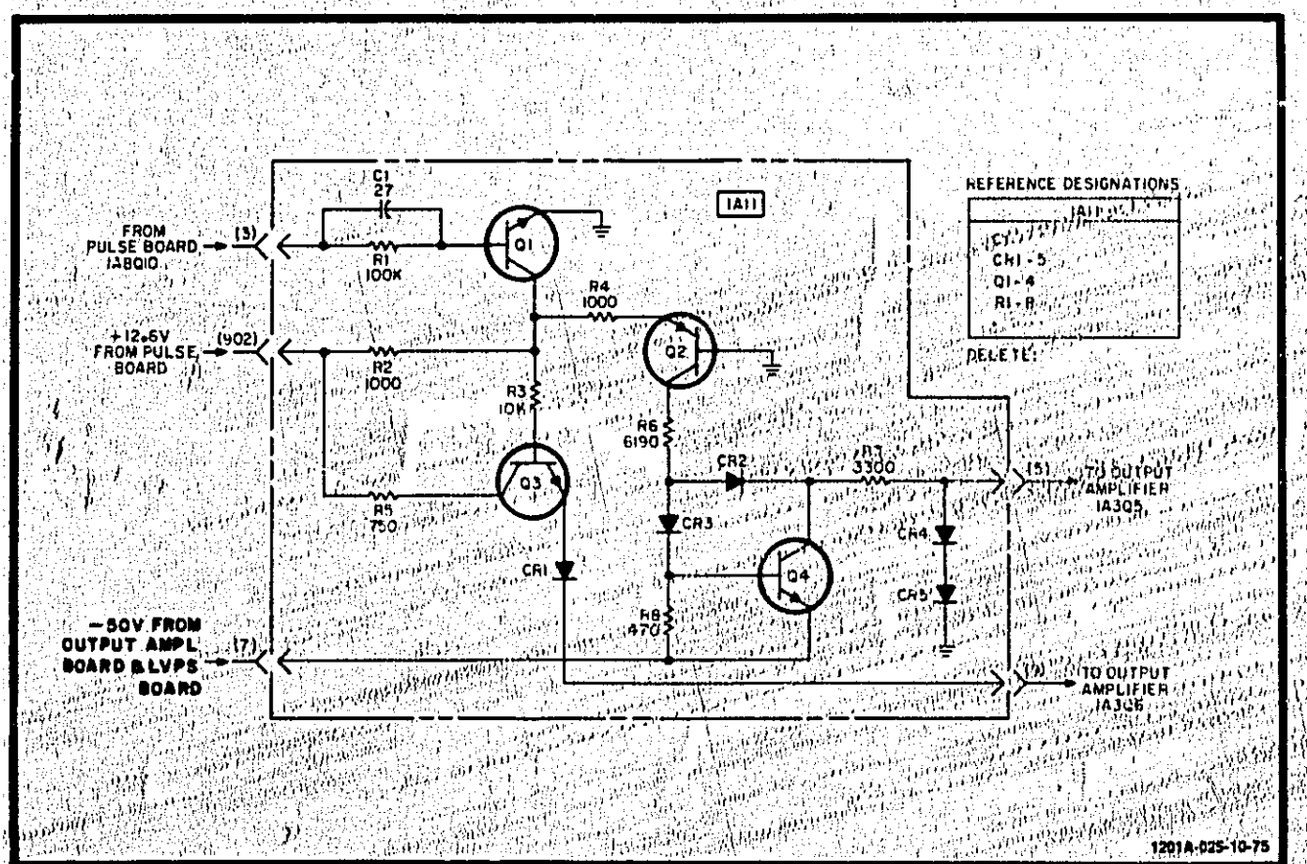


Figure 8-48. Deflection Assembly 1A11 Schematic

MANUAL CHANGES

MANUAL IDENTIFICATION

Model Number: 1201A/B
Date Printed: February 1977
Part Number: 01201-90905

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

To use this supplement:
Make all ERRATA corrections.
Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes
1921S00236 Thru 1921S00305	1
1921S00306 Thru 1921S00415	1, 2
1921S00416 Thru 1921S00501	1, 2, 3
1921S00502 Thru 1921S00574	1, 2, 3, 4
1921S00575 Thru 1921S00664	1, 2, 3, 4, 5
1921S00665 Thru 1921S00716	1, 2, 3, 4, 5, 6
1921S00717 Thru 1921S00805	1, 2, 3, 4, 5, 6, 7
1921S00806 Onwards	1, 2, 3, 4, 5, 6, 7, 8

▲ NEW ITEM

NOTE

This Manual Change Sheet is applicable only to manuals with HP Part No. 01201-90905 with wire binding.

▲ ERRATA

Page 5-1, Table 5-1, Recommended Test Equipment.
Replace: Table 5-1 with Table 5-1 in this manual change sheet.

Page 5-3, 5-4, paragraph 5-25, HIGH VOLTAGE POWER SUPPLY.
Replace: paragraph 5-25 with paragraph 5-25 below.

5-25. HIGH VOLTAGE POWER SUPPLY.

a. Develop a correction factor for this 1000:1 probe by measuring 200 Vdc from the dc standard using the 1000:1 probe and the dvm. Compare the measured value to the actual voltage to determine the correction factor for a particular probe.

NOTE

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

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b. Determine what the observed reading will be on the dvm using the 1000:1 probe for the required high voltage of -2915 ±5 Vdc.

Note: This simple ratio will allow you to acquire the correct reading.

$$\frac{-200 \text{ (dc voltage from Voltage standard)}}{\text{Actual measurement observed on dvm using 1000:1 probe when measuring 200 Vdc from the dc source.}} = \frac{-2915}{\text{Actual measurement observed on dvm using 1000:1 probe when measuring HV on the 1201A/B.}}$$

WARNING

Voltages present in the high voltage power supply are dangerous to life.

c. Monitor the high voltage supply (858 wire between A6 and A7) with the dvm and the divider probe. Adjust A6R17B (see Figure 5-2) for the same voltage calculated in step b.

Page 5-5, paragraph 5-30, GATE ADJUSTMENT.
Step a. Add:
DISPLAY ..... A

Page 5-5, paragraph 5-31, WRITE GUN INTENSITY LIMIT ADJUST.
Change: Step a. as follows:
DISPLAY ..... A
SWEEP/EXT. HORIZ XI
WRITING SWEEP ..... CONV
Sweep MODE ..... FREE RUN
INTENSITY ..... 10 O'clock
INPUTS ..... OFF

Step d. Add:
INTENSITY ..... FULLY CW

Page 5-6, paragraph 5-34.
Change: WRITING SPEED setting to CONV.

Page 6-4, Table 6-2, Replaceable Parts.
Change: IMP8 to HP Part No. 01201-60602, Shield Assembly, CRT, Mfr. Code 28480, Mfr. Part No. 01201-60602.

Page 6-5, Table 6-2, Replaceable Parts.
Change: IXF1 to consist of HP Part No. 2110-0564, Fuseholder-Body; 2110-0565, Fuseholder-cap; 2110-0569, Nut-Mounting, Mfr. Code 06328, Mfr. Part No. 031-1657; 031-1666; 583-0016 respectively.

Page 6-7, Table 6-2, Replaceable Parts.
Change: 1A1A1S1 to HP Part No. 3101-0424
Change: 1A1A2R1 and 1A1A2R3 to HP Part No. 5086-7647, Resistors, matched pair.

Page 6-12, Table 6-2, Replaceable Parts.
Change: 1A4A2R14 to HP Part No. 0698-5675, Resistor 30M 1% 1W CF TC = 0±100, Mfr. Code 03888, Mfr. Part No. PMEF70S.

Page 6-13, Table 6-2, Replaceable Parts.
Change: 1A6CR8 to HP Part No. 1901-0045.
Change: 1A6CR9 to HP Part No. 1901-0033.
Delete: 1A6CR10.

Page 6-14, Table 6-2, Replaceable Parts.
Delete: 1A8CR11.
Change: 1A8Q4 to HP Part No. 1854-0330, Transistor NPN Si PD = 21W FT = 10MHz, Mfr. Code 04713, Mfr. Part No. SJE901.
Change: 1A6R12 to HP Part No. 0698-8427, Resistor 29M 10% 1W CF TC = 0±250, Mfr. Code 03888, Mfr. Part No. FLI.
Change: 1A6R20 to HP Part No. 0757-0280, Resistor 1K 1% 0.125W F TC = 0±100, Mfr. Code 24546, Mfr. Part No. C4-1/8-TO-1001-F.
Change: 1A6R34 to HP Part No. 0757-0449, Resistor 20K 1% 0.125W F TC = 0±100, Mfr. Code 24546, Mfr. Part No. C4-1/8-TO-2002-F.
Add: 1A6R35, HP Part No. 0757-0407, Resistor 200 ohms 1% 0.125W F TC = ±100, Mfr. Code 24546, Mfr. Part No. C4-1/8-TO-201-F.

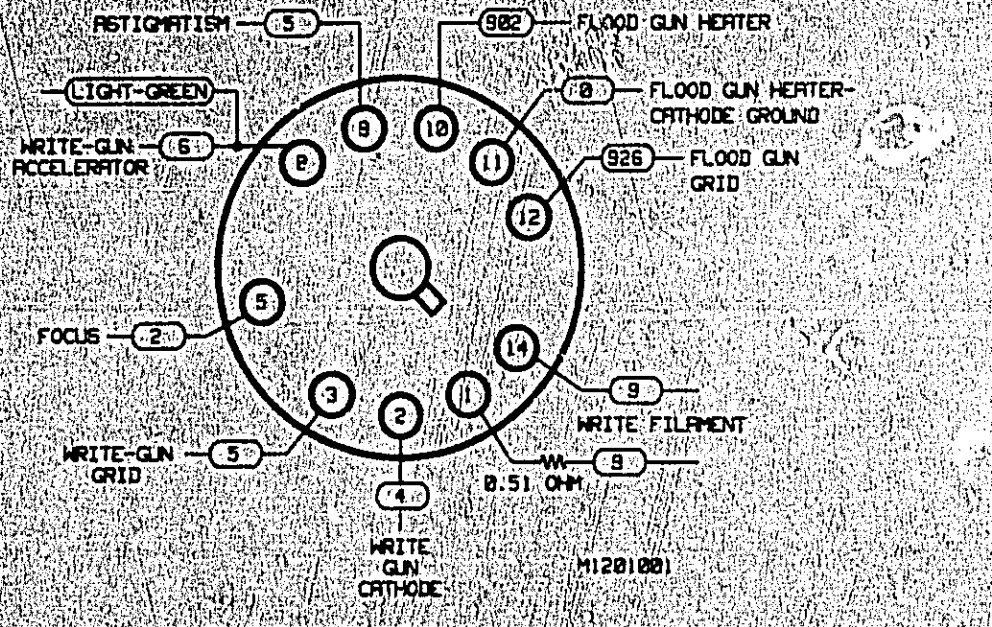
Page 6-15, Table 6-2, Replaceable Parts.
Change: 1A8C7 to HP Part No. 0180-1795, Capacitor-fxd 22µF±20% 70Vdc TA, Mfr. Code 56289, Mfr. Part No. 109D226X0100F2.
Change: 1A8C9 to HP Part No. 0180-0288, Capacitor-fxd 22µF±10% 15Vdc TA, Mfr. Code 56289, Mfr. Part No. 150D226X9015B2.
Change: 1A8Q4 to HP Part No. 1855-0367, Transistor, uni junction si, Mfr. Code 04713, Mfr. Part No. SU194.

Page 8-13, Figure 8-13.
Change: R9 value to 511. Note: part of interstage attenuator, R9 not mounted on PC Board.

Page 8-17, Figure 8-19.
Change: R9 value from 513 to 511.

Page 8-19, Figure 8-22.
Change: Voltage to L1, L2, L3 and L4 to +158V.

Page 8-39, Figure 8-46.
Delete: CR10, CR11.
Change: R20 value to 1K.
Change: R34 value to 20K.
Add: R35, 200 ohms between base of Q4 and ground.
Change: Wire on INTENSITY POT to anode of 1A8CR1 from (935) to (936) and wire to R3 centre tap from (936) to (935). Add series dropping resistor to 0.51 ohms on CRT socket diagram as shown. Change wire to CRT socket pin 8 from (93) to (8).



AS VIEWED FROM REAR OF INSTRUMENT

▲ CHANGE 1

Page 6-6, Table 6-2, Replaceable Parts.
Change: 1A1A1C3 and 1A1A1C15 to HP Part No. 0160-5200, Capacitor-fxd .047μF ±10% 200W Vdc polye, Mfr. Code 30983, Mfr. Part No. 706D1HP473PK201AX.

▲ CHANGE 2

Page 6-14 and 6-15, Table 6-2, Replaceable Parts.
Change: 1A8C2, 1A8C3, and 1A8C11 to HP Part No. 0160-3208, Capacitor-fxd 0.02μF +80-20% 100V Vdc cer, Mfr. Code 0551C, Mfr. Part No. TA-0.025 80/20% OKLPI.

▲ CHANGE 3

Page 6-9, Table 6-2, Replaceable Parts.
Change: 1A4S6 to HP Part No. 3101-2431, switch-PB SPST 0.1A 125VAC CLR-LENS, Mfr. Code 04537, Mfr. Part No. 813-1151-1637-F.

▲ CHANGE 4

Page 6-6, Table 6-2, Replaceable Parts.
Change: 1A1A1R19 to HP Part No. 2100-0554, Resistor-Trmr 500 ohms ±10% 0.5W TC = 0±100, Mfr. Code 73138, Mfr. Part No. 72PR500.

Page 6-11, Table 6-2, Replaceable Parts.
Change: 1A4A1R21 to HP Part No. 2100-0554, Resistor-Trmr 500 ohms ±10% 0.5W TC = 0±100, Mfr. Code 73138, Mfr. Part No. 72PR500.
Delete: 1A4A1R34.
Add: 1A4A1R34A and 1A4A1R34B, HP Part No. 2100-0558, Resistor-Trmr 200 ohms ±10% 0.5W TC = 0±100 Mfr. Code 73138, Mfr. Part No. 72PR200.

Page 6-13, Table 6-2, Replaceable Parts.
Change: 1A6C6 and 1A6C7 to HP Part No. 0160-5380, Capacitor-fxd 4700pF ±20% 4000wVdc cer, Mfr. Code 56289, Mfr. Part No. 564CAZ402EP472MA32.
Change: 1A6C8, 1A6C9, and 1A6C10 to HP Part No. 0160-5379, Capacitor-fxd 4700pF ±20% 4000 wVdc, Mfr. Code 56289, Mfr. Part No. 564CAZ402EP472MA31.

Page 6-14, Table 6-2, Replaceable Parts.
Change: 1A7C1, 1A7C3, and 1A7C5 to HP Part No. 0160-5380, Capacitor-fxd 4700pF ±20% 4000wVdc cer, Mfr. Code 56289, Mfr. Part No. 564CAZ402EP472MA32.
Change: 1A7C2, 1A7C4, and 1A7C6 to HP Part No. 0160-5379, Capacitor-fxd 4700pF ±20% 4000wVdc, Mfr. Code 56289, Mfr. Part No. 564CAZ402EP472MA31.

▲ CHANGE 5

Page 6-15, Table 6-2, Replaceable Parts.
Change: 1A8CR5 to HP Part No. 1901-0033, Diode-Gen Prp. 180V 200MA DO7, Mfr. Code 07263, Mfr. Part No. FDH3369.
Change: 1A8F1 to HP Part No. 2110-0063, Fuse 0.75A 250V NORM-BLO 1.25 X 0.25, Mfr. Code 71400, Mfr. Part No. AGC-3/4.

▲CHANGE 6

Page 6-16, Table 6-2, Replaceable Parts.
Delete: 1A8R49.
Add: 1A8R49A, 1A8R49B, and 1A8R49C, HP Part No. 2100-3355, Resistor-Trmr 100K ±10% 0.5W TC = 0±100, Mfr. Code 73138, Mfr. Part No. 72XR100K.
Delete: 1A8R55.
Add: 1A8R55A, HP Part No. 2100-3207, Resistor-Trmr 5K ±10% 0.5W TC = 0±100, Mfr. Code 73138, Mfr. Part No. 72XR5K.
Add: 1A8R55B, and 1A8R55C, HP Part No. 2100-3354, Resistor-Trmr 50K ±10% 0.5W TC = 0±100, Mfr. Code 73138, Mfr. Part No. 72XR50K.

▲CHANGE 7

Page 6-10, Table 6-2, Replaceable Parts.
Delete: 1A4R10.
Add: 1A4A1R10A, 1A4A1R10B, 1A4A1R10C, and 1A4A1R10D, HP Part No. 2100-3573, Resistor-Trmr 25K ±10% 0.5W TC = 0±100, Mfr. Code 73138, Mfr. Part No. 72XR25K.

Page 6-11, Table 6-2, Replaceable Parts.
Change: 1A4A1R36 to HP Part No. 2100-3573, Resistors 25K ±10% 0.5W F TC = 0±100, Mfr. Code 73138, Mfr. Part No. 72XR25K.

Page 6-14, Table 6-2, Replaceable Parts.
Delete: 1A6R15.
Add: 1A6R15A, HP Part No. 2100-3356, Resistor-Trmr 200K ±10% 0.5W TC = 0±100, Mfr. Code 04568, Mfr. Part No. 72XR200K.
Add: 1A6R15B, HP Part No. 2100-3355, Resistor Trmr 100K ±10% 0.5W TC = 0±100, Mfr. Code 04568, Mfr. Part No. 72XR100K.
Change: 1A8C4 to HP Part No. 0160-2218, Capacitor-fxd 1000pF ±15% 300wVdc Mica.

Page 6-15, Table 6-2, Replaceable Parts.
Change: 1A8R11 to HP Part No. 0698-3455, Resistor 261K 1% 0.125W F TC = 0±100, Mfr. Code 24546, Mfr. Part No. C4-1/8-TO-2613-F.
Change: 1A8R12 to HP Part No. 0757-0424, Resistor 1.1K 1% 0.125W F TC = 0±100, Mfr. Code 24546, Mfr. Part No. C4-1/8-TO-1101-F.
Change: 1A8R13 to HP Part No. 0684-1511, Resistor 150 10% 0.25W FC TC = -400/+500, Mfr. Code 01121, Mfr. Part No. CB1521.

Page 8-33, Figure 8-39.
Change: R11 value to 261K.
Change: R12 value to 1100.
Change: R13 value to 150.
Change: C4 value to 1000.

Page 8-39, Figure 8-45.
Change: R15A value to 200K.

▲CHANGE 8

Page 6-7, Table 6-2, Replaceable Parts.
Change: 1A3C6 to HP Part No. 0150-0012, C: fxd cer .01µF ±20% 1000wVdc.

Page 6-10, Table 6-2, Replaceable Parts.
Change: 1A4A1C25, and 1A4A1C31 to HP Part No. 0150-0012, C: fxd cer .01µF ±20% 1000wVdc.

Table 5-1. Recommended Test Equipment

Recommended Instrument		Required Characteristics	Used For:
Type	Model		
DC Standard	Ballantine Model 6125C	0.5 mV to 100 V dc ±0.2% accuracy	Adjustment Procedure Performance Check
Oscillator	HP Model 3311A	50 Hz to 500 kHz; up to 8.0 Volt peak-to-peak at 500 kHz; 20 Volt peak-to-peak at 10 kHz	Adjustment Procedure Performance Check
Time Mark Generator	Ballantine Model 6125C	Markers from 1 μsec to 5 sec	Adjustment Procedure Performance Check
Digital Voltmeter	HP Model 3435A/3466A	±50 Volt; ±0.05% accuracy −165 Volt; ±0.05% accuracy	Adjustment Procedure
1000:1 Divider Probe	HP Model 34111A	−3000 Vdc	Adjustment Procedure
AC Voltmeter	HP Model 3400A	10 V; 2% accurate 50 kHz to 500 kHz	Performance Check
LCR Meter	Any compatible capacitance measurement device	45 pF ±3%	Adjustment Procedure
Square Wave Generator	HP Model 3311A	4.5 Volt peak-to-peak at 1 kHz risetime ≈ 0.5 μsec	Adjustment Procedure Performance Check
Frequency Compensated Divider Probe	HP Model 10001A	10:1 dc to 30 mHz; 10 megohms; 10 pF; 2%; 600 Volts; risetime ≈ 5 nsec	Adjustment Procedure
Test Oscilloscope	HP Model 1200A/B	100 mV; 100 kHz	Adjustment Procedure

REVISED 1/84