Errata

Title & Document Type: **1710B Oscilloscope Operating and Service Manual**

Manual Part Number: **01710-90906**

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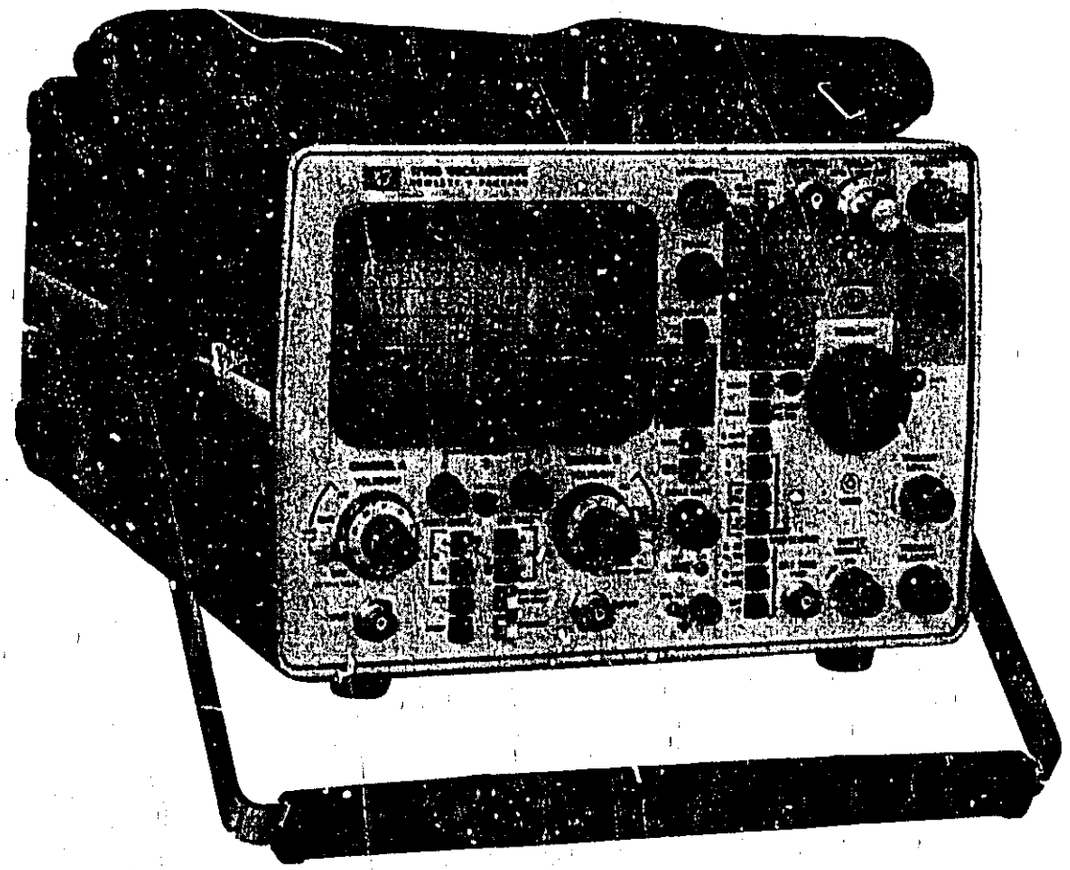
OPERATING AND SERVICE MANUAL

MODEL 1710B
OSCILLOSCOPE



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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.

C,W&A 9/76

OPERATING AND SERVICE MANUAL

OSCILLOSCOPE
MODEL 1710B

(Including Options 001, 003, 011, 091, and 101)

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1608A.

With changes described in Section VII this manual also applies to instruments with serial numbers prefixed 1420A through 1602A.

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

Manual Part Number 01710-90906
Microfiche Part Number 01710-90806

PRINTED: MARCH 1976

SAFETY SUMMARY

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

GROUND THE INSTRUMENT.

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

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.

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

KEEP AWAY FROM LIVE CIRCUITS.

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

DO NOT SERVICE OR ADJUST ALONE.

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

USE CAUTION WHEN EXPOSING OR HANDLING THE CRT.

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

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.

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

DANGEROUS PROCEDURE WARNINGS.

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

WARNING

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

SS-2-1/76

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SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. The Hewlett-Packard Model 1710B Oscilloscope is a general-purpose, wide-band oscilloscope designed for bench or field service. It provides accurate measurements of high-frequency signals and fast rise-time pulses with 10-mV/div vertical deflection capability over the full 200 MHz bandwidth. Selectable input impedance of either 50 ohms or 1 megohm permits impedance selection that best meets measurement applications. Its low shunt capacitance of less than 11 pF reduces phase shift and signal loss in pulse or cw measurements.

1-3. This manual contains installation and operating instructions, as well as maintenance information for the Model 1710B. Instrument specifications and procedures for verifying proper operation are included. Procedures are also included for adjusting the instrument to its performance specifications. Schematic diagrams, the theory of operation, and troubleshooting information are provided for use in maintaining the instrument.

1-4. This section of the manual contains the performance specifications for the Model 1710B, and a list of the options available. It also lists the accessories supplied with the Model 1710B and other accessories that are available. Instrument and manual identification information are also included.

1-5. SPECIFICATIONS.

1-6. Table 1-1 is a complete list of the Model 1710B critical specifications that are controlled by tolerances. Table 1-2 contains general information that describes operating characteristics of the Model 1710B.

1-7. Any change in the specifications due to manufacturing, design, or traceability to the U.S. National Bureau of Standards will be listed on a manual change sheet included with this manual. The manual and manual change sheet supersede all previous information concerning specifications of the 1710B.

1-8. ACCESSORIES SUPPLIED.

1-9. The following accessories are supplied with the 1710B:

One Blue Light Filter, HP Model 10115A
One Front-panel Cover, HP Part No. 01720-64101
One Vinyl Storage Pouch, HP Part No. 1540-0292
One 7.5-ft Power Cord, HP Part No. 8120-1521
Two 10:1 Divider Probes, HP Model 10014A
One Attenuator Resistor Kit, HP Part No. 5080-9696

1-10. ACCESSORIES AVAILABLE.

1-11. The following accessories are available for the 1710B:

Model 10020A Resistive Divider Probe Kit
Model 1120A 500 MHz Active Probe
Model 1125A Impedance Converter Probe
Model 10491A Rack Mount Adapter

1-12. OPTIONS.

1-13. The following standard options extend the usefulness of the Model 1710B:

OPTION 001. This option supplies a fixed ac power cord in place of the normal detachable power cord. The option consists of the standard instrument modified by the addition of a power cord adapter plate (HP Part No. 01720-03201) and a power cord (HP Part No. 8120-1202).

OPTION 003. This option supplies two rear-panel connectors for probe power. The option consists of the standard instrument and assembly A18 (HP Part No. 01720-66516). Refer to Section VII for additional information.

OPTION 011. Replaces standard P31 phosphor CRT (V1) with internal graticule P11 phosphor CRT (HP Part No. 5083-4042). The option consists of replacing the CRT and assembly A14 with assembly A14 (HP Part No. 01720-66531).

OPTION 091. This option replaces the standard Model 10014A probes with HP Model 10016A 10:1 Voltage Divider Probes.

OPTION 101. This option adapts the Model 1710B for use with HP Model 1607A Logic State Analyzer to provide both digital and analog analysis. Refer to Section VII for additional information.

1-14. INSTRUMENT AND MANUAL IDENTIFICATION.

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

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

Table 1-1. Specifications

VERTICAL DISPLAY MODES

Channel A, channel B, channels A and B displayed alternately on successive sweeps (ALT); channels A and B displayed by switching between channels at approx 1 MHz rate with blanking during switching (CHOP); channel A plus channel B (algebraic addition); X-Y (channel A vs. channel B).

VERTICAL AMPLIFIERS (2)

BANDWIDTH: (3 dB down from a 6 div reference signal).

DC-Coupled: dc to 200 MHz in both 50 ohm and high impedance input modes, 10 mV/div to 5 V/div; dc to 150 MHz at 5 mV/div.

AC-Coupled: lower limit is approx 10 Hz.

BANDWIDTH LIMIT: limits upper bandwidth to approx 20 MHz.

RISE TIME: <1.75 ns, 10 mV/div to 5 V/div; <2.3 ns at 5 mV/div (measured from 10% to 90% points of 6 div input step).

DEFLECTION FACTOR

Ranges: 5 mV/div to 5 V/div (10 calibrated positions) in 1, 2, 5 sequence. ±2% attenuator accuracy.

Vernier: continuously variable between all ranges; extends maximum deflection factor to at least 12.5 V/div. Front panel light indicates when vernier is not in CAL position.

POLARITY: channel B may be inverted, front panel pushbutton.

Signal Delay: input signals are delayed sufficiently to view leading edge of input pulse without advanced trigger.

INPUT COUPLING: selectable, AC or DC, 50 ohms (dc) or ground. Ground position disconnects input connector and grounds amplifier input.

INPUT RC (selectable)

AC and DC: 1 megohm ±2% shunted by approx 11 pF.

50 Ohm: 50 ohms ±2%, SWR <1.3:1 on 5, 10, 20, and 50 mV ranges and <1.15:1 on all other ranges.

MAXIMUM INPUT

AC and DC: ±250 V (dc + peak ac) at 1 kHz or less.

50 Ohm: 5 V rms or ±250 V peak whichever is less.

A + B OPERATION

Amplifier: bandwidth and deflection factors are unchanged; channel B may be inverted for A—B operation.

Differential (A—B) Common Mode: CMRR is at least 40 dB from dc to 5 MHz, decreasing to 26 dB at 50 MHz. Common mode signal amplitude equivalent to 12 cm with one vernier adjusted for optimum rejection.

TRIGGER SOURCE

Selectable from channel A, channel B, or composite.

CHANNEL A: all display modes triggered by channel A signal.

CHANNEL B: all display modes triggered by channel B signal.

COMPOSITE: all display modes triggered by displayed signal.

VERTICAL OUTPUT

AMPLITUDE: one division of vertical deflection produces approx 100 mV output (dc to 25 MHz).

CASCADED DEFLECTION FACTOR: 1 mV/div with both vertical channels set to 10 mV/div.

CASCADED BANDWIDTH: dc to 5 MHz with bandwidth limit engaged.

SOURCE RESISTANCE: approx 100 ohms.

SOURCE SELECTION: trigger source set to channel A selects channel A output, trigger source set to channel B selects channel B output.

HORIZONTAL DISPLAY MODES

Main, main intensified, delayed, mixed, and X-Y.

MAIN TIME BASE

SWEEP

RANGES: 10 ns/div to 0.5 s/div (24 ranges) 1, 2, 5 sequence.

Accuracy

Main Sweep Time/Div	Accuracy	0°C to 55°C
	X1	X10
10 ns to 50 ns	±3%	±5%
100 ns to 20 ms	±2%	±3%
50 ms to 0.5 s	±3%	±3%

Table 1-1. Specifications (Cont'd)

Vernier: continuously variable between all ranges; extends slowest sweep to at least 1.25 s/div. Vernier uncalibrated light indicates when vernier is not in CAL position.
Magnifier: expands all sweeps by a factor of 10; extends fastest sweep to 1 ns/div.
SWEEP MODE
Normal: sweep is triggered by internal or external signal.
Automatic: bright baseline displayed in absence of input signal from 10 ns/div to 20 ms/div. Triggering is same as normal above 40 Hz. Normal triggering is generally required for sweep speeds from 50 ms/div to 0.5 s/div.
Single: in Normal mode, sweep occurs once with same triggering as normal, reset pushbutton arms sweep and lights indicator; in Auto mode, sweep occurs once each time Reset pushbutton is pressed.

MAIN TIME BASE TRIGGERING

INTERNAL: dc to 100 MHz on signals causing 0.5 division or more vertical deflection, increasing to 1 division of vertical deflection at 200 MHz in all display modes. Triggering on line frequency is also selectable.
EXTERNAL: dc to 100 MHz on signals of 50 mV p-p or more increasing to 100 mV p-p at 200 MHz. Maximum input ±250 V (dc + peak ac) at 1 kHz or less.
External Input RC: approx 1 megohm shunted by approx 15 pF.
TRIGGER LEVEL AND SLOPE
Internal: at any point on the vertical waveform displayed.
External: continuously variable from +1.0 V to —1.0 V on either slope of the trigger signal. +10 V to —10 V in divide by 10 mode (+10).
COUPLING: AC, DC, LF REJ, or HF REJ.
AC: attenuates signals below approx 10 Hz.
LF Reject: attenuates signals below approx 7 kHz.
HF Reject: attenuates signals above approx 7 kHz.
TRIGGER HOLDOFF: time between sweeps continuously variable, exceeding one full sweep from 10 ns/div to 50 ms/div.

MAIN INTENSIFIED

Intensified that part of main time base to be expanded to full screen in delayed time base mode. Delay control adjusts position of intensified portion of sweep. Rear panel intensity ratio control sets relative intensity of brightened segment.

DELAYED TIME BASE

SWEEP
Ranges: 10 ns/div to 20 ms/div (20 ranges) in 1, 2, 5 sequence.
Accuracy (0° to 55°C): same as main time base.
Magnifier (0° to 55°C): same as main time base.

DELAYED TIME BASE TRIGGERING

INTERNAL: same as main time base except there is no Line Frequency triggering.
STARTS AFTER DELAY: delayed sweep automatically starts at end of delay period.
TRIGGER: with delayed trigger level control out of detent (starts after delay) delayed sweep is triggerable at end of delay period.
EXTERNAL: dc to 100 MHz on signals of 50 mV/p-p or more increasing to 100 mV p-p at 200 MHz. Maximum input ±250 V (dc + peak ac) at 1 kHz or less.
EXTERNAL INPUT RC: approx 1 megohm shunted by approx 15 pF.
TRIGGER LEVEL AND SLOPE
Internal: at any point on the vertical waveform displayed when in the trigger mode.
External: continuously variable from +1.0 V to —1.0 V on either slope of the trigger signal, +10 V to —10 V in divided by 10 mode (+10).
COUPLING: AC, DC, LF REJ, or HF REJ.
AC: attenuates signals below approx 10 Hz.
LF Reject: attenuates signals below approx 7 kHz.
HF Reject: attenuates signals above approx 7 kHz.
DELAY TIME RANGE: 0.5 to 10X Main Time/Div settings of 20 ns to 0.5 s (minimum delay 50 ns).
Differential Time Measurement Accuracy (+15°C to 35°C)

Main Time Base Setting	Accuracy
50 ns/div to 20 ms/div	±(0.5% +0.1% of full scale)
20 ns/div	±(1% +0.2% of full scale)
50 ms/div to 0.5 s/div	±3%

DELAY JITTER: <0.005% (1 part in 20 000) of maximum delay in each step.

MIXED TIME BASE

Dual time base in which the main time base drives the first portion of sweep and the delayed time base completes the sweep at the faster delayed sweep. Also operates in single sweep mode.

X-Y OPERATION

BANDWIDTH
Y-axis (channel A): same as channel A.
X-axis (channel B): dc to >1 MHz.
DEFLECTION FACTOR: 5 mV/div to 5 V/div (10 calibrated positions) in 1, 2, 5 sequence.
PHASE DIFFERENCE BETWEEN CHANNELS: <3°, dc to 1 MHz.

Table 1-2. General Information

CATHODE-RAY TUBE AND CONTROLS

TYPE: post accelerator, approx 20.5 kV accelerating potential, aluminized P31 phosphor.

GRATICULE: 6 x 10 div internal graticule. 0.2 subdivision markings on major horizontal and vertical axes. 1 div = 1 cm. Rear panel adjustment aligns trace with graticule. Internal flood gun graticule illumination.

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

INTENSITY MODULATION: +8 V, >50 ns width pulse blanks trace of any intensity, useable to 20 MHz for normal intensity, Input R, 1 kΩ ±10%. Maximum input ±10 V (dc + peak ac).

AUTO-FOCUS: automatically maintains beam focus with variations of intensity.

INTENSITY LIMIT: automatically limits beam current to decrease possible CRT damage. Circuit response time ensures full writing speed for viewing low duty cycle, fast rise time pulses.

REAR PANEL CONTROLS: astigmatism, pattern, main/delayed intensity ratio, and trace align.

GENERAL

REAR PANEL OUTPUTS: main and delayed gates, —0.7 V to +1.3 V capable of supplying approx 3 mA.

CALIBRATOR:

Type: 1 kHz ±15% square wave.

Voltage: 3 V p-p ±1%.

Rise Time: <0.1 μs.

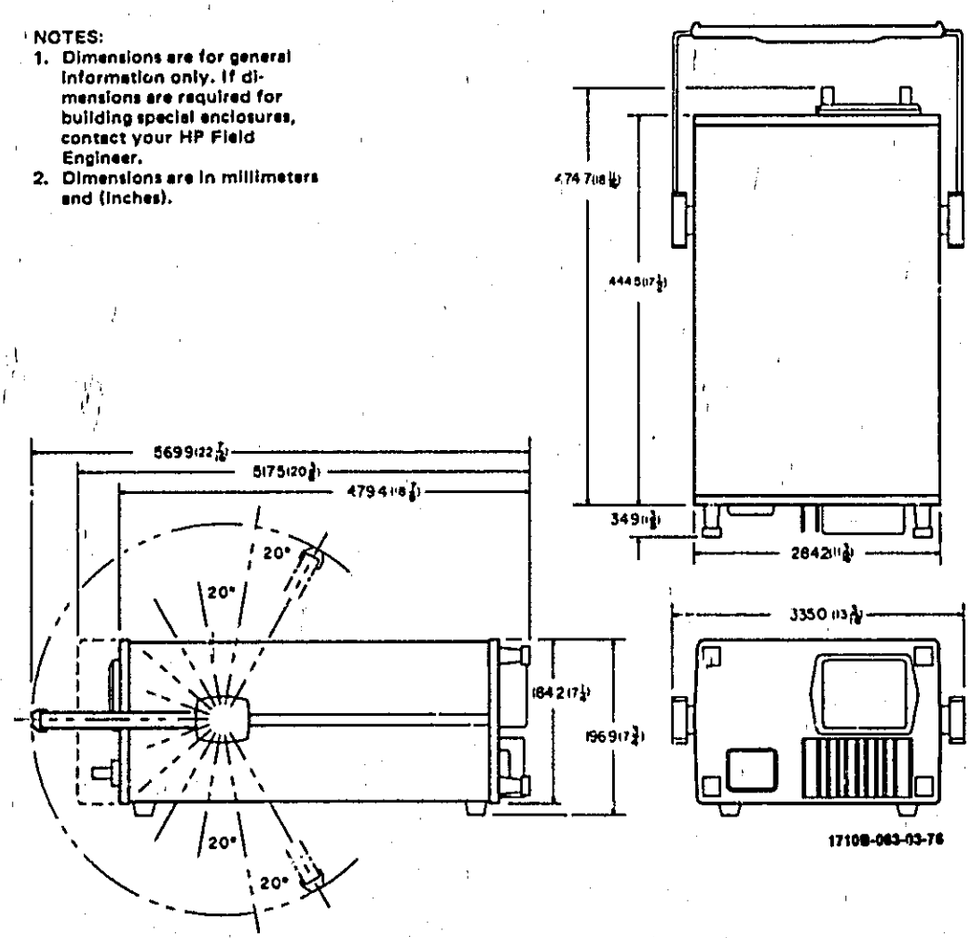
POWER: 100, 120, 220, 240 Vac, —10% +5%; 48 to 440 Hz; 110 VA max.

WEIGHT: net, 12.9 kg (28.5 lb); shipping 17.9 kg (39.5 lb).

OPERATING ENVIRONMENT: temperature, 0 to +55°C; humidity, to 95% relative humidity at 40°C; altitude, to 4572 m (15 000 ft); vibration, vibrated in three planes for 15 min. each with 0.25 mm (0.010) excursion, 10 to 55 Hz.

DIMENSIONS: see outline drawing.

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



SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information and instructions necessary for installing and interfacing the Model 1710B Oscilloscope. Included are initial inspection procedures, power and grounding requirements, installation instructions, and procedures for repackaging the instrument for shipment.

2-3. INITIAL INSPECTION.

2-4. This instrument was carefully inspected both mechnically 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. Check for supplied accessories (listed in Section I) and test the electrical performance of the instrument using the performance test procedures outlined in Section V. If there is damage or deficiency, see the warranty in the front of this manual.

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

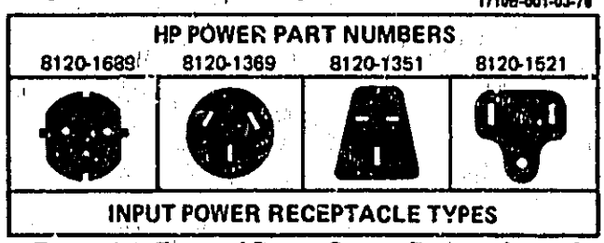


Figure 2-1. Types of Power Source Receptacles and Applicable Input Power Cable Part Numbers

2-7. POWER REQUIREMENTS.

2-8. The Model 1710B can be operated from any power source supplying 100 V, 120 V, 220 V, or 240 V (±10%), single phase, 48 to 440 Hz. Power dissipation is 100 VA maximum.

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 120-volt operation. To operate the instrument from any other ac power source, proceed as follows:

a. Verify that Model 1710B power cable is not connected to any input power source.

b. Move LINE VOLTAGE SELECT switch on rear panel to 220 or 240 position.

c. Replace 1.5 Amperes LINE FUSE with 0.8 ampere fuse (HP Part No. 2110-0020) provided with instrument.

d. Connect input power cable to 220- or 240-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.

OPERATION

SECTION III

OPERATION

3-1. INTRODUCTION.

3-2. This section provides general operating instructions, power and warmup information, functional identification of all controls and connectors, and special applications information for the Model 1710B.

3-3. INSTRUMENT CAPABILITIES.

3-4. The instrument contains dual vertical preamplifiers for dual-channel operation. Each channel offers a choice of ac, high-Z dc, or 50-ohm input coupling. With the dual trace feature, displays can be obtained on either channel A or channel B or on both channels. Simultaneous display of two signals is possible in either chop or alternate mode of display. A+B and A—B modes of operation are also available. In addition, an X-Y mode of operation is provided. In this mode of display, the instrument becomes an X-Y display with inputs through channel A (Y-axis) and channel B (X-axis). The sensitivity of each axis is controlled by the channel A or channel B attenuator.

3-5. Ten calibrated switch settings on each vertical amplifier provide a deflection factor range from 5 mV/div to 5 V/div in 1, 2, 5 sequence. The vertical verniers permit continuous adjustment between calibrated steps and extends the least sensitive deflection factor (5 V/div) to at least 12.5 V/div.

3-6. Main horizontal amplifier sweep-speed settings from 10 ns/div to 0.5 s/div are available in a 1, 2, 5 sequence. The main sweep speed is calibrated when the SWEEP VERNIER control is set to CAL detent position.

3-7. FRONT- AND REAR-PANEL DESCRIPTIONS.

3-8. Front- and rear-panel features are described in figure 3-1. Description numbers match the numbers on the illustration.

3-9. GENERAL OPERATING INSTRUCTIONS.

3-10. Before connecting ac power to the Model 1710B, make sure the rear-panel line select switches are set to correspond to the voltage of the available power line. The instrument is normally set at the factory to operate from a 120-Vac source. If a different power source is to be used, refer to Section II for settings of the line select switches and fuse type.

NOTE

In the following paragraphs all control numbers (in parentheses) refer to the numberical assignment in figure 3-1.

3-11. INITIAL TURN-ON. To place the Model 1710B into operation, perform the following steps:

a. Set INTENSITY (1) fully counterclockwise.

b. Set VERT DISPLAY to ALT (47).

c. Set INT TRIG to A (41).

d. Set vertical vernier controls (52) for channel A and channel B to CAL detent.

e. Set B INVERT switch (44) to out position.

f. Set vertical coupling for channel A and channel B to GND (50).

g. Set horizontal position (18) control to midrange.

h. Set main TIME/DIV (23) to 1 mSEC.

i. Set delayed TIME/DIV (24) to OFF.

j. Set main SWEEP VERNIER (28) to CAL detent.

k. Set AUTO/NORM (22) switch to AUTO.

l. Set main INT/EXT (34) trigger switch to INT.

m. Set LINE (38) switch to on and allow 5-minute warm-up period.

n. Adjust INTENSITY control (1) for just visible trace.

3-12. TRACE ALIGN ADJUSTMENT. The trace align adjustment compensates for external magnetic fields that may affect alignment of the horizontal trace with respect to the graticule. When the instrument is moved to a new location, trace alignment should be checked and adjusted if necessary. To align the trace, proceed as follows:

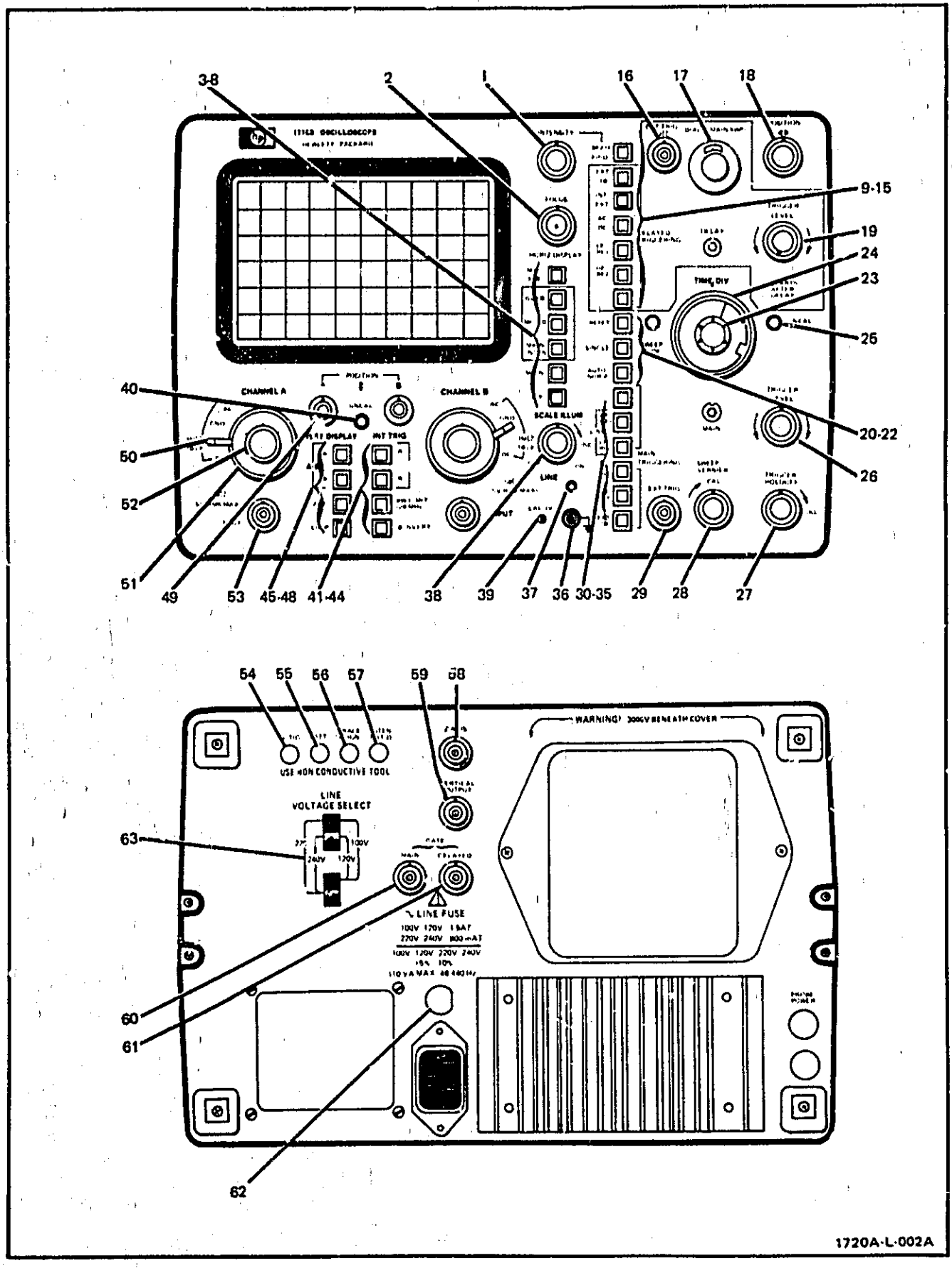


Figure 3-1. Controls and Connectors

1. INTENSITY. Controls brightness of display.
2. FOCUS. Control to provide the best focused display.
3. MAG X10. In X10 position, sweep or X in X-Y mode, is magnified 10 times.
4. DLY'D. Selects delayed sweep mode for display.
5. MIXED. Selects mixed sweep mode for display.
6. MAIN INTEN. Intensifies delayed sweep portion of main sweep.
7. MAIN. Selects main sweep mode for display.
8. X-Y. Display mode for providing X-axis deflection with signal applied to channel B input.
9. BEAM FIND. Returns display to viewing area.
10. delayed EXT + 10. Attenuates external trigger signal by factor of 10; increases external trigger range to ±10V.
11. delayed INT/EXT. Selects internal or external delayed sweep triggering.
12. delayed AC/DC. Selects delayed sweep triggering coupling.
13. delayed LF REJ. Attenuates delayed trigger signals below approximately 15 kHz.
14. delayed HF REJ. Attenuates delayed trigger signals above approximately 1[illegible] kHz.
15. delayed slope. Selects slope of delayed trigger signal that starts sweep.
16. delayed EXT TRIG. BNC connector for delayed external trigger signal.
17. DELAY. Selects delay time between start of main sweep and start of delayed sweep.
18. horizontal POSITION. Controls coarse and fine horizontal position of display.
19. delayed TRIGGER LEVEL. Selects amplitude point on trigger signal that starts delayed sweep.
20. RESET. Resets sweep in SINGLE sweep mode; reset light indicates when sweep is armed.
21. SINGLE. Selects single or normal sweep operation.
22. AUTO/NORM.
    a. AUTO. Automatic sweep in absence of trigger signal; triggering occurs on trigger signals above 40 Hz.
    b. NORM. Sweep is triggered only by applying trigger signal.
23. main TIME/DIV. Controls sweep time in MAIN sweep mode.
24. delayed TIME/DIV. Controls sweep time in MIXED and DLY'D sweep modes; controls intensified portion of sweep in MAIN INTEN sweep mode.
25. UNCAL light. Refer to step 28.
26. main TRIGGER LEVEL. Selects amplitude point on trigger signal that starts main sweep.
27. TRIGGER HOLDOFF. Provides control of time between sweeps. With control fully counterclockwise, holdoff time is minimum.
28. SWEEP VERNIER. Provides continuous control of sweep time between calibrated positions of TIME/DIV switch. UNCAL light indicates when control is out of CAL detent position.
29. main EXT TRIG. BNC connector for main external trigger signal.
30. main slope. Selects slope of main trigger signal that starts sweep.
31. main HF REJ. Attenuates main trigger signals above approximately 15 kHz.
32. main LF REJ. Attenuates main trigger signals below approximately 15 kHz.

NOTE

LINE trigger is selected by engaging both HF REJ and LF REJ pushbutton switches simultaneously.

33. main AC/DC. Selects main sweep triggering coupling.
34. main INT/EXT. Selects internal or external main sweep triggering.
35. main EXT + 10. Attenuates external trigger signal by factor of 10; increases external trigger range to ±10V.
36. ⏚. Chassis ground connection for external equipment.
37. power lamp. Lights when input power switch on.
38. SCALE ILLUM. Controls brightness of scale illumination; control also contains input ac power on-off switch. With control completely counterclockwise in POWER OFF position, ac power is disconnected internally.
39. CAL 3V. Provides 1-kHz, negative square wave of 3 volts ±1%.
40. vertical UNCAL light. Lights when either channel A or channel B vernier is out of CAL detent.
41. internal trigger A. Selects channel A input signal for triggering.
42. internal trigger B. Selects channel B input signal for triggering.

NOTE

Engaging both channel A and channel B internal trigger pushbutton switches results in composite triggering (COMP) on the displayed signal(s).

43. BW LIMIT 20 MHz. Display bandwidth limited to 20 MHz. Useful for noise reduction in normal and cascade operation.
44. B INVERT. Control used to invert polarity of channel B signal display.
45. vertical display A. Selects channel A input signal for display.
46. vertical display B. Selects channel B input signal for display.

NOTE

Engaging both channel A and channel B vertical display pushbutton switches results in A+B (algebraic addition) display.

47. ALT. Displays each channel on alternate sweeps.
48. CHOP. Displays each channel by switching between channels at 1 MHz rate.
49. position A. Varies vertical position of channel A display.
50. coupling. Selects capacitive (AC), direct (DC), or 50-ohm coupling of input signal. GND position disconnects input signal and grounds input to vertical preamplifier.
51. VOLTS/DIV. Selects vertical deflection factor necessary for calibrated measurements.
52. vernier. Provides continuous adjustment of volts/div between calibrated positions of VOLTS/DIV switch.
53. INPUT. BNC connector for channel A input signal.
54. ASTIG. Adjusts roundness of writing spot.
55. PATT. Adjusts for uniform pattern over CRT viewing area.
56. TRACE ALIGN. Adjust to align trace with horizontal graticule.
57. INTEN RATIO. Adjusts intensity of intensified portion of sweep in MAIN INTEN mode of operation.
58. Z AXIS. BNC connector for Z-axis input.
59. VERTICAL OUTPUT. BNC connector for vertical amplifier output signal; provides approximately X10 gain, dc coupled, and source impedance of 100 ohms.
60. MAIN gate. BNC connector for main gate output to external equipment.
61. DELAYED gate. BNC connector for delayed gate output to external equipment.
62. FUSE. AC power input fuse.
63. LINE SELECTOR. Selects 100/120/220/240 ac operation.

Figure 3-1.
Controls and Connectors (Cont'd)

a. Accomplish paragraph 3-11.

b. Using channel A POSITION control (49), position trace on center horizontal graticule line.

c. Using non-metallic alignment tool, adjust TRACE ALIGN (56) until trace aligns with horizontal graticule.

3-13. FOCUS AND ASTIGMATISM ADJUSTMENTS. Adjust focus and astigmatism as follows:

a. Turn INTENSITY control (1) fully counterclockwise.

b. Set LINE switch (38) to on position.

c. Set channel A controls as follows:

VOLTS/DIV (51)	.01
Coupling (50)	GND
VERT DISPLAY (45)	A
Vernier (52)	fully cw
Trigger select (42)	B
POSITION (18) (49)	as required
HORIZONTAL DISPLAY (8)	X-Y

d. Set INTENSITY (1) to observe dot.

e. Adjust FOCUS (2) and ASTIG (54) controls for best defined dot.

3-14. OPERATOR'S PERFORMANCE CHECK.

3-15. Model 1710B operation may be checked without additional test equipment by using the CAL 3 V output as a signal source. These tests will functionally check each display mode and operation of front-panel controls. To check specifications listed in table 1-1, refer to Section V for performance checks.

3-16. Operator's checks must be performed in the sequence given. Do not attempt to start a procedure in midsequence, as succeeding steps depend on control settings and results of previous steps. If any of the results are unobtainable, refer to Section V and the schematics at the rear of this manual.

a. Set Model 1710B controls as follows:

CHANNEL A

VOLTS/DIV	.5
Coupling	DC
Vernier	CAL
POSITION	as required
VERTICAL DISPLAY	A
B INVERT	out

CHANNEL B

VOLTS/DIV	N/A
Coupling	N/A
Vernier	N/A
POSITION	N/A

TIME BASE

Horizontal POSITION	as required
SWEEP VERNIER	CAL
HORIZ DISPLAY	MAIN
Main TIME/DIV	0.5 mSEC
Delayed TIME/DIV	10 nSEC
AUTO/NORM	AUTO
Main trigger	INT
Main slope +/—	+
Delayed slope +/—	+
Main TRIGGER LEVEL	as required
Delayed TRIGGER LEVEL	ccw detent
TRIGGER HOLDOFF	ccw
MAG X10	out

b. Set INTENSITY, FOCUS, and POSITION controls for desired baseline display.

c. Apply CAL 3V output directly to channel A INPUT.

d. Adjust main TRIGGER LEVEL for stable display. Observe six positive-going pulses with leading edge of first and sixth pulse on first and eleventh vertical graticule lines respectively (±10%).

e. Set HORIZ DISPLAY for MAIN INTEN operation.

f. Set delayed TIME/DIV to 0.2 mSEC. Observe intensified portion of sweep.

NOTE

Intensified portion should cover 4 to 5 divisions.

g. Adjust DELAY control until intensified portion is centered on CRT.

h. Set HORIZ DISPLAY for DLY'D operation. Observe that intensified portion is expanded to 10 divisions.

i. Set HORIZ DISPLAY for MAIN INTEN operation.

j. Vary DELAY control. Observe that intensified portion moves smoothly along display.

k. Set delayed TIME/DIV control to 10 nSEC.

l. Turn SWEEP VERNIER counterclockwise to stop. Observe 5 or more pulses between first and eleventh graticule lines.

m. Disconnect calibrator signal from vertical channel A INPUT connector.

n. Set TIME/DIV to .1 SEC.

o. Set main TRIGGER LEVEL control to fully clockwise position.

p. Set AUTO/NORM switch to NORM.

q. Select SINGLE operation.

r. Press RESET pushbutton switch. Observe no sweep.

s. Turn main TRIGGER LEVEL fully counterclockwise. Observe one sweep; RESET indicator goes off after sweep.

t. Set AUTO/NORM switch to AUTO.

u. Press RESET pushbutton. Observe one sweep.

3-17. OPERATING INFORMATION.

3-18. The following paragraphs provide additional information concerning use of one special function over another.

3-19. AUTO VERSUS NORM. In AUTO operation, there will always be a recurrent sweep, except in trigger operation. A trigger of 40 Hz or higher overrides AUTO operation and produces a stable presentation. Adjustment of main TRIGGER LEVEL control may be necessary for a stable display. If the trigger is 40 Hz or less, NORM operation must be used. A trigger signal is always needed in NORM operation to generate a sweep.

3-20. In delayed operation, the delayed sweep is armed at the end of the delay time established by the DELAY control. When the delayed TRIGGER LEVEL switch is out of detent position, the delayed sweep is started by the first trigger signal after the delay time established by the setting of the DELAY control if the delayed TRIGGER LEVEL is adjusted for a stable display. In this mode, the delay time is longer than that set by the DELAY control. In starts after delay mode (detent position), the sweep starts immediately after arming.

3-21. AC VERSUS DC. AC coupling removes the dc level of trigger signals and attenuates signals below 10 Hz. For example, if the trigger signal contains a dc voltage component, extreme levels can cause the signal to move out of trigger level range of the 1710B and lose the trigger operation.

3-22. DELAYED SWEEP. After obtaining a desired sweep, any portion can be expanded up to 1 ns per division with 5% accuracy over center eight major divisions (X10 magnification) or 10 ns per division with 3% accuracy. This permits viewing of critical rise times or signal shapes with increased resolution. Because the sweeps are independent, the main VERNIER may be out of CAL detent and the delayed sweep will still be calibrated.

3-23. Sweep jitter can be reduced by using delayed trigger operation. By rotating the delayed TRIGGER LEVEL control out of detent, the delayed sweep starts on a new trigger. This reduces the jitter accumulated since start of the main sweep.

3-24. MIXED SWEEP. In MIXED SWEEP modes of operation, a dual sweep-speed display is presented. The main sweep drives the first portion of the sweep and the delayed sweep completes the display. This mode can also be selected when SINGLE sweep is desired.

3-25. APPLICATION PROCEDURES.

3-26. PEAK-TO-PEAK VOLTAGE MEASUREMENTS. To measure peak-to-peak voltage of an input signal, proceed as follows:

a. Accomplish paragraph 3-11.

b. Connect input signal to be measured to channel A INPUT connector.

c. Set channel A VOLTS/DIV control for signal display of at least three divisions in amplitude.

d. Set main TIME/DIV control so that display contains two or three cycles of input signal.

e. Adjust main TRIGGER LEVEL control for stable display.

f. Using channel A POSITION control, position negative peaks of input signal on horizontal graticule line near bottom of graticule.

g. Using horizontal POSITION control, position one positive peak of input signal on center vertical graticule line.

h. Count number of vertical divisions from most negative to most positive portions of waveform (estimate to nearest tenth of division).

i. Multiply number of divisions noted in step h by channel A VOLTS/DIV control setting for peak-to-peak voltage of input signal.

NOTE

If the input signal is applied through a divider probe, multiply the results obtained in step i by the attenuation factor of the probe.

3-27. DC VOLTAGE MEASUREMENTS. To determine the dc component of an input signal or a dc level point on an input signal, proceed as follows:

a. Accomplish paragraph 3-11.

b. Connect input signal to be measured to channel A INPUT connector.

c. With channel A input coupling at GND position baseline on convenient horizontal graticule line using channel A POSITION control.

NOTE

Reference for positive dc voltages should be below the center horizontal graticule line; reference for negative dc voltages should be above the center horizontal graticule line. Once a particular horizontal graticule line is selected as reference, do not change channel A POSITION control.

d. Set channel A input coupling switch to DC position.

e. Set channel A VOLTS/DIV control so that point of input signal to be measured is as far as possible from zero-volt reference line selected in step c.

f. Using horizontal POSITION control, move point on signal to be measured until it rests on center vertical graticule line.

g. Count number of vertical divisions between zero-volt reference graticule line and point on signal to be measured (estimate to nearest tenth of division).

h. Multiply number of divisions noted in step g by channel A VOLTS/DIV control setting for dc voltage measurement.

NOTE

If the input signal is applied through a divider probe, multiply the results obtained in step h by the attenuation factor of the probe.

3-28. TIME-INTERVAL MEASUREMENTS. To measure the time interval between two events of interest, proceed as follows:

a. Accomplish paragraph 3-11.

b. Connect signal to be measured to channel A INPUT connector.

c. Set main TIME/DIV control so that both events of interest are displayed on CRT.

d. Adjust main TRIGGER LEVEL control for stable display.

e. Using horizontal POSITION control, position one measurement point on signal to convenient vertical graticule line.

f. Using channel A POSITION control, position other measurement point on center horizontal graticule line.

g. Count horizontal divisions between two measurement points (estimate to nearest tenth of division).

h. Multiply number of divisions noted in step g by main TIME/DIV control setting for time interval between two events of interest.

3-29. FREQUENCY CALCULATION. To determine the approximate frequency of an input signal, proceed as follows:

a. Accomplish paragraph 3-28 using start and ending points of one cycle of input signal as events of interest.

b. Calculate input signal frequency using the following formula:

$$\frac{1}{\text{time in seconds noted in step a}}$$

3-30. PROBE COMPENSATION. To adjust divider probes which have a compensation adjustment, proceed as follows:

a. Accomplish paragraph 3-11.

b. Connect divider probe cable to channel A INPUT connector.

c. Connect probe tip to PROBE ADJ terminal.

d. Set channel A VOLTS/DIV control for a square-wave display that has two or three divisions of vertical deflection.

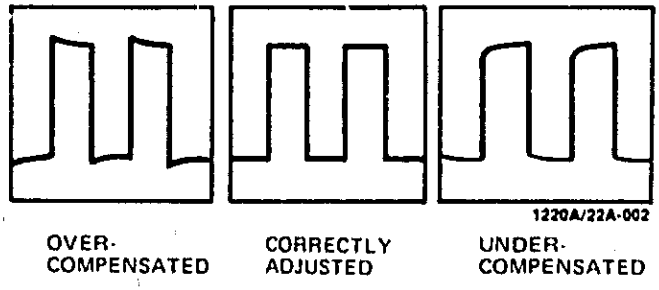


Figure 3-2. Divider Probe Adjustment Display

e. Set main TIME/DIV control for horizontal display of at least two full square waves.

f. Adjust divider probe compensation for correct display (see figure 3-2).

3-31. TIME DIFFERENCE MEASUREMENTS. To measure the time difference between two events having a common source, (e.g., propagation delay), proceed as follows:

a. Accomplish paragraph 3-11 for both channels A and B.

b. Connect one signal of interest to channel A INPUT connector.

c. Connect other signal of interest to channel B INPUT connector.

NOTE

Make sure reference signal is connected to channel A since the trigger signal for both channel A and channel B is obtained from channel A.

d. Set channel A and channel B VOLTS/DIV controls for desired vertical amplitude of display.

e. Set main TIME/DIV control so that the two events are at least four horizontal divisions apart.

f. If necessary, adjust main TRIGGER LEVEL control for stable display.

NOTE

If stable display is not obtainable, externally trigger the oscilloscope with the common source signal.

g. Using horizontal POSITION control, position first event on convenient vertical graticule line.

h. Using appropriate vertical POSITION control, position second event on center horizontal graticule line.

i. Count horizontal divisions between two measurement points (to nearest tenth of division).

j. Multiply number of divisions noted in step i by main TIME/DIV control setting for time difference between events.

3-32. X-Y PHASE MEASUREMENTS. The X-Y horizontal display mode of operation provides a method of measuring phase differences between two signals of the same frequency (up to 3 MHz). In this mode, one input signal provides deflection along the horizontal axis (x) and the other input signal provides deflection along the vertical axis (y). The phase angle can be determined from the resulting lissajous pattern. There are other uses for this mode, such as, establishing a horizontal sweep from a free-running sweep oscillator.

3-33. To measure phase relationship between two signals of the same frequency, proceed as follows:

a. Connect one signal to channel A and the other to channel B INPUT connector.

b. Press VERT DISPLAY pushbutton switch A.

c. Press INT TRIG pushbutton switch B.

d. Press HORIZ DISPLAY pushbutton switch X-Y.

e. Set both channel A and channel B VOLTS/DIV switches for a display of about 4 divisions (both horizontally and vertically).

f. Adjust POSITION controls until display is at center of CRT.

g. Measure distances A and B as shown in figure 3-3.

h. Divide A by B to obtain sine of phase angle (ϕ); (sine (ϕ) = $\frac{A}{B}$).

i. Determine sine value to determine phase angle.

j. Phase angle will be accurate to within 3° for signals up to 1 MHz.

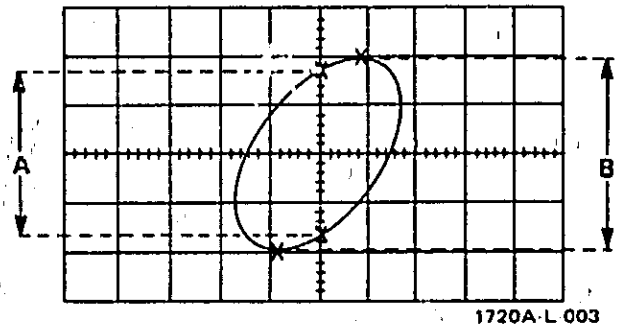


Figure 3-3. X-Y Waveform

THEORY

SECTION IV

PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

4-2. This section contains functional descriptions keyed to overall, simplified block diagrams of circuit groups (schematics 1 and 2). For simplicity, the block diagrams are drawn for function and do not show circuit details. Schematics are located in Section VIII.

4-3. VERTICAL SECTION BLOCK DIAGRAM. (See schematic 1.)

4-4. INPUT ATTENUATORS. Channel A and channel B attenuators accept the input signals applied to the front-panel INPUT connectors. The attenuators have two functions: they select the type of input coupling (50Ω, DC, GND, AC); and, they set the vertical deflection factor (5 mV/div to 5 V/div) as selected by the front-panel VOLTS/DIV switches.

4-5. VERTICAL PREAMPLIFIER AND CONTROL IC. The vertical preamplifier and control integrated circuit accept a single-ended signal from the attenuator and convert it to a differential signal. The differential signal is then amplified and a portion of it is used for the sync amplifier while the main path is then acted upon by the polarity switch, vernier, position, and channel switch controls (in that sequence).

4-6. DELAY LINE. The delay line assembly delays the vertical signal approximately 50 nanoseconds. This delay allows the sweep to trigger before the vertical signal reaches the CRT plates.

4-7. VERTICAL OUTPUT AMPLIFIER. The vertical output amplifier provides drive to the CRT vertical deflection plates.

4-8. HORIZONTAL SECTION BLOCK DIAGRAM. (See schematic 1.)

4-9. TRIGGER CIRCUIT. The internal sync amplifier provides the synchronization signal for the main and delayed trigger generators. The generators develop the trigger signals that start the main and delayed sweep. The trigger is also applied to an auto circuit that is used in AUTO mode only. The outputs of the generators are controlled by the level of the sync signal applied and the reset signal from the holdoff control circuit. When the reset signal is logic high, the generator is inoperative. When the reset signal is low, the generator is operational and a trigger signal will be developed if there is an internal or external sync input.

4-10. SWEEP AND INTEGRATOR CIRCUITS. The sweep circuits initiate a horizontal sweep by the trigger signal that is applied to their inputs. A Miller integrator produces the horizontal sweep ramp; slope is controlled by the TIME/DIV switch on the front panel of the instrument. Output from the Miller integrator is applied through horizontal display control switches to the horizontal preamplifier circuit.

4-11. The horizontal sweep is also compared to a reference voltage by a comparator sweep length that drives the reset circuit. The reset circuit, along with other holdoff circuits, controls the timing sequence of the sweep ramp.

4-12. HOLDOFF CIRCUITRY. The holdoff circuit establishes the time interval between trigger points. This time interval is adjustable by the TRIGGER HOLDOFF control. The sweep ramp and the TIME/DIV switch control the holdoff ramp generator. When the generator is activated, a ramp, determined by a selected holdoff capacitor and the TRIGGER HOLDOFF control, is produced. When the ramp reaches a predetermined voltage level, the reset circuit activates. This arms the trigger generator. Upon receipt of a new trigger signal, a new sweep is generated.

4-13. HORIZONTAL PREAMPLIFIER. The horizontal preamplifier provides amplification for the sweep-time ramp. A horizontal POSITION control establishes a reference level for the horizontal sweep. The BEAM FIND switch, when engaged, reduces emitter current in the output stage of the preamplifier so that the horizontal sweep will be returned to the viewing area of the CRT.

4-14. HORIZONTAL OUTPUT. The horizontal output stage provides drive to the CRT horizontal deflection plates.

4-15. GATE CIRCUITRY. (See schematic 2.)

4-16. The gate assembly contains the circuitry necessary to control brightness of the CRT display. An intensity control circuit is used for brightening or blanking the CRT when necessary. Astigmatism, focus, pattern, and floodgun filament controls are part of the gate assembly. A 3-VOLT calibrator is also part of the gate assembly.

4-17. HIGH-VOLTAGE POWER SUPPLY. (See schematic 2.)

4-18. The high-voltage power supply consists of the high voltage oscillator and a rectifying network. The high voltage oscillator produces cathode and grid voltages for the CRT. A secondary winding on the high voltage transformer provides voltage for the CRT cathode heater.

4-19. The CRT cathode voltage is sampled and fed back to a HV oscillator control circuit on the gate assembly. If the cathode voltage becomes more negative, less current is supplied to the oscillator. With less current supplied, the output amplitude of the oscillator is reduced and the cathode voltage will return to its normal operating value. If the cathode becomes less negative, more current is supplied to the oscillator.

4-20. A tap on the secondary of the high voltage transformer is connected to a multiplier assembly. Output of the multiplier (X6) is connected to the CRT post accelerator terminal.

4-21. LOW-VOLTAGE POWER SUPPLY. (See schematic 2.)

4-22. The low-voltage power supply operates from an ac power source. The ac line is applied to the input power circuit where 100/120/220/240-Vac operation is selectable. The input power circuit contains the ac line protection fuse. The ac input is applied to a step-down power transformer.

4-23. Secondary outputs from the power transformer are applied to rectifiers and voltage regulator circuits, which convert input ac power to usable dc outputs of different voltage levels.

4-24. CIRCUIT DETAILS.

4-25. The following paragraphs provide a detailed explanation of individual circuits in the Model 1710B. Circuits that are identical for both channels are only explained for channel A.

4-26. ATTENUATOR ASSEMBLIES.

4-27. GENERAL INFORMATION. (See schematic 3.) The channel A attenuator assembly is a two section, cam-actuated attenuator. The first section is controlled by coupling switch A1S1. The second section is controlled by VOLTS/DIV switch A1S2. The attenuator components are closely mounted and their interrelationship is critical. If a malfunction occurs in an attenuator assembly, it is recommended that the attenuator board be replaced with a like unit.

4-28. In describing the attenuator assembly, only basic reference designators will be used. When referring to table 6-2 (Section VI), prefix all basic reference designators (except A3 assembly components) with A1. See figure 4-1 for simplified block diagram of the attenuator.

4-29. INPUT. The input signal applied to channel A INPUT connector J1 is routed to coupling switch A1S1 through a 50-ohm stripline that is part of the etched circuit board. With A1S1 in its AC position, the input signal is applied through capacitor A1C1 to the first section of the attenuator. The value of A1C1 is such that signals below 10 Hz will be attenuated. In GND position, A1S1 disconnects the input signal and applies a ground to the attenuator input. In DC position, A1S1 forms a straight-through connection and applies the input signal directly to the high impedance section of the attenuator. In 50Ω position, A1S1 terminates the input signal in 50 ohms. The termination consists of two 100-ohm resistors, A1R1 and A1R2. These resistors are constructed of flame-proof material as a precaution against over-voltage application in the 50Ω position. The resistors are mounted in sockets to facilitate replacement.

4-30. ATTENUATOR STAGES. The VOLTS/DIV switch A1S2 controls a two-section cascaded attenuator. Each section consists of a group of attenuation networks. The high impedance section contains X1, X10, and X100 networks. The low impedance section contains X1, X2, and X5 networks. Each position of A1S2 cascades a network in the high impedance section with a network in the low impedance section. By cascading different network combinations, the attenuator provides 5 mV/div to 5 V/div vertical deflection. To obtain 5 mV/div, the attenuator activates a gain change of two in the vertical preamplifier.

4-31. A high-to-low impedance converter stage is inserted between the two sections of attenuator switch A1S2. The high frequency amplifier section of the impedance converter consists of field-effect transistor (FET) A1Q1 connected in a source follower configuration. Input to the gate of the FET is capacitively coupled through A1C5. Transistor A1Q2 functions as the current source for A1Q1. Emitter follower A1Q3 drives the resistive divider network of the low impedance section of attenuator switch A1S2. Under input over-voltage conditions, A1CR1 prevents reverse breakdown of the base-emitter junction of A1Q3.

4-32. The low frequency path of the input signal consists of error amplifier A3U1 and level shifter A3Q7. The error amplifier samples input and output signals within a frequency range of DC to 1 kHz and generates a correction signal to the high frequency amplifier to replace the missing low frequency signal components. The input signal sample is accomplished through a resistor divider network consisting

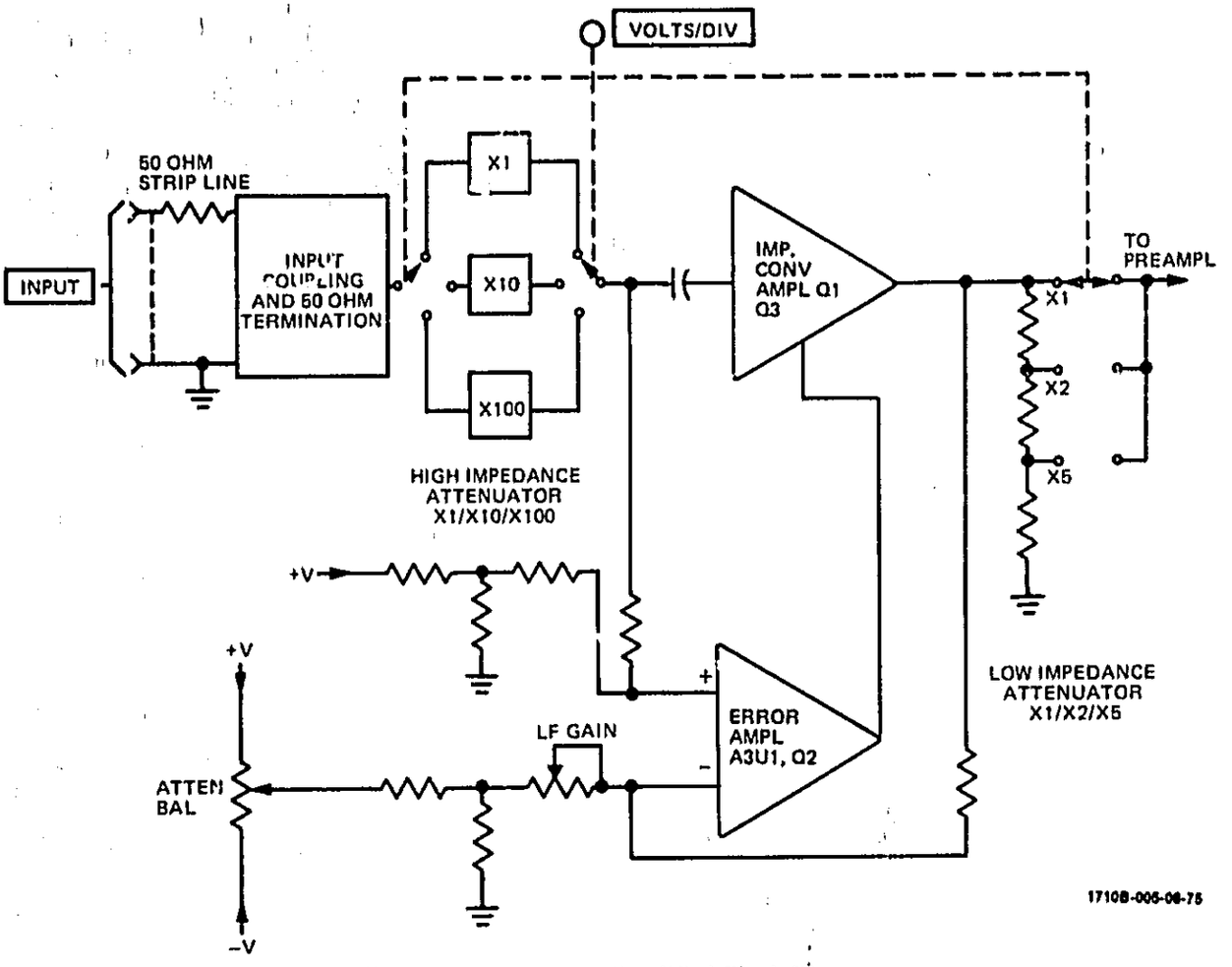


Figure 4-1. Attenuator Simplified Block Diagram

of A1R8 and A3R64-A3R66. This provides isolation of capacitive loading to high frequency signals and over-voltage protection for the error amplifier. Gain of the low frequency path is set by adjusting the resistor divider ratio used to sample the output signal. Adjustment is accomplished with A3R74. Transistor A3Q7 functions as a level shifter for the low frequency correction signal. The low frequency correction signal is applied through current source A1Q2 to the high frequency amplifier circuit.

4-33. Channel B attenuator A2 functions identically as the channel A attenuator described in paragraphs 4-27 through 4-32. See schematic 4 for channel B component identification.

4-34. VERTICAL SECTION.

4-35. GENERAL INFORMATION. (See schematic 5.) Each channel preamplifier circuit consists of an integrated circuit (IC), associated biasing networks, and a chip transistor. All four ICs mounted on substrate assembly A3A1 provide two outputs: the main vertical signal and the internal sync signal.

4-36. PREAMPLIFIER STAGE. Since channel A and channel B are almost identical, only channel A will be described in detail. Where channel B differs from channel A, the difference will be discussed.

4-37. The input signal from attenuator A1 is applied to the channel A section of substrate assembly A3A1. The input amplifier stage is balanced (attenuators not in 5 mV/div) by main balance potentiometer A3R12 (A3R23 for channel B). A signal split is then accomplished with the two signals taken out separately (main signal and sync signal for time base triggering).

4-38. The 5 mV/div vertical sensitivity is obtained by increasing the gain of the input amplifier stage by a factor of two. This is done by actively switching the emitter impedance of the input amplifier stage. The 5 mV/div range is balanced by potentiometer A3R9 (A3R24 for channel B) after A3R12 and A3R23 have been adjusted.

4-39. Outputs from channel A and channel B are combined in a common load resistor and applied to

the input of delay line driver stage A3Q5/A3Q6. The sync outputs of channel A and channel B are combined in a common base stage and its output drives a balanced 300Ω line to the input of main sync amplifier A10.

4-40. The output of A3Q3/A3Q4 is connected to delay line A4 through a bandwidth limit circuit. The bandwidth limit circuit limits the amplifier, 3 dB down to 20 MHz. A3Q3/A3Q4 operates as a differential common emitter amplifier.

4-41. BEAM FIND switch A8S1A (see schematic 15) supplies emitter bias (—15V) to amplifier A3Q3/A3Q4. When A3S1A is pressed, emitter bias is removed from the circuit. Signal sensitivity is reduced enough to return the trace to the viewing area of the CRT.

4-42. Each channel has a vertical POSITION control (R3 and R4) located on the front panel. Vertical positioning of the viewed display is accomplished by adding or subtracting current in the main signal path. This results in shifting the vertical dc level of the output signal and causes the trace on the CRT to move up or down

4-43. With front panel vernier controls A1R1 and A2R1 in CAL detent position (attenuators not in 5 mV/div), the gain of each channel is adjusted by A3R1 (channel A) and A3R28 (channel B). By adjusting the ratio of bias current through two parallel connected junctions, the current division between the two junctions can be controlled. After the above adjustments have been made, the 5 mV/div gain of each channel is adjusted by A3R4 (channel A) and A3R27 (channel B).

4-44. An input signal applied to channel B can be inverted for A—B operation by front-panel B INVERT switch A6S1D. A saturated switch and bias circuit is also provided so that only a dc level change is needed to switch polarity. The dc level change (+15V) is supplied by the B INVERT switch when engaged.

4-45. PREAMPLIFIER CONTROLS (See schematic 7.) Internal Trigger Switch Assembly A6 and Vertical Display Switch Assembly A7 control the operation of substrate assembly A3A1. Control of the substrate assembly is described in the following paragraphs.

4-46. Channel A Display. Engaging VERT DISPLAY switch A7S1A selects the channel A input signal for display on the CRT. When engaged, A7S1A applies a constant high to the set input on flip-flop A7U1, causing its Q output (pin 13) to be held high and its $\overline{Q}$ output (pin 1) to be held low.

4-47. Since A7U1 is held in its set condition, the base bias applied to A7Q2 is more positive than that applied to A7Q1. Transistor A7Q2 conducts, and applies a disabling voltage to the channel B channel switch on assembly A3. With +V1 bias removed, output from the channel B preamplifier is inhibited.

4-48. Channel B Display. Engaging VERT DISPLAY switch A7S1B selects the channel B input signal for display on the CRT. When engaged, A7S1B applies a constant high to the reset input (pin 12) on flip-flop A7U1.

4-49. With A7S1B engaged and A7U1 held in its reset condition, the $\overline{Q}$ output of A7U1 is held high and the Q output is held low. With its base bias more positive, A7Q1 conducts and applies a disabling voltage to the channel A channel switch on assembly A3. With +V1 bias removed, output from the channel A preamplifier is inhibited.

4-50. Channel A and Channel B Displays. To display signals applied to both channels, VERT DISPLAY switches A7S1A and A7S1B are not engaged. The set and reset voltages applied to A7U1 are low. The flip-flop is controlled by inputs from either the ALT signal through OR/NOR gate A7U2A or the CHOP signal generated by chop oscillator A7U2B. The high and low inputs from either the ALT signal or the chop oscillator causes the Q and $\overline{Q}$ output of A7U1 to alternate between high and low logic levels. This action causes A7Q1 and A7Q2 to conduct alternately.

4-51. Channel A+B Display. To algebraically display input signals applied to both channels, VERT DISPLAY switches A7S1A and A7S1B are pressed simultaneously. With both switches engaged, —15V bias is removed from the emitter circuits of A7Q1 and A7Q2, cutting them off. This causes both channel A and channel B preamplifier stages on assembly A3 to be operational. In addition, with both A7S1A and A7S1B engaged, +15V is applied to the junction of A3VR5 and A3VR6. This increases the current available at the output circuit of the preamplifiers by effectively bypassing A3VR6.

4-52. For composite triggering in A+B or CHOP mode of operation, +15V is applied to the emitter circuits of A3Q5/A3Q6 through trigger switches A6S1A and A6S1B. This increases the current available at the emitters of sync amplifier A3Q5/A3Q6.

4-53. CHOP Mode Display. When CHOP mode of display is selected by VERT DISPLAY switch A7S1D, a low is applied to pin 11 of OR/NOR gate A7U2B. With a low applied to pin 11, A7U2B operates as an astable multivibrator. The repetition rate of A7U2B, controlled by feedback capacitor A7C3, is approximately 1 MHz. The NOR gate output of A7U2B

is applied as an input to flip-flop A7U1. The Q and $\overline{Q}$ output of the flip-flop control the operation of A7Q1/A7Q2 explained previously.

4-54. The NOR gate output of A7U2B is also applied to gate assembly A14 as a chop blanking signal. The chop blanking signal blanks the CRT trace during channel switching

4-55. ALT Mode Display. When ALT mode of display is selected by VERT DISPLAY switch A7S1C, it releases all other display switches (A7S1A, A7S1B, and A7S1D). Electrically, A7S1C performs no function. It is mechanically connected to the other display switches so as to release them if they are engaged.

4-56. The ALT signal that is developed on main sweep assembly A8 is applied to an input on OR/NOR gate A7U2A. At the start of the main sweep, the ALT signal goes low. With all inputs low, the NOR output of U2A (pin 5) is high. The high is applied as an input to flip-flop A7U1. At the end of the main sweep, the ALT signal becomes high and the NOR output of A7U2A becomes low. The negative transition at the input to flip-flop A7U1 causes it to change states. Thus, at the end of each sweep, channel control flip- flop A7U1 alternately disables channel A or channel B.

4-57. Channel A Sync Circuit. Internal sync switch assembly A6 contains the sync control circuitry necessary for selective internal triggering.

4-58. Engaging channel A sync switch A6S1A applies a low to the base of A7U3Q1 (pin 2). Since the channel B switch is not engaged, a high is applied to the base of A7U3Q2 turning it on. With A7U3Q5 conducting, the emitter level of A7U3Q1/A7U3Q2 (pin 3) is approximately the bias applied to A7U3 pin 13. With A7U3Q2 conducting, the bias developed at A7U3 pin 5 is applied to the channel B sync enabling network on assembly A3, preventing a channel B sync signal from being generated.

4-59. Channel B Sync Circuit. Engaging channel B sync switch A6S1B applies a low to the base of A7U3Q2. Since channel A switch is not engaged, a high is applied to the base of A7U3Q1 turning it on. With A7U3Q5 conducting, the emitter level of A7U3Q1/A7U3Q2 (pin 3) is approximately the bias applied to A7U3 pin 13. With A7U3Q1 conducting, the bias developed at A7U3 pin 1 is applied to the channel A sync enabling network on assembly A3, preventing a channel A sync signal from being generated.

4-60. Composite Sync Circuit. When composite sync is selected, channel A and channel B sync switches (A6S1A and A6S1B) are engaged simultaneously. With both sync switches engaged, a ground is applied to the emitter circuit of A7U3Q5, cutting it off, and thereby disabling the emitter circuit of A7U3Q1/A7U3Q2. This cuts off A7U3Q1 and A7U3Q2. In addition, with both sync switches engaged, —15V is applied to the emitter circuit of A7U3Q3 and A7U3Q4 through CHOP display switch A7S1D.

4-61. For composite sync, the outputs of A7U3Q3 and A7U3Q4 are controlled by the Q and $\overline{Q}$ outputs of A7U1. When the Q output of A7U1 is high ($\overline{Q}$ output low), A7U3Q4 conducts and A7U3Q3 is cut off. With A7U3Q4 conducting, its output (A7U3 pin 11) is approximately the bias voltage applied to its emitter (A7U3 pin 10). The bias at A7U3 pin 11 is applied to the B sync enabling network on assembly A3, preventing a channel B sync signal from being generated.

4-62. When the input to the base of A7U3Q3 is high (input to the base of A7U3Q4 is low), the collector output of A7U3Q3 (pin 8) is approximately the bias voltage applied to its emitter (A7U3 pin 7). The bias at A7U3 pin 8 is applied to the A sync enabling network on assembly A3, preventing a channel A sync signal from being generated.

4-63. Composite Sync Chop Mode Display. When composite sync is selected for CHOP mode of display, A7U3 is disabled by removing the —15V bias from both sections of the IC. This prevents A7U3 from applying a disabling voltage to either channel A or channel B enabling networks on assembly A3. The sync signal generated is a composite of signals applied to channel A and channel B.

4-64. Also, when composite sync is selected for CHOP mode of display, +15V is applied by CHOP switch A7S1D through sync switches A6S1A and A6S1B to emitter circuits of sync amplifier A3Q5/A3Q6. The additional voltage source increases current available at the input to the sync amplifier (similar to A + B operation of the main signal amplifier A3Q3/A3Q4). When B INVERT switch A6S1D is engaged during this mode of operation, the channel B sync signal is inverted prior to developing the composite sync signal by applying +15V through A6R1 and A6S1D to a cross-over network in the channel B sync circuit on A3A1. This results in the channel B sync signal being inverted prior to combining with the channel A sync signal.

4-65. DELAY LINE ASSEMBLY. The output of the main signal amplifier A3Q3/A3Q4 is applied to delay line assembly A4. The delay line has a differential impedance of approximately 125 ohms and provides a time delay of approximately 50 nanoseconds. This delay is sufficient to allow the internal sync signal to trigger the time base and start the horizontal sweep. Without the insertion of this time delay in the signal path, the sweep would start after the signal reached the vertical deflection plates of the CRT and the leading edge of fast rise time signals would not be displayed.

4-66. VERTICAL OUTPUT AMPLIFIER. (See schematic 6.) The vertical output amplifier assembly A5

consists of two integrated circuits with their associated control components. Integrated circuit A5U1 is the main vertical amplifier. It receives the differential signal from delay line assembly A4, amplifies it and applies it to output amplifier A5U2. High frequency adjustments A5C4, A5C6, A5C7, A5C13, A5R11, and A5R22 are adjusted for optimum pulse response.

4-67. Output amplifier A5U2 is a shunt feedback differential amplifier whose transimpedance converts the current gain of A5U1 to a voltage gain at the input of the CRT. The CRT's vertical section is the distributed line type with a 330-ohm terminating impedance.

4-68. HORIZONTAL SECTION.

4-69. MAIN TRIGGER CIRCUITRY. (See schematics 8 and 9.) The internal sync signal developed on preamplifier assembly A3 is connected to horizontal display switch assembly A10 through a 300-ohm impedance cable. Signal amplification is accomplished by sync amplifier stages A10Q1-A10Q5. Output from A10Q5 is applied through X-Y switch A10S1F to VERTICAL OUTPUT connector J4 on the rear panel of the instrument. Output from A10Q6 drives dual emitter followers A10Q7/A10Q8. Transistor A10Q7 supplies the main sync signal. Transistor A10Q8 supplies the delayed sync signal.

4-70. There are two sources of sync inputs to the main trigger circuit (see figure 4-4 for time base simplified block diagram). One input is from EXT TRIG connector J1 on the front panel of the instrument. The other input is from internal sync source A10Q7. The position of INT/EXT switch A8S10 determines which trigger source is selected. The external sync is applied to A8S10 through EXT +10 switch A8S1P. When A8S1P is engaged, a voltage divider network connected to the external input circuit reduces the input signal by a factor of 10.

4-71. The sync signal (external or internal) is applied to a high-frequency circuit and to a low-frequency circuit (see schematic 9). The high-frequency circuit consists of A8Q1/A8Q2. This circuit readily passes all frequencies above 15 kHz. The low frequency circuit consists of A8U1/A8Q3 and readily passes all frequencies below 15 kHz.

4-72. The low-frequency path for the trigger signal is through the INT/EXT switch, AC/DC switch, and LF REJ switch to the input of an inverting operational amplifier A8U1. The output of A8U1 is applied to A8Q3 that functions as an emitter follower. The output of the low frequency path is applied to U2 pin 14. Front-panel TRIGGER LEVEL control R15 is part of the low frequency path.

4-73. With AC/DC switch A8S1N in its AC position, A8C1 blocks the dc component of the trigger signal. When LF REJ switch A8S1M is engaged, the low-frequency circuit is disconnected and the input to A8U1 is grounded. Pressing both the LF REJ switch and the HF REJ switch applies the line-frequency signal from primary ac power transformer T1 (see schematic 19) to the input of A8U1.

4-74. For high-frequency rejection, HF REJ switch A8S1L is engaged. This applies —15V through A8R7 to the gate of A8Q1. The source of A8Q1 and the emitter of A8Q2 are clamped by diodes A8CR2 through A8CR4 turning them off.

4-75. After conditioning by the high- and low-frequency bandpass circuits, the sync signal is applied to A8U2. This IC contains the pulse shaping network, arming circuitry, and trigger controls required to develop the trigger signal.

4-76. The sync signal is amplified by A8U2 and covered to differential signals. The differentially constructed signals are applied to the inputs of a pair of dual-input Schmitt trigger circuits located in the IC. Another Schmitt trigger on the IC controls the dual-input Schmitts.

4-77. At the end of the holdoff period, the holdoff-comparator develops a reset signal that is applied to the first Schmitt trigger on A8U2. The Schmitt trigger changes state, arming the second Schmitt trigger. When the applied trigger signal reaches the selected trigger level established, the second Schmitt trigger fires. One-half cycle later (when the trigger signal falls below the selected trigger level), the third Schmitt trigger fires producing trigger outputs from A8U2 (pin 1 and pin 2).

4-78. The input sensitivity on which A8U2 generates a trigger pulse is controlled by main trigger sensitivity potentiometer A8R47. The input sync signal slope on which A8U2 generates a trigger pulse is controlled by main slope switch A8S1K. This switch applies +5 volts to pin 16 for positive slope triggering and a ground for negative slope triggering.

4-79. The output of A8U2 (pin 2) is applied as one input of a dual-input current switch consisting of A8Q8 through A8Q10. The other input to the current switch is from bright-line auto generator A8U3. When the output of A8U2 (pin 2) or A8U3 (pin 5) goes low, either transistor A8Q8 or A8Q9 will conduct. With either transistor conducting, the current path for the current switch is through A8R36, A8R37, the conducting transistor, and A8R41. The signal developed at the high end of A8R41 is the main gate signal applied to the gate schmitt circuit (see schematic 14). In addition, when A8Q8 or A8Q9 conducts, A8Q10 cuts off. With A8Q10 cut off, a sweep ramp is generated by the integrator circuit (see schematic 10).

4-80. Transistor array A8U3 forms the bright-line auto circuit. In the absence of a sync signal, the output at A8U2 pin 2 is high, cutting off A8Q8. The comple-

mentary low output at A8U2 pin 1 is applied to the base of transistor A8U3Q3 which drives the base of A8Q11 low causing A8C15 to change to the lower voltage level. The emitter of A8Q11 follows the negative charging of A8C15 which will reach its final charge in 25 milliseconds (unless a new sync signal occurs). With the lower voltage at the emitter of A8Q11, A8U3Q1 will now follow the auto signal applied to the base of A8U3Q5. A8U3Q1/A8U3Q2 form a Schmitt trigger circuit. With a sync signal applied, A8U3Q1 conducts constantly, holding off A8U3Q2. In the absence of a sync signal, the Schmitt trigger will follow the auto signal. When A8U3Q2 conducts, its collector goes low, turning on A8Q9, and, in turn, cutting off A8Q10. With A8Q10 cut off, the main sweep is activated. At the end of the main sweep, the reset signal goes high and is applied to A8U2 pin 4. With a high applied to A8U2 pin 4, the output at A8U2 pin 6 is low, turning on A8Q5. When A8Q5 conducts, it turns on A8U3Q5 which turns on A8U3Q1. With A8U3Q1 conducting, bias is removed from A8U3Q2, cutting it off. The output at A8U3 pin 5 goes high, turning off A8Q9 and turning on A8Q10. With A8Q10 conducting, a new sweep ramp will not start. At the end of the holdoff period, the reset signal goes low, the output at A8U2 pin 6 goes high, and A8Q5 turns off. When A8Q5 turns off, the cycle is repeated and a new sweep is initiated.

4-81. In NORM position of the AUTO/NORM switch A8S1K, +5V is applied to the base of A8U3Q4 turning it on. With A8U3Q4 conducting, forward bias is applied to the base of A8U3Q5 turning it on. This applies a constant forward bias to A8U3Q1 turning it on. With A8U3Q1 conducting, A8U3Q2 and A8Q9 are cut off. In the absence of a trigger signal, A8Q8 is also cut off and A8Q10 is conducting, preventing the generation of a sweep ramp. When a sync signal is applied to A8U2, the output at A8U2 pin 2 goes low. This turns on A8Q8 and turns off A8Q10, starting a new sweep.

4-82. For single sweep operation SINGLE switch A8S1I is pressed. With A8S1I engaged, +5V is applied through resistor network A8R30, A8R32, and A8R34 to A8U2 pin 5. This prevents A8U2 from developing a trigger signal. When RESET switch A8S1H is pressed, causes a negative-going spike to be applied to A8U2 pin 5. A8U2 is armed causing the output at A8U2, pin 6 to go high turning off A8Q5. A8Q4 and A8Q6 turn on and the reset lamp, DS4, on the front panel lights. A sync signal will produce one sweep.

4-83. MAIN SWEEP AND INTEGRATOR. (See schematic 10.) The main integrator, in conjunction with the sweep time controls, generates the main sweep ramp. The sweep is applied to the horizontal circuits.

4-84. The main integrator circuit is controlled by A8Q10 on assembly A8. When conducting, A8Q10 serves as a current source and prevents generation of a main sweep ramp. When A8Q10 is cut off by the bright-line auto circuit or the receipt of a trigger signal, A11Q1B and A11Q2 turn off, removing reset current from the ramp capacitors. With A11Q2 cut off, Miller integrator circuit A11Q3/A11Q4 is activated. Depending upon the position of main TIME/DIV switch A11S1, a specific integrating capacitor is connected between the gate of A11Q3 and the collector of A11Q4. The TIME/DIV switch also connects a specific integrating resistor to the emitter circuit of A11Q7 that functions as a constant current source for the ramp capacitors. When A11Q2 turns off, the charging current drained by A11Q7 flows through the selected ramp capacitor (A11C11 through A11C17). This results in a linear, positive-going ramp at the output of A11Q4. The ramp generated is applied to emitter follower A11Q6. The output of A11Q6 is applied to the horizontal preamplifier through horizontal display switch assembly A10.

4-85. The output of constant current source A11Q7 is controlled by operational amplifier A11U1. A different reference voltage is developed for different ranges covered by the TIME/DIV switch This reference voltage is applied to A11U1 pin 3. When different ranges are selected by the TIME/DIV switch, the values of the ramp capacitor, integrating resistor, and A11U1 reference voltage are changed. This action changes the ramp slope for various sweep speeds. The ramp slope can be varied for any selected range with main SWEEP VERNIER potentiometer R12. The potentiometer is part of a voltage divider in parallel with the reference voltage applied to operational amplifier A11U1. When the fastest range (10 ns) of the TIME/DIV switch is selected, capacitors A11C3 and A11C4 function as the ramp generator.

4-86. The sweep ramp, developed at the collector of A11Q4 is applied to the base of A12Q14. Conduction through A12Q14 and A12Q15 follows the positive-going sweep ramp and charges (positively) a particular holdoff capacitor (A12C2 through A12C8) in the collector circuits of A12Q1 through A12Q7. The holdoff capacitor that charges positively is determined by which transistor is conducting. Depending upon the position of TIME/DIV switch A11S1 (see schematic 10), base bias is applied to only one transistor which conducts. With the TIME/DIV switch in either the 10-nanosecond or 20-nanosecond position, no transistor is biased on. The holdoff capacitor, which is always in the circuit, is A13C1.

4-87. When the selected holdoff capacitor charges to approximately +11V, transistor A12Q8 turns off and transistor A12Q9 turns on. The output of A12Q9 is the positive reset pulse applied to A8U2 (refer to paragraph 4-80.)

4-88. While the reset pulse is positive, A8Q8 and A8Q9 are turned off and A8Q10 turns on (see schematic 9). Since the base bias on A11Q1A (see sche-

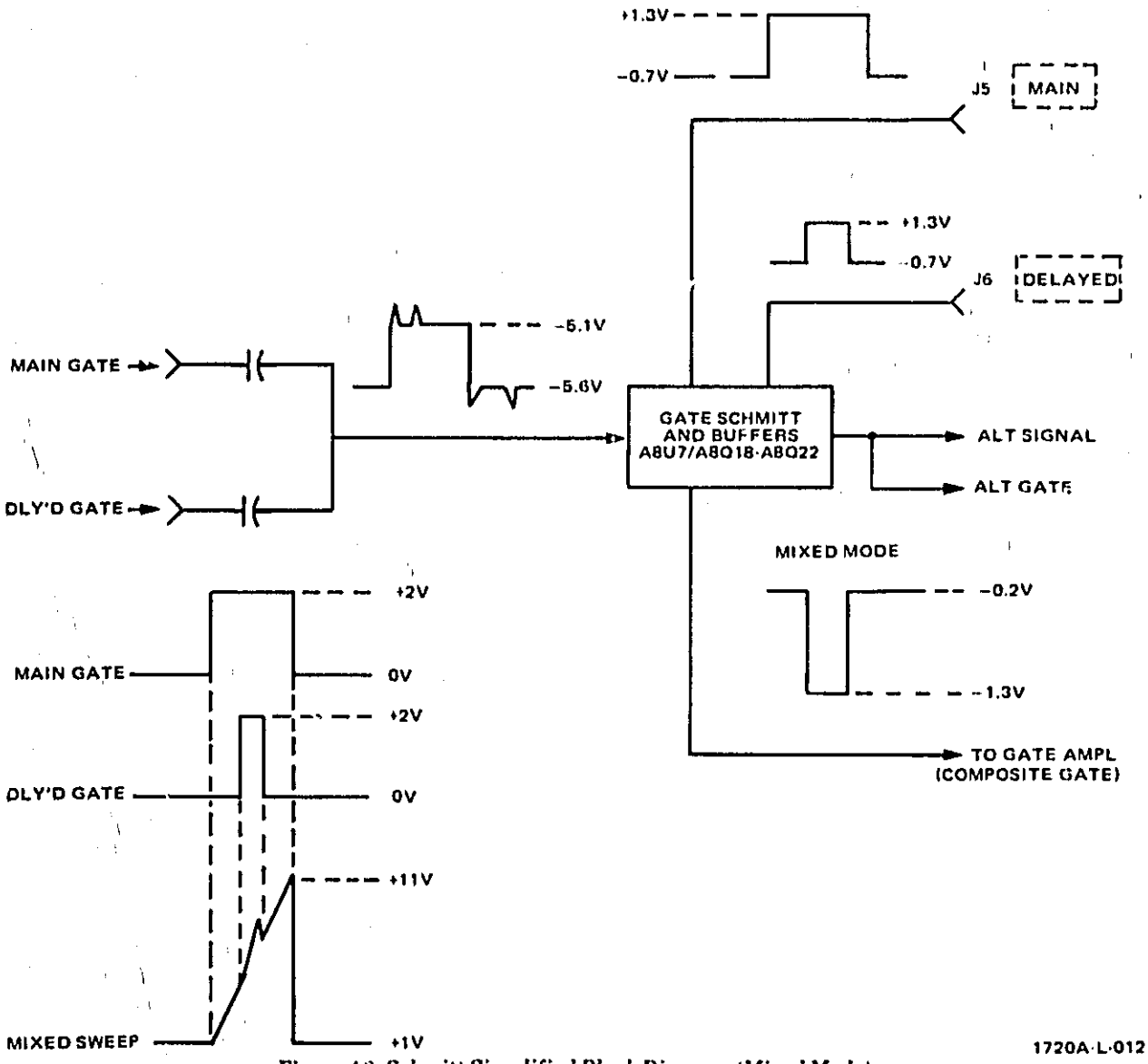


Figure 4-2. Schmitt Simplified Block Diagram (Mixed Mode)

matic 10) is more positive than A11Q1B, A11Q1B conducts heavily and discharges the selected ramp capacitor (A11C11 through A11C17) through A11Q2. When the voltage on the base of A11Q1A reaches the voltage level applied to the base of A11Q1B, both A11Q1B and A11Q2 turn on and the sum of currents at the gate of A11Q3 is zero and the ramp is reset.

4-89. As the sweep ramp resets, transistors A12Q14 and A12Q15 turn off (see schematic 13). The selected holdoff capacitor (A12C1-A12C8) discharges through A12R1 and TRIGGER HOLDOFF potentiometer R8. The position of R8 determines the rate of discharge and therefore the holdoff period. When the holdoff capacitor discharges to approximately +1.4V, A12Q10 turns off and A12Q11 turns on causing the reset signal to go negative. The negative transition of the reset signal arms trigger generator A8U2. Upon receipt of the next sync signal a new sweep is generated.

4-90. Transistor array A12U2 controls arming of the delayed sweep. DELAY potentiometer R7 establishes a reference voltage which is applied through isolation amplifier A12U1 to the base of comparator A12U2Q5. The high input impedance of A2U1 prevents load variations from affecting the setting of R7. When the main sweep ramp which is applied to the base of A12U2Q4 slightly exceeds the reference level applied to the base of A12U2Q5, A12U2Q4 conducts, turning on A12U2Q1 and turning off A12U2Q2. With A12U2Q2 turned off, A12U2Q3 conducts, arming the delayed trigger control A8U5. When main sweep only is selected by MAIN sweep switch A10S1E (see schematic 8), A12Q12 conducts, turning off A12Q13. With A12Q13 turned off, emitter bias is removed from comparator A12U2Q3/Q5 and the delay comparator control signal is inhibited. This prevents the delayed sweep from being generated.

4-91. The gate Schmitt circuit (see schematic 14) provides gate assembly A14 with the proper input for

each display mode. The main and delayed sweep require their own respective gates, (see figure 4-2 for simplified block diagram of gate Schmitt circuit). In mixed mode of display, a gate is generated at the start of the main sweep and stops at the end of the delayed sweep. Depending upon which input is supplied, gate Schmitt (A8U7) changes state on the first positive control pulse and resets on the first negative control pulse. The pulses are provided by differentiating the control pulses. Buffered outputs are provided to rear-panel BNC connectors (J5 and J6) for both the main gate and delayed gate. In addition, the ALT signal is developed from the buffered main gate output signal. It is applied to vertical display switch A7.

4-92. DELAYED SWEEP CIRCUITRY. (See schematics 11 and 12). The delayed trigger, integrator, and sweep circuits function similarly to the main sweep circuit described previously. The one exception is that the slowest speed for delayed sweep is 20 milliseconds. Refer to paragraphs 4-69 through 4-90 for theory of operation of trigger, integrator, and sweep circuits.

4-93. HORIZONTAL DISPLAY SWITCH ASSEMBLY. (See schematic 8.) The horizontal display switch assembly selects the mode of horizontal display. The different modes are X10 magnification, delayed sweep, mixed sweep, main/delayed intensified sweep, main sweep, and X-Y display.

4-94. X10 Magnification. The MAG switch A10S1A supplies bias to one of two circuits in the horizontal preamplifier. When not engaged, A10S1A supplies forward bias to a X1 stage (A8Q28/A8Q29) on the horizontal preamplifier. When engaged, A10S1A removes the forward bias from the X1 stage and applies it to a X10 stage (A8Q26/A8Q27).

4-95. Delayed Sweep. The DLY'D sweep switch A10S1B performs two functions. When engaged, A10S1B reverse biases the main gate control circuit preventing development of a main gate signal. Also, when engaged, A10S1B routes the delayed sweep ramp to the horizontal preamplifier.

4-96. Mixed Sweep. The MIXED sweep switch A10S1C performs two functions. When engaged, A10S1C applies the main sweep ramp as the reset reference to the delayed sweep integrator circuit. Also, when engaged, A10S1C routes the delayed sweep ramp to the horizontal preamplifier.

4-97. Main Intensified. The MAIN INTEN sweep switch A10S1D performs three functions. When engaged, A10S1D removes the +5V bias applied to intensity gate A14Q10. It also applies +5V to the delayed gate control circuit, disabling it. In addition, A10S1D routes the main sweep ramp to the horizontal preamplifier.

4-98. Main Sweep. The MAIN sweep switch A10S1E performs three functions. When engaged, A10S1E applies +5V to the delay comparator control and to the delayed gate control circuits disabling them. In addition, A10S1E routes the main sweep ramp to the horizontal preamplifier.

4-99. X-Y Control. The X-Y switch A10S1F performs a number of functions. When engaged, A10S1F removes the sync signal from rear-panel connector J4 and applies it to the horizontal preamplifier. It applies the x-y offset voltage to the horizontal preamplifier. The x-y control signal is grounded to prevent generation of the composite gate signal. It also inhibits the main and delayed gate signals applied to connectors on the rear of the instrument, inhibits the sweep circuit, and unblanks the CRT.

4-100. HORIZONTAL PREAMPLIFIER. (See schematic 15.) The horizontal preamplifier converts the single-ended sweep from the sweep generator into a differential sweep for driving the horizontal output amplifier. During x-y operation, horizontal position and the x-signal are summed and applied to the preamplifier. The preamplifier provides sweep gain adjustment, trace magnification (X10), and trace centering.

4-101. Transistors A8Q23 and A8Q24 are emitter followers used to provide input isolation. Current in the collector circuit of A8Q25 is determined by the setting of horizontal POSITION control R13A/B. The output current from A8Q25 is applied to A8Q24 base resistor A8R137. In x-y operation, channel B vernier controls the x-axis gain. A8R133 serves as the x-axis gain calibration adjustment. An offset current is supplied to the junction of A8R132, A8R133, and A8R135 to center the x-y display. Variable capacitor A8C45 compensates the x-y phase.

4-102. The emitter outputs from transistors A8Q23/A8Q24 are applied to a dual differential stage that furnishes the X1 or X10 magnification for the horizontal sweep. When MAG switch A10S1A is not engaged, +53V is applied to the emitter circuits of transistors A8Q28 and A8Q29, biasing them on. Gain for the X1 range is adjusted by A8R148. Engaging MAG switch A10S1A removes the +53V bias from A8Q28/A8Q29 and applies it to the emitter circuits of A8Q26 and A8Q27. Gain for the X10 range is adjusted by A8R146. Resistors A8R152, A8R153, and A8R154 provide a dc balance network for the differential amplifier.

4-103. Differential amplifier A8Q30/A8Q31 provides differential drive to the horizontal output amplifier. This stage, as well as the preceding differential stage, will current limit when overdriven. This prevents saturation of the output amplifier. Transistor A8Q32 functions as a constant current source for the amplifier stage. When BEAM FIND switch A8S1A is pressed, less current is supplied to the amplifier stage. This ensures that the horizontal portion of the trace is returned to the viewing area of the CRT.

4-104. HORIZONTAL OUTPUT. (See schematic 16.) The horizontal output is a differential shunt-feedback amplifier. The currents through A13R3 and A13R4 determine the output voltage since little current flows in the bases of transistors A13Q1, A13Q2, A13Q3, and A13Q4. Variable capacitors A13C5 and A13C7

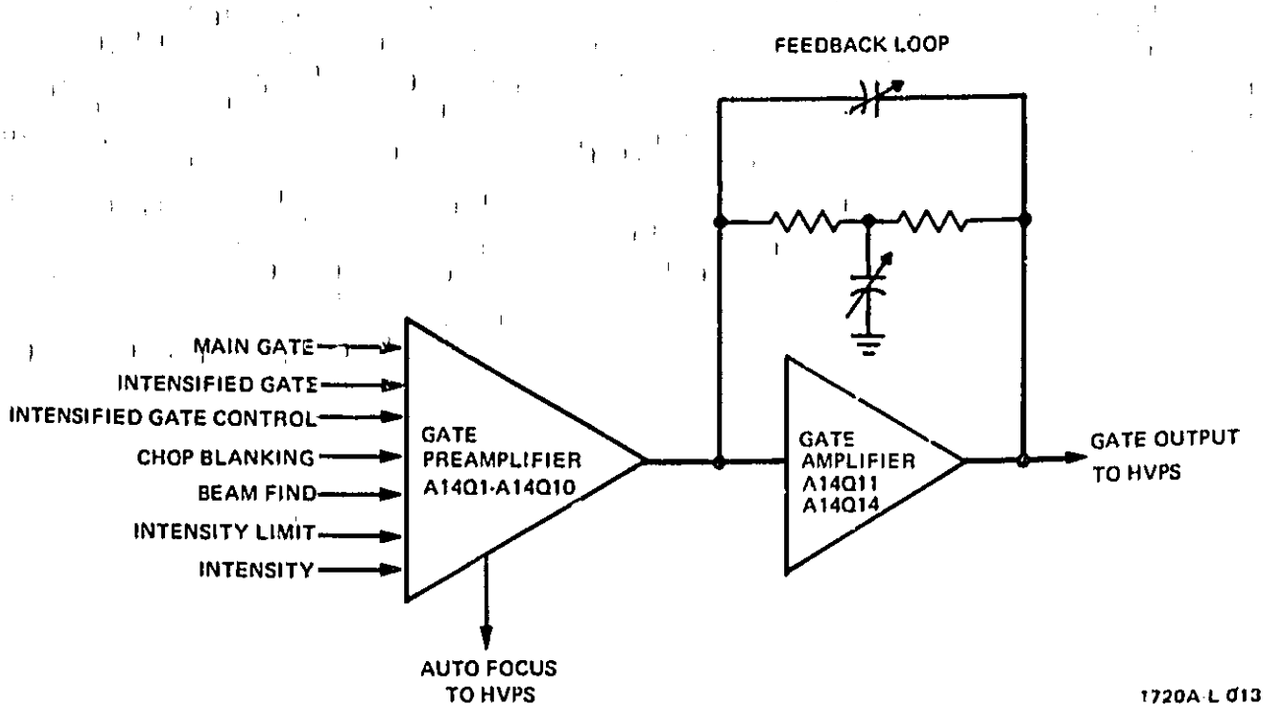


Figure 4-3. Gate Control Simplified Block Diagram

control the fast corner response, and A13C6 and A13C8 control the slightly slower corner response of the circuit. Resistors A13R1 and A13R2 establish the minimum output voltage level. With the input circuit disconnected, the minimum output voltage level is approximately +9V.

4-105. Transistors A13Q1 through A13Q4 are emitter followers with A13Q1 and A13Q4 providing the dc signal path and A13Q2 and A13Q3 providing the ac signal path. In a similar manner, A13Q5 and A13Q8 are the dc signal path, and A13Q6 and A13Q7 are the ac signal path. Transistors A13Q6 and A13Q7 are current sources, and resistors A13R23 and A13R24 serve to lower the power in these transistors. Each side of the output amplifier can swing from approximately +9V to +95V.

4-106. GATE ASSEMBLY AND CALIBRATOR.

4-107. GATE CIRCUITRY. (See schematics 17 and 18.) The gate assembly controls intensity of the trace on the CRT. The gate preamplifier, consisting of A14Q1 through A14Q10 sums all desired functions necessary for control of trace intensity. This is accomplished with current switches (see figure 4-3 for simplified block diagram of gate circuit).

4-108. Gate Preamplifier. The setting of front-panel INTENSITY control R2 controls the base voltage applied to A14Q8. The emitter voltage of A14Q8 follows the base voltage and is 0.6V above the base voltage. This voltage applied to A14R18 establishes the current for current switch A14Q1, A14CR3, and A14Q9.

4-109. The composite gate signal from the gate Schmitt is applied to the base of A14Q1. This signal switches the current path between A14Q1 or A14Q9, thus causing the gate output voltage to the high-voltage power supply to change.

4-110. The intensified gate functions in a similar manner. It is a current switch consisting of A14Q10, A14CR4, and A14CR5. Its current source is the voltage at the emitter of A14Q8 across A14R22 and A14R23. Zener diode A14VR1 and resistor A14R2 limit the maximum level of the intensified gate. The main intensity control signal is applied through A14R25 to this current switch. The main intensity signal enables the current switch during main intensified mode only.

4-111. Chop blanking is accomplished by current switch A14Q2 and A14Q3. When CHOP mode of operation is selected, the chop blanking signal applied to the base of A14Q2 turns it on and off. The alternating action switches the current path between A14Q2 and A14Q3. Transistor A14Q3 supplies additional current to A14Q9 increasing the brightness of the trace.

4-112. When BEAM FIND switch A8S1A is pressed, the front-panel INTENSITY control R2 is disabled and a fixed voltage is supplied through the gate amplifier to the high-voltage power supply. A z-axis voltage applied to A14R6 similarly causes a current

change through the gate amplifier. A z-axis signal of > +1V, pulse width > 50 nanoseconds, dc to 20 MHz will blank the CRT trace of normal intensity. A z-axis signal of +8V will blank the CRT trace regardless of intensity setting.

4-113. Transistors A14Q4 and A14Q5 make up an intensity limit circuit. As intensity becomes excessive in the CRT, its first accelerator begins to draw current. This increases current through A14R16, causing the voltage on the base of A14Q4 to change. The voltage at the emitter of A14Q4 follows the base voltage and is 0.6V below the base. This raises the voltage applied to the base of A14Q8 through front-panel INTENSITY control R2. Variable resistor A14R15 establishes the level at which limiting takes place. Variable resistor A14R10 sets the maximum level the gate output can reach, providing optimum gate drive to the CRT.

4-114. An auto-focus circuit is incorporated in the instrument. Varying INTENSITY control R2 varies the bias applied to the emitter circuit of A14Q7. As conduction through A14Q7 increases or decreases, the voltage drop across FOCUS control R1 changes accordingly (see schematic 18). This automatically corrects the focus adjustment for changes in intensity level.

4-115. Gate Amplifier. The gate amplifier output is a shunt feedback stage consisting of A14Q12 through A14Q14. Transistors A14Q11 and A14Q13 are emitter followers with A14Q11 providing the ac signal path. Resistors A14R30 and A14R31 provide the dc feedback path. Variable capacitor A14C7 controls fast corner response while A14C8 controls slightly slower corner response.

4-116. Due to the high open loop gain of the amplifier most of the current appearing at the summing junction (bases of A14Q11 and A14Q13) flows through the feedback resistors A14R30 and A14R31. This results in a change in output voltage equal to the input current times the feedback resistance (A14R30 plus A14R31). Under certain conditions, the gate output may swing from +5V to +100V.

4-117. CALIBRATOR. (See schematic 17.) The calibrator consists of integrated circuit A14U1 and associated bias controls. It is connected in a multivibrator configuration and free-runs at approximately 1 kHz. Calibrator amplifier adjustment A14R51 is adjusted to produce a square wave with 3 volts amplitude at the CAL 3V terminal on the front panel.

4-118. CRT CONTROLS. (See schematic 18.) There are a few CRT adjustments physically located on gate assembly A14 yet are accessible at the rear panel of the instrument for CRT control. These adjustments are TRACE ALIGN (A14R67), ASTIG (A14R74), and PATT (A14R76). A functional description of these controls is given in Section III.

4-119. Two additional CRT controls physically located on gate assembly A14 are screwdriver adjustments. Flood-gun pattern control A14R64 adjusts the voltage applied to flood-gun filaments of the CRT to control scale illumination range. ORTHO ADJ control A14R70 adjusts current through the y-axis alignment coil on the CRT.

4-120. HIGH-VOLTAGE POWER SUPPLY.

4-121. The high-voltage power supply contains a high-voltage oscillator and a rectifying circuit. The high-voltage regulator is part of gate assembly A14.

4-122. When the instrument is turned on, +20V (unregulated) is applied to transistor Q1, turning it on. As A1 conducts through the primary winding of A15T1 (pin 3 and 4), positive feedback to the base of Q1 occurs through another winding on the transformer (pins 1 and 2). The circuit oscillates at a rate determined by the inherent distributed inductance and capacitance of the circuit. The magnitude of the oscillations, and consequently the output of the power supply, is controlled by voltage on the collector of voltage regulator A14Q17.

4-123. A reference voltage from the +15V supply is established at the junction of A15R10 and A15R12 and is applied to the base of A14Q15 on gate assembly A14. A sample of the rectified cathode voltage is fed back to the base of A14Q15 through A15R10. Any difference in cathode voltage is amplified and inverted by Darlington amplifier A14Q15/Q16. Output of the Darlington pair drives the base of A14Q17, causing its collector voltage to change. This change is coupled through a winding on A15T1 to the base of Q1 and causes the amplitude of its oscillations to change. This change is in such a direction as to correct the original change in the rectified cathode voltage. Diodes A15CR1 and A15CR2 protect the oscillator transistor base from excess reverse voltage.

4-124. The CRT cathode and grid voltages are developed in the secondary of high voltage transformer A15T1. The cathode voltage is rectified and filtered before application to the cathode of the CRT. It is also used as a feedback control to the high-voltage oscillator, as a reference for the CRT filament winding, for grid bias supply, and for the focus voltage-divider network. The cathode voltage will vary between —2827V to —2973V, depending on component tolerances and is not adjustable.

4-125. The CRT grid voltage is supplied by a voltage tap (pin 5) on the secondary winding of A15T1. Approximately 300V peak is developed and applied through a series RC network (A15C2/A15R2) to diodes which clamp the voltage swing between that established by INT SET control A15R3 and the gate dc levels. The peak-to-peak voltage swing is rectified, and applied to the grid with reference to cathode voltage and controls the beam brightness.

4-126. The unrectified cathode voltage in the secondary of A15R1 is applied to multiplier assembly A16 where the voltage is multiplied approximately six times. The output of the multiplier (approximately +17.5 kV) is applied to the post accelerator connector on the CRT.

4-127. Another secondary winding of transformer A15T1 provides filament voltage for the CRT. This winding is referenced to the rectified cathode voltage through A15R5.

4-128. LOW-VOLTAGE POWER SUPPLY.

4-129. The low-voltage power supply provides regulated +5V, +15V, +53.3V, +115V, and —15V for operation of the various circuits in the instrument. All low voltage supplies are referenced to the +15V supply for regulation purposes.

4-130. ±15-VOLT SUPPLIES. (See schematic 20.) +15-volt Supply. One of the secondary windings on input power transformer T1 is connected to bridge rectifier A17CR7. The rectified voltage (nominally +20 Vdc) is filtered by A17C8. The output of the supply is maintained at +15 volts by integrated circuit A17U2 and series regulator transistor Q5. Regulator A17U2 contains a temperature-compensated reference circuit (pin 4) and a differential amplifier with a Darlington output. The reference circuit is connected to the noninverting input of the differential amplifier (pin 3) through A17R20. The +15-volt output is attenuated through A17R22, A17R23, and A17R24. The wiper of potentiometer A17R23 is connected to the inverting input of the differential amplifier. The Darlington output (pin 6) drives the base of series transistor Q5. Resistor A17R23 is adjusted to compensate for variations of the reference voltage (nominally +7.15 volts), so that with an output of +15 volts from the supply, the inverting and noninverting input voltages are equal.

4-131. The IC regulation includes an output current limiting circuit consisting of an NPN transistor whose collector is connected to the differential amplifier and first base of the Darlington pair (within the IC). The emitter and base connections for the NPN transistor are pins 1 and 10 on A17U2. When load current through A17R21 produces a sufficient voltage drop, the NPN transistor conducts, pulling the input to the Darlington pair toward the emitter potential of Q5. This limits the output current. The output current limit is 0.55 to 0.75 ampere.

4-132. —15-volt Supply. (see schematic 20.) Operation of the —15V regulator A17U3 is identical to that of the +15V regulator except that the inverting input to the IC is the sum of the +15V and —15V outputs (Nominally 0V).

4-133. +5-VOLT SUPPLY. (See schematic 19.) The +5-volt regulator A17U1 functions identically to that of the +15V regulator A17U2 except that the reference is provided by the output of the +15V supply and attenuated by A17R15 and A17R16.

4-134. +115-VOLT AND +53.3-VOLT POWER SUPPLIES. (See schematic 19.) The +115-volt and +53.3-volt power supplies function identically, therefore only the +115-volt supply will discussed.

4-135. The ac input voltage from power transformer T1 is applied to bridge rectifier A17CR1. The dc output from A17CR1 is filtered by A17C1. A +15V reference is applied through A17CR5 to the emitter of transistor A17Q3. The base of A17Q3 is connected to a voltage-divider network across the output circuit. If the output falls below +115V, the base of A17Q3 becomes less positive than the emitter and it conducts. With A17Q3 turned on, conduction through Darlington pair Q2 and A17Q2 increases. This results in an increase in output voltage. When the output voltage again reaches +115 volts, A17Q3 turns off. Transistor A17Q1 and resistor A17R2 form a current limiting circuit. As current requirements increase toward the limit of the supply capability, the voltage drop across A17R2 is applied to the base of A17Q1 which conducts and limits current drain from the Darlington pair.

4-136. The +53.3-volt power supply functions identically as the +115-volt supply. The Darlington pair consists of transistor Q3 and A17Q5. The current limiting circuit consists of transistor A17Q4 and resistor A17R8.

4-137. FLOOD-GUN FILAMENT VOLTAGE. (See schematic 20.) Flood-gun filament voltage is developed in a secondary winding of ac power transformer T1. The ac input voltage is rectified by A17CR9/CR10 and filtered by A17C14. One branch of the output circuit is applied directly to the flood-gun filament connection on the CRT. The other branch is applied to a control circuit on gate assembly A14. Output of the control circuit on assembly A14 is applied to the other filament connection on the CRT (see schematic 18).

4-138. LINE FREQUENCY. (See schematic 19.) The line frequency trigger signal is developed in the same secondary winding of power transformer T1 that is used for the +5-volt power supply. The line frequency signal is applied through A17R18 to HF REJ switch A8S1M on assembly A8 (see schematic 9).

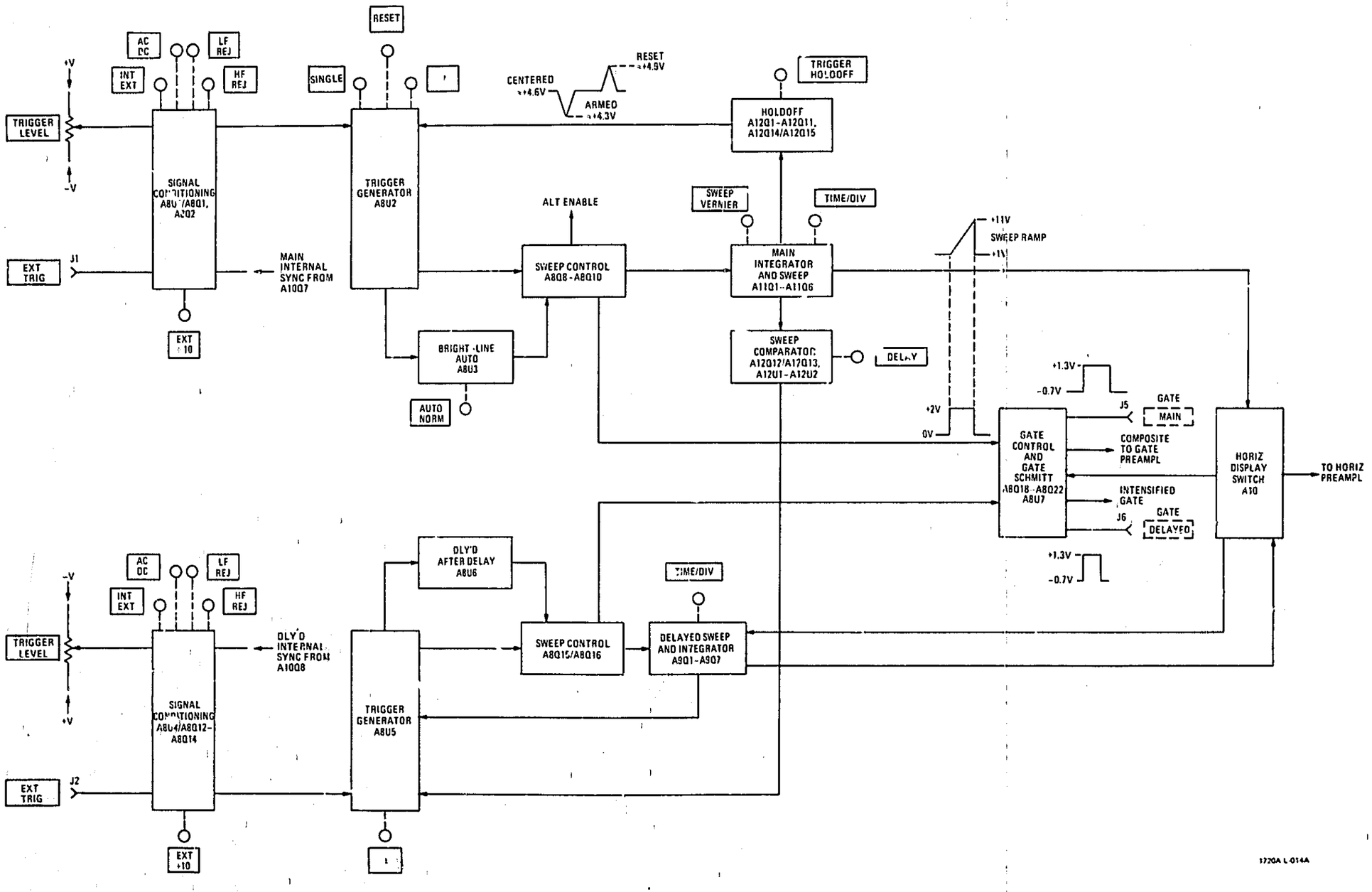


Figure 4-4.
Time Base Simplified Block Diagram

PERFORMANCE CHECK

Table 5-1. Recommended Test Equipment

Instrument		Required Characteristics	Required For
Type	Model		
DC Standard Voltmeter	HP Model 740B	Voltage: 0.5 to 30V Accuracy: to 0.1%	P, A
VHF Oscillator	HP Model 3200B	Frequency: to 300 MHz Accuracy: ±2%	P, A
Test Oscillator	HP Model 651B	Frequency: 10 MHz	P, A
RF Voltmeter	HP Model 3406A	Voltage: to 3V	P, A
Time-mark Generator	HP Model 226A	Time marks: 2 ns to 0.5 s	P, A
Fast-rise Pulse Generator	HP Model 1105A and 1108A	Pulse rise time: <400 ps	P
Multifunction Digital Voltmeter	HP Model 34740A with 34702A	Voltage Range: >115V Accuracy: ±0.1%	A
Adapter	HP Part No. 1250-0849	GR874 to BNC male	P
Adapter (2)	HP Part No. 1250-0850	GR874 to BNC female	P
Adapter	HP Model 10110A	Twin Banana Plug to BNC male adapter	P, A
Adapter	HP Part No. 1250-0080	BNC female to BNC female	P
44-in. BNC Cable (4)	HP Model 10501A	BNC, 44-in. cable	P, A
9-in. BNC Cable (3)	HP Model 10502A	BNC, 9-in. cable	P
Adapter	HP Part No. 1251-2277	Twin Banana Plug to BNC female adapter	
Test Leads	HP Model 11002A		P, A
50-ohm Tee	HP Model 11063A	Accessory for RF voltmeter	P
BNC Tee (2)	HP Part No. 1250-0781	BNC Tee	P
Probe	HP Model 10014A	Divide Ratio: 10:1	A
20-dB Attenuator	HP Model 355D	Attenuator: 20 dB	A
50-ohm Power Divider	HP Model 11549A		P
Adapter (3)	HP Part No. 1250-0780	Male type N to female BNC	P
Test Oscilloscope	HP Model 180C/1808A/1820C	Blanking Gate Output; Sweep Output	A
Pulse Generator	HP Model 8013B	Trigger Output Frequency: 10 kHz	A
50-ohm Load	HP Part No. 0950-0090		P
50-ohm Termination	HP Model 10100C	Termination: 50 ohms	P

P = Performance Check, A = Adjustment Procedure.

SECTION V

PERFORMANCE CHECK AND ADJUSTMENTS

5-1. INTRODUCTION.

5-2. This section contains step-by-step procedures for checking the instrument specifications as given in table 1-1 of this manual. The performance checks are arranged in numerical order. For best results, this order should be followed. Included in this section are test setups, procedures, and test equipment required. Most test points and adjustment locations are shown within the procedures in which they are referenced. The procedures for making all internal adjustments are covered in paragraphs 5-46 through 5-99.

5-3. TEST EQUIPMENT.

5-4. Recommended test equipment and accessories are listed in table 5-1. Test equipment equivalent to that recommended may be substituted, provided it meets the required characteristics listed in the table. For best results, use recently calibrated test equipment.

5-5. PERFORMANCE CHECKS.

5-6. The performance checks given in this section are suitable for incoming inspections, preventative maintenance, and troubleshooting. The checks are designed to verify the published instrument specifications. Perform the checks in the order given, and record the measured information on the performance check record at the end of the performance check.

5-7. ADJUSTMENTS.

5-8. The adjustment procedures are arranged in a recommended sequence of adjustments. While most adjustments may be made independent of other adjustments, it is recommended that adjustments be made sequentially as a number of adjustments are directly related to preceding or following adjustments.

5-9. PERFORMANCE CHECK RECORD.

5-10. Each measurement point in the performance check is repeated in the performance check record. The pages may be removed for filing. The first time the performance check is made, enter the results on the performance check record and file it for future reference.

5-11. FRONT-PANEL CONTROL SETTINGS.

5-12. Set up the instrument and perform initial adjustments outlined in Section III before proceeding with the performance check and adjustment procedures.

5-13. The control settings listed below are to be used for each performance check and adjustment procedure. If a control is to be set to another position, it will be listed in the procedure. After the completion of each performance check or adjustment procedure, set the controls back to the original front-panel settings.

Control	Position
Vertical (channels A and B):	
POSITION	centered
VOLTS/DIV	.1
Coupling	DC
Verniers	CAL
VERT DISPLAY	A
INT TRIG	A
BW LIMIT	out position
B INVERT	out position
Horizontal:	
POSITION (coarse and fine)	centered
HORIZ DISPLAY	MAIN
MAG X10	X1 position
DELAY	1.00
TIME/DIV (main)	.1 mSEC
TIME/DIV (delayed)	OFF
TRIGGER LEVEL (delayed)	STARTS AFTER DELAY
TRIGGER LEVEL (main)	midrange
SWEEP VERNIER	CAL
TRIGGER HOLDOFF	detent position
All time base pushbuttons	out position
INTENSITY	visible trace

5-14. PERFORMANCE CHECK PROCEDURES.

5-15. DEFLECTION FACTOR. The ranges are from 5 mV/div to 5 V/div (9 ranges) in 1, 2, 5 sequence. The accuracy is ±2% with the vernier in calibrated

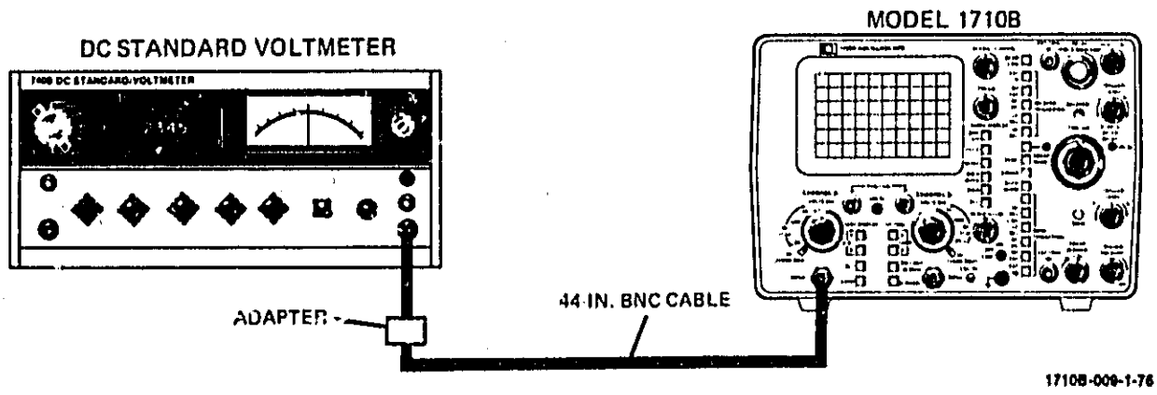


Figure 5-1. Deflection Factor Test Setup

position. The vernier is continuously variable between all ranges and extends maximum deflection factor to at least 12.5 volts/div. The UNCAL light indicates when vernier is not in CAL position.

5-16. The deflection factor is checked by applying a dc voltage-calibrated signal to the input. The displayed displacement is compared against the voltage standard.

Equipment Required:

DC Standard voltmeter
Adapter (HP Part No. 1251-2277)
44-in. BNC cable

5-17. Perform deflection factor check as follows:

a. Connect instruments as shown in figure 5-1.

b. Set main TIME/DIV control to .5 mSEC.

c. Set channels A and B VOLTS/DIV controls to .01 position.

d. Set base line to bottom graticule line.

e. Set dc standard voltmeter controls for 50-mV dc output signal.

f. Note display. Vertical deflection should be 5 divisions ±2% (±.1 div).

g. Observe vertical deflection factors specified in table 5-2.

h. Set dc standard voltmeter output for 30V.

i. Set channel A VOLTS/DIV control to 5.

j. Rotate channel A vernier fully counterclockwise. Vernier UNCAL light should be lighted and display amplitude should decrease to less than 2.4 divisions.

k. Set channel A vernier to CAL position.

l. Connect dc standard voltmeter to channel B INPUT connector.

m. Set VERT DISPLAY control to B.

n. Set INT TRIG control to B.

o. Repeat steps d through k for channel B.

p. Disconnect test equipment.

q. Set Model 1710B front-panel controls to initial settings.

Table 5-2. Deflection Factor Accuracy

DC Standard Settings (Volts)	VOLTS/DIV Settings	Vertical Display (div)
.03	.005	6 ±2% (±.12)
.05	.01	5 ±2% (±.1)
.1	.02	5 ±2% (±.1)
.3	.05	6 ±2% (±.12)
.5	.1	5 ±2% (±.1)
1	.2	5 ±2% (±.1)
3	.5	6 ±2% (±.12)
5	1	5 ±2% (±.1)
10	2	5 ±2% (±.1)
30	5	6 ±2% (±.12)

5-18. CALIBRATOR ACCURACY. The calibrator output is a square wave with 3V ±1% amplitude, at approximately 1 kHz.

5-19. The amplitude is checked by comparing the p-p signal against a known 0.1% signal.

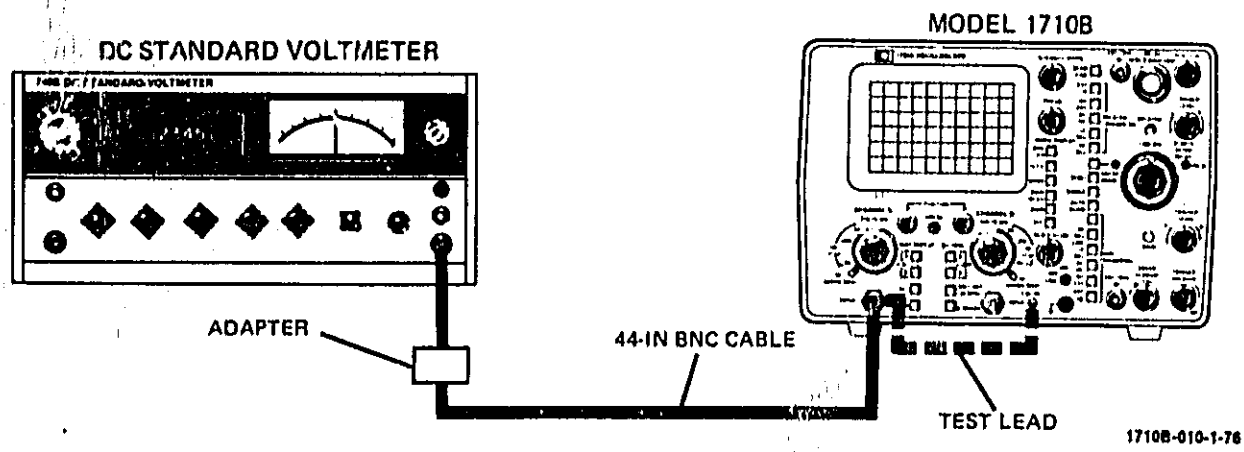


Figure 5-2. Calibrator Accuracy Test Setup

Equipment Required:

DC Standard voltmeter
Adapter (HP Part No. 1251-2277)
44-in. BNC cable
Test lead
Adapter

5-20. Perform calibrator accuracy check as follows:

a. Connect equipment as shown in figure 5-2.
b. Set Model 1710B controls as follows:

TIME/DIV (main) ..... .5 mSEC
VOLTS/DIV (channel A) 5

c. Set dc standard voltmeter for 3V dc output signal.

d. Note vertical deflection on CRT.

e. Disconnect dc standard voltmeter from Model 1710B.

f. Connect Model 1710B CAL 3V output to channel A INPUT connector using test lead and HP Model 10110A adapter.

g. Note vertical deflection on CRT. Vertical deflection should be same as noted in step d, ±1%. Frequency should be approximately 1 kHz.

h. Disconnect test lead.

i. Set Model 1710B front-panel controls to initial settings.

5-21. Z-AXIS BLANKING. A signal of +8 volts, >50-ns wide pulse will blank a trace of any intensity. Usable to 20 MHz for normal intensity.

5-22. A free-running trace of normal intensity is obtained on CRT. A signal of +8 volts is applied to the Z-AXIS input connector on the rear panel of Model 1710B. The display should be blanked regardless of INTENSITY setting.

Equipment Required:

DC Standard voltmeter
Adapter (HP Part No. 1251-2277).
44-in. BNC cable

5-23. Perform Z-axis blanking check as follows:

a. Obtain free-running base line on CRT.

b. Adjust INTENSITY control for normal viewing level of baseline.

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

d. Set dc standard voltmeter for +8 volts, dc output signal.

e. Observe base line is blanked.

f. Disconnect test equipment.

g. Set Model 1710B front-panel controls to initial settings.

5-24. BANDWIDTH. Direct or with HP Model 10020 probe, or with 10X, 10-megohm divider probe (HP Model 10014A). (3 dB down from a 10-MHz 6-division reference signal from a terminated 50-ohm source.) DC coupled: dc to 200 MHz; AC coupled: 10 Hz to 200 MHz; except on 5 mV/range: 150 MHz.

5-25. To check the bandwidth, a vhf oscillator is used to apply a 6-division 10-MHz reference signal to the input of Model 1710B. An rf voltmeter is used to measure the signal level. The vhf oscillator frequency is increased to 200 MHz and the amplitude is adjusted to give the same indication on the rf

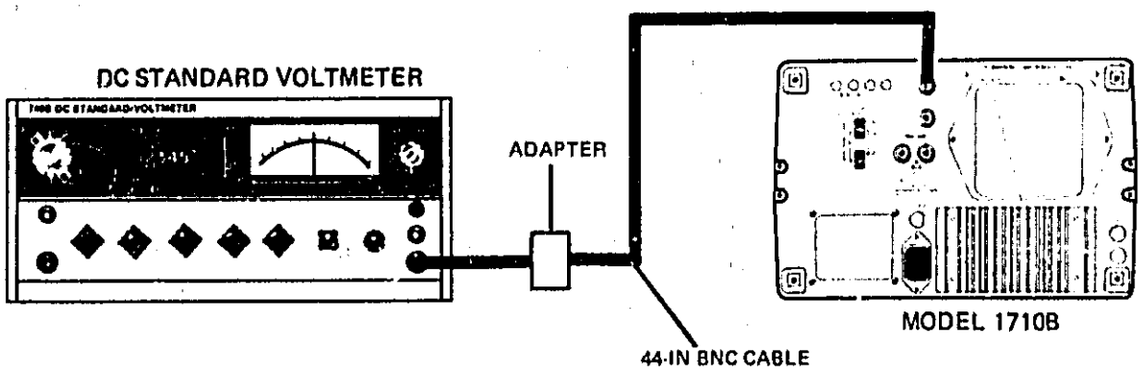


Figure 5-3. Z-axis Blanking Test Setup

voltmeter. Displayed amplitude on CRT must be equal to or greater than 4.2 divisions.

Equipment Required:

VHF oscillator
RF voltmeter
44-in. BNC cable
50-ohm Tee
Adapter (HP Part No. 1250-0850)
Adapter (HP Part No. 1250-0849)
50-ohm termination
50-ohm power divider

5-26. Perform bandwidth check as follows:

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

b. Set channels A and B input coupling to 50Ω position.

c. Adjust vhf oscillator for 10-MHz 6-division display on CRT.

d. Note indication on rf voltmeter.

e. Increase signal output of vhf oscillator to 200 MHz.

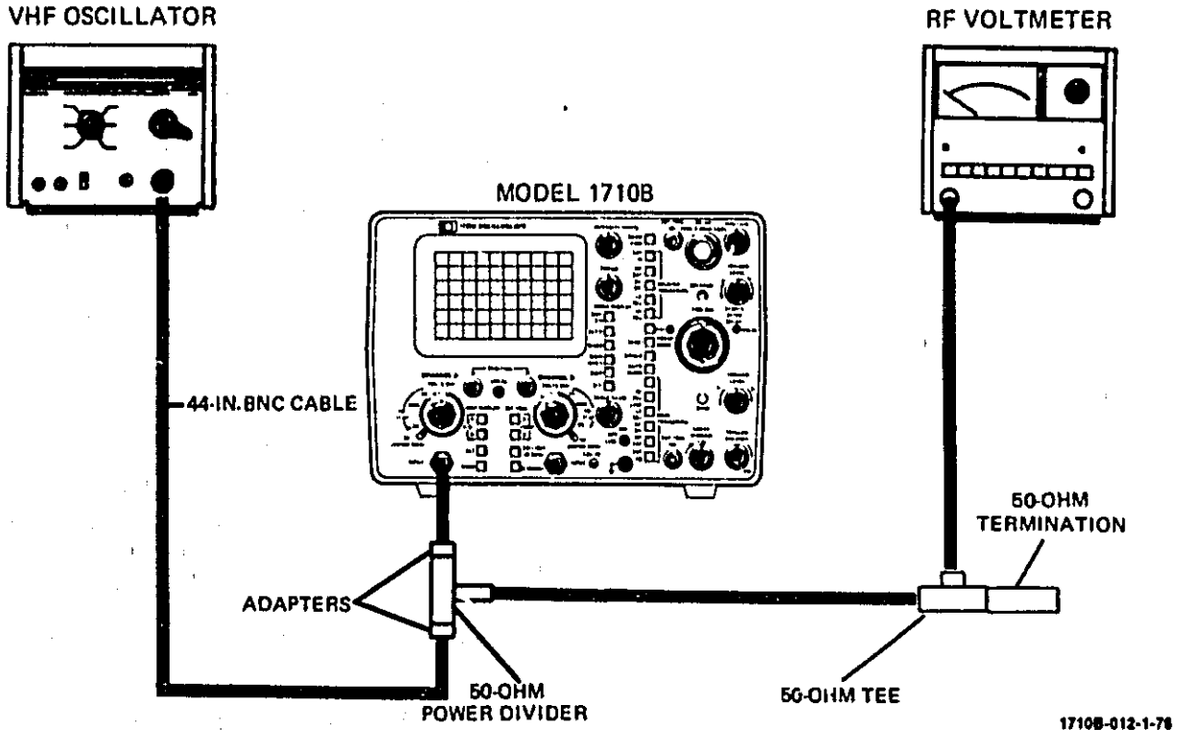


Figure 5-4. Bandwidth Test Setup

f. Adjust output amplitude of signal from vhf oscillator until rf voltmeter indication is same as noted in step d.

g. Observe display on CRT. Signal amplitude should be equal to or greater than 4.2 divisions.

h. Disconnect input signal from channel A INPUT connector.

i. Connect input signal to channel B INPUT connector.

j. Set VERT DISPLAY control to B.

k. Set INT TRIG control to B.

l. Repeat steps c through h for channel B.

m. Set channels A and B VOLTS/DIV to .005 and repeat steps c thru l, checking bandwidth to 150 MHz.

n. Disconnect test equipment.

o. Set Model 1710B front-panel controls to initial settings.

5-27. TRIGGERING. Internal triggering occurs from dc to 100 MHz on signals causing 0.5 division or more of vertical deflection, increasing to 1-division vertical deflection at 200 MHz in all display modes. Triggering on line frequency is also selectable. External triggering occurs from dc to 100 MHz on signals with an amplitude of 50 mV p-p or more, increasing to 100 mV p-p at 200 MHz.

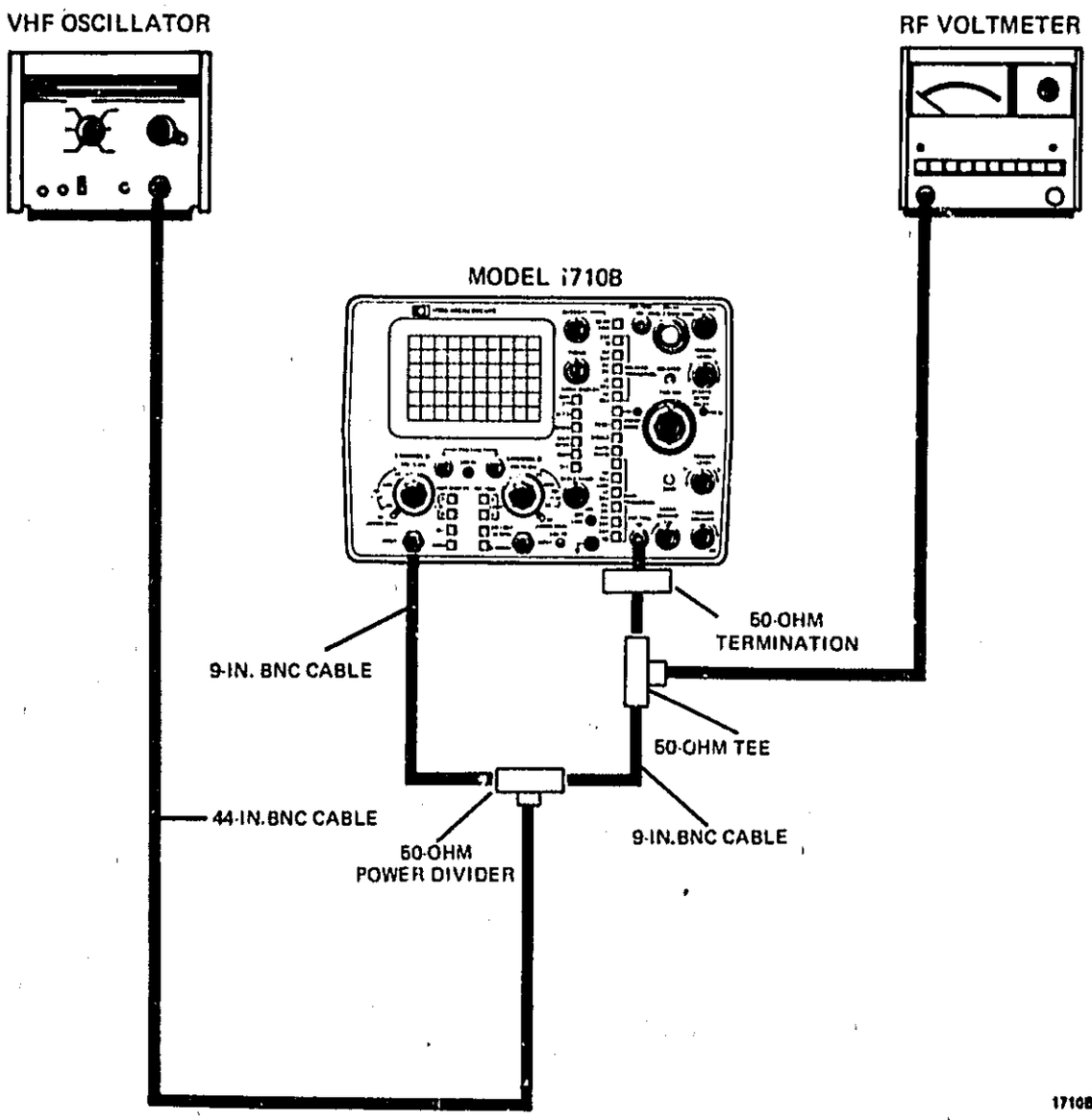


Figure 5-5. Main Triggering Test Setup

5-28. In the internal trigger mode of operation, triggering is checked against certain vertical deflections on the CRT. In the external trigger mode of operation, the input signal amplitude is monitored with an rf voltmeter.

Equipment Required:

VHF oscillator
RF voltmeter
44-in. BNC cable
Two 9-in. BNC cables
50-ohm Tee
50-ohm power divider
50-ohm termination

5-29. Perform triggering check as follows:

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

b. Set Model 1710B channel A coupling to 50Ω position.

c. Set vhf oscillator for 100 MHz, 0.5 division of vertical deflection output signal.

d. Adjust main TIME/DIV and main TRIGGER LEVEL controls for stable display. (If stable display is obtained, instrument is triggering properly.)

e. Set vhf oscillator for 200 MHz, 1 division of vertical deflection output signal.

f. Adjust main TRIGGER LEVEL control for stable display. (If stable display is obtained, instrument is triggering properly.)

g. Set main INT/EXT switch to EXT position.

h. Set vhf oscillator for 100-MHz 17.7-mV output signal as observed on rf voltmeter (50 mV p-p).

i. Adjust main TRIGGER LEVEL control for stable display. (If stable display is obtained, instrument is triggering properly.)

j. Set vhf oscillator for 200-MHz 35.4-mV output signal as indicated on rf voltmeter (100 mV p-p).

k. Adjust main TRIGGER LEVEL control for stable display. (If stable display is obtained, instrument is triggering properly.)

l. Set main INT/EXT switch to INT position.

m. Set main TIME/DIV control to 20-nSEC position.

n. Set delayed TIME/DIV control to 10-nSEC position.

o. Adjust vhf oscillator for 1 division of signal amplitude.

p. Adjust main TRIGGER LEVEL control for stable display.

q. Set HORIZ DISPLAY control to DLY'D.

r. Adjust delayed TRIGGER LEVEL control for stable display.

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

t. Set delayed INT/EXT switch to EXT position.

u. Set HORIZ DISPLAY control to MAIN.

v. Set vhf oscillator for 200-MHz 35.4-mV output signal as indicated on rf voltmeter (100 mV p-p).

w. Adjust channel A VOLTS/DIV switch for approximately two major divisions of vertical deflection.

x. Adjust main TRIGGER LEVEL control for stable display.

y. Set HORIZ DISPLAY control to DLY'D.

z. Adjust delayed TRIGGER LEVEL control for stable display. (Readjust main TRIGGER LEVEL control if necessary.)

aa. If stable display is obtained, instrument is triggering properly.

ab. Disconnect test equipment.

ac. Set Model 1710B front-panel controls to initial setings.

5-30. TRIGGER-LEVEL RANGE. Internal triggering at any point on displayed waveform when in a triggered mode. External triggering is continuously variable between +1 volt and —1 volt on either slope of trigger signal.

Equipment Required:

VHF oscillator
50-ohm power divider
44-in. BNC cable
Two 9-in. BNC cables
Three adapters (HP Part No. 1250-0780)
50-ohm termination

5-31. Perform trigger level range check as follows:

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

b. Set vhf oscillator for displayed signal on CRT of approximately 10 MHz and 5-division amplitude.

c. Set channel A coupling to 50Ω.

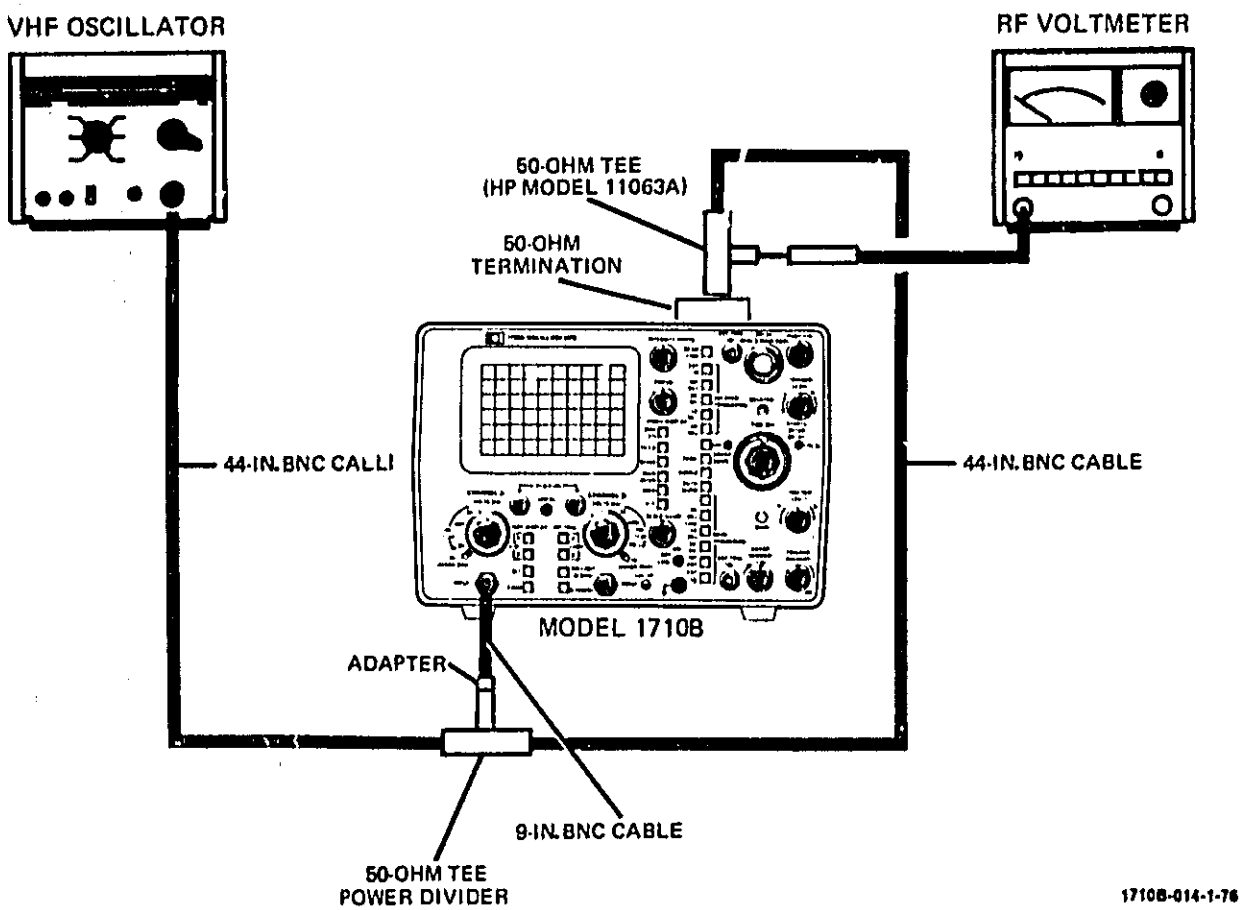


Figure 5-6. Delayed Triggering Test Setup

d. Set main TIME/DIV switch to 10 nSEC.

e. Rotate main TRIGGER LEVEL control to both extremes. Triggering point should adjust smoothly across positive slope of displayed waveform.

f. Set main trigger slope to (—).

g. Rotate main TRIGGER LEVEL control to both extremes. Triggering point should adjust smoothly across negative slope of displayed waveform.

h. Set channel A VOLTS/DIV control to .5 position.

i. Increase output of vhf oscillator so that displayed signal on CRT has vertical amplitude of 4 divisions.

j. Set main INT/EXT switch to EXT position.

k. Rotating main TRIGGER LEVEL control, triggering point should adjust smoothly from +1 volt to —1 volt (using both (+) and (—) main-slope controls).

l. Set main INT/EXT switch to INT position.

m. Adjust main TRIGGER LEVEL control for stable display.

n. Set HORIZ DISPLAY control to DLY'D.

o. Set main TIME/DIV control to 20-nSEC position.

p. Set delayed TIME/DIV control to 10-nSEC position.

q. Rotating delayed TRIGGER LEVEL control, stable triggering should occur at all points on displayed waveform (using both (+) and (—) delayed-slope controls).

r. Set delayed INT/EXT switch to EXT position.

s. Disconnect external trigger signal from main EXT TRIG input connector.

t. Connect external trigger signal to delayed EXT TRIG input connector.

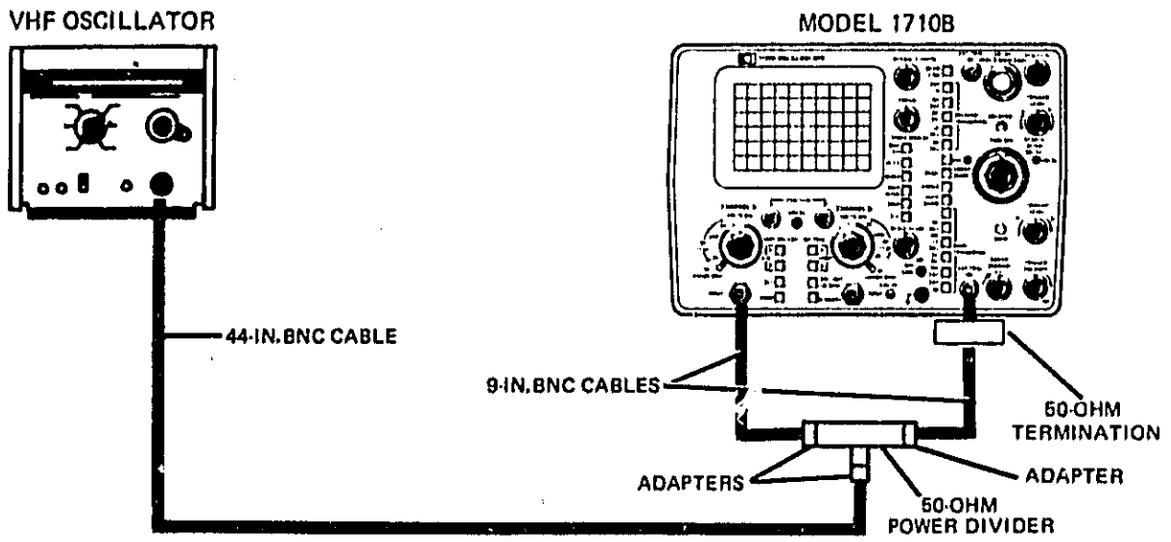


Figure 5-7. Trigger Level Test Setup

u. Rotating delayed TRIGGER LEVEL control, triggering point should adjust smoothly from +1 volt to —1 volt (using both (+) and (—) delayed-slope controls).

v. Disconnect test equipment.

w. Set Model 1710B front-panel controls to initial settings.

5-32. COMMON-MODE REJECTION. At least 40 dB, dc to 5 MHz, decreasing to 26 dB at 50 MHz. The common-mode signal amplitude is equivalent to 12 divisions with one vernier adjusted for optimum rejection.

5-33. Identical signals are applied to both channels A and B with channel B set to the inverted mode. The displayed signal is the common-mode signal.

Equipment Required:

Test oscillator
50-ohm power divider
44-in. BNC cable
Two 9-in. BNC cables

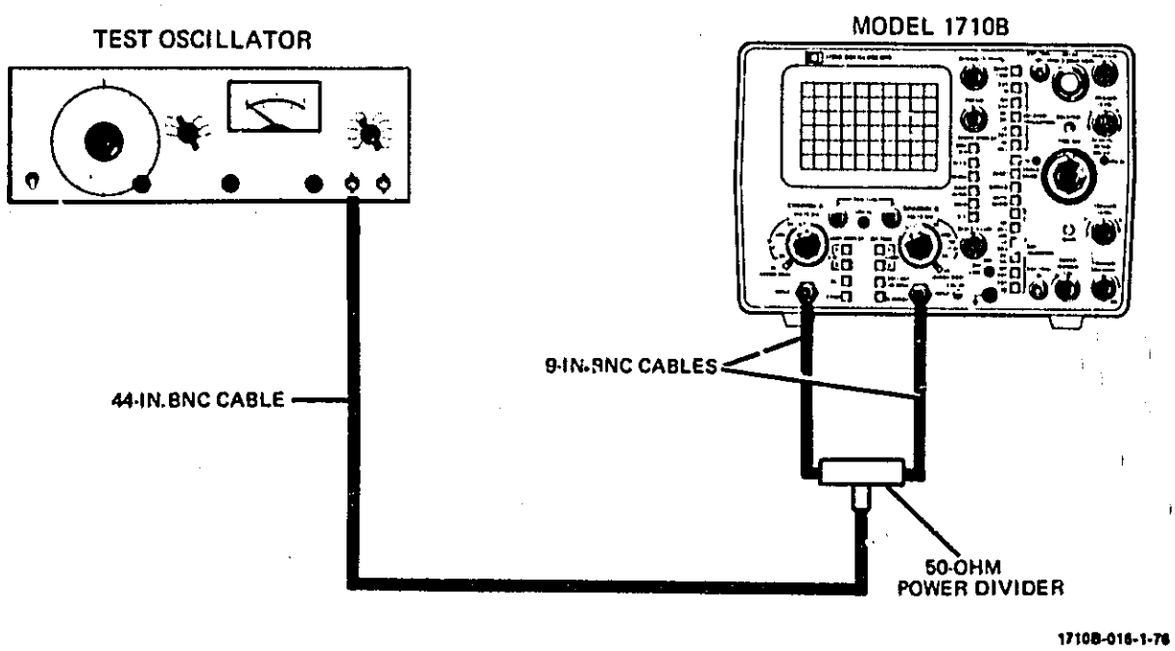


Figure 5-8. CMRR Test Setup

5-34. Perform common-mode rejection check as follows:

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

NOTE

Cables used to connect channels A and B INPUT connectors to 50-ohm power divider must be of the same electrical length.

b. Set Model 1710B front-panel controls as follows:

VOLTS/DIV (channels A and B)..... .1
Coupling (channels A and B)..... 50Ω
B INVERT ..... engaged

c. Set test oscillator for 5-MHz 2-division amplitude display on CRT.

d. Set channels A and B VOLTS/DIV controls to .01 position.

e. Set VERT DISPLAY control for A+B operation (both A and B pushbutton switches depressed).

f. Adjust either channel A or channel B vernier (whichever is most effective) to achieve minimum deflection.

g. Deflection should be less than one minor division (40 dB).

h. Set test oscillator for 50-MHz output.

i. Repeat steps b through f, using 50 MHz.

j. Deflection should be less than 1.1 major division (26 dB).

k. Disconnect test equipment.

l. Set Model 1710B front-panel controls to initial settings.

5-35. SWEEP-TIME ACCURACY. The ranges are from 10 ns/div to 0.5 s/div (24 ranges) in 1, 2, 5 sequence. The accuracy of the 10 ns/div through 50 ns/div and 50 ms/div through 0.5 s/div ranges is ±3%. The accuracy of the 100 ns/div through 20 ms/div ranges is ±2%. The stipulated accuracies of all ranges are with the vernier in calibrated position. The vernier is continuously variable between all ranges and extends slowest sweep to at least 1.25 s/div. The vernier UNCAL light indicates when the vernier is not in CAL position.

5-36. The Model 1710B time base is compared to a time-mark generator to verify accuracy.

Equipment Required:

Time-mark generator
44-in. BNC cable

5-37. Perform sweep time accuracy check as follows:

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

b. Set channel A input coupling to 50Ω position.

c. Check main sweep accuracy in accordance with table 5-3.

d. Set HORIZ DISPLAY control to DLY'D.

e. Check delayed sweep accuracy in accordance with table 5-4.

f. Disconnect test equipment.

g. Set Model 1710B front-panel controls to initial settings.

Table 5-3. Main Sweep Performance Check

Main TIME/DIV and Time Mark Generator Settings	*Accuracy
10 nSEC to 50 nSEC	±3% (within .3 div)
.1 uSEC to 20 mSEC	±2% (within .2 div)
50 mSEC to .5 SEC	±3% (within .3 div)

*Set one time mark at first left graticule line and read error at eleventh graticule line. Adjust main TRIGGER LEVEL control as necessary for stable displays.

Table 5-4. Delayed Sweep Performance Check

*Delayed TIME/DIV and Time Mark Generator Settings	**Accuracy
10 nSEC to 50 nSEC	±3% (within .3 div)
.1 nSEC to 20 mSEC	±2% (within .2 div)

* Main TIME/DIV is always one sweep position slower than delayed TIME/DIV switch setting.

**Set one time mark at first left graticule line and read error at eleventh graticule line. Adjust main and delayed TRIGGER LEVEL controls as necessary for stable display.

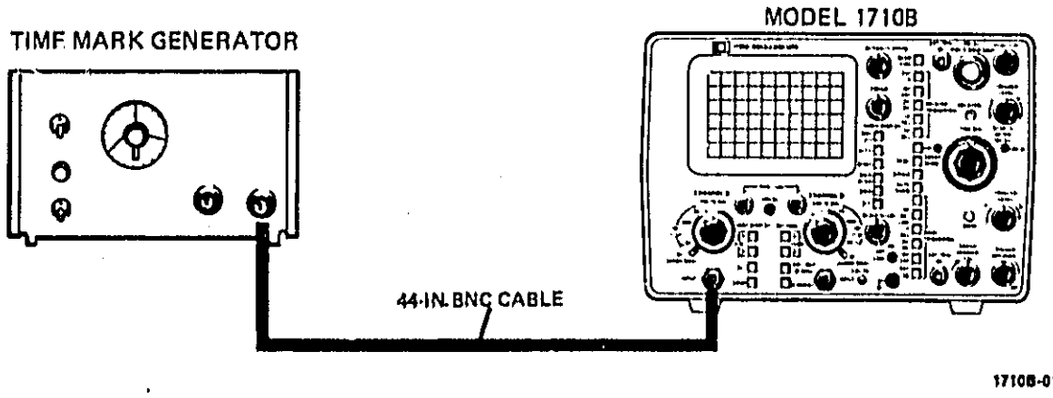


Figure 5-9. Sweep-time Test Setup

5-38. DELAY JITTER. Delay jitter should be less than 0.005% (1 part in 20,000).

5-39. Delay jitter is checked by expanding the sweep by 20,000 and visually monitoring the jitter.

Equipment Required:

Time-mark generator (HP Model 226A).
44-in. BNC cable (HP Model 10501A).

5-40. Perform delay jitter check as follows:

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

b. Set Model 1710B front-panel controls as follows:

TIME/DIV (main)	1 mSEC
VOLTS/DIV (channel A)	.5
TIME/DIV (delayed)	.5 uSEC
HORIZ DISPLAY	MAIN INTEN

c. Set time-mark generator for 1-mSEC time marks.

d. Adjust DELAY control so intensified portion of sweep starts at 11th graticule line.

e. Set HORIZ DISPLAY control to DLY'D.

f. Adjust DELAY control so display is centered. Delay jitter (horizontal axis) should be less than 1 division, which is equal to less than 0.005%.

g. Disconnect test equipment.

h. Set Model 1710B front-panel controls to initial settings.

5-41. DIFFERENTIAL TIME MEASUREMENT ACCURACY. (+15°C to +35°C) 50 ns/div to 20 ms/div (±0.5% of measurement, ±0.1% of full scale); 20 ns/div (±1% of measurement, ±0.2% of full scale). Full scale is 10X the main TIME/DIV control setting.

Equipment Required:

Time-mark generator (HP Model 226A).
44-in. BNC cable (HP Model 10501A).

5-42. Perform differential time measurement accuracy check as follows:

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

b. Set Model 1710B front-panel controls as follows:

VOLTS/DIV (channel A)	.5
Coupling (channel A)	50Ω
HORIZ DISPLAY	MAIN INTEN
TIME/DIV (main)	1 mSEC
TIME/DIV (delayed)	10 uSEC

c. Set time-mark generator for 1-mSEC time marks.

d. Adjust DELAY control to intensify second time mark from left.

e. Set HORIZ DISPLAY control to DLY'D.

f. Adjust DELAY control to place visible time mark on center vertical-graticule line.

g. Note DELAY control dial setting.

h. Set HORIZ DISPLAY control to MAIN INTEN.

i. Adjust DELAY control to intensify 10th time mark from left.

j. Set HORIZ DISPLAY control to DLY'D.

k. Adjust DELAY control to place visible time mark on center vertical-graticule line.

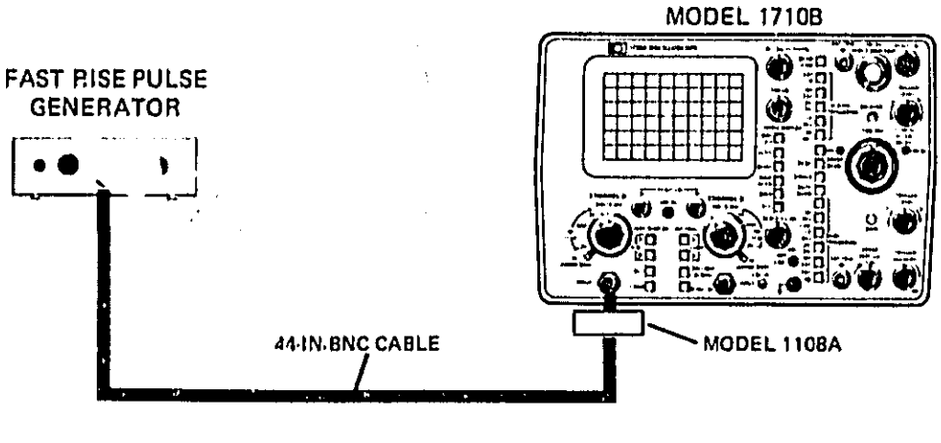


Figure 5-10. Rise Time Test Setup

l. Note DELAY control dial setting.

m. Subtract DELAY control dial setting obtained in step g from dial setting obtained in step l.

n. Difference obtained in step m should be 8 ±.050.

o. Disconnect test equipment.

p. Set Model 1710B front-panel controls to initial settings.

5-43. RISE TIME. The rise time is less than 1.75 nanoseconds (measured from the 10% to 90% points of a 6-division input step from a terminated 50-ohm source). On 5-mV range rise time is less than 2.3 nanoseconds. Measurements can be made direct, with HP Model 10020A probe, or with 10X, 10-megohm divider probe (HP Model 10004A).

5-44. A step with a rise time of less than 400 picoseconds is applied to the vertical input. The displayed rise time is then checked to see that it is less than 1.75 nanoseconds, except on the 5-mV range when it should be less than 2.3 nanoseconds.

Equipment Required:

Fast-rise pulse generator (HP Models 1105A and 1108A)
44-in. BNC cable (HP Model 10501A)

5-45. Perform rise time check as follows:

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

b. Set main TIME/DIV control to .01 uSEC position.

c. Set channels A and B input coupling to 50Ω position.

d. Adjust channel A VOLTS/DIV and fast-rise pulse generator controls for display signal having exactly 6 divisions amplitude.

e. Adjust main TRIGGER LEVEL control for stable display.

f. Set HORIZ DISPLAY control to MAG X10.

g. Adjust horizontal POSITION control as necessary to measure rise time.

h. Observed rise time should be less than 1.75 nanoseconds (10% to 90% points).

i. Disconnect fast-rise pulse generator from channel A INPUT connector.

j. Connect fast-rise pulse generator to channel B INPUT connector.

k. Set VERT DISPLAY control to B.

l. Set INT TRIG control to B.

m. Repeat steps d through h for channel B.

n. Disconnect test equipment.

o. Set Model 1710B front-panel controls to initial settings.

5-46. ADJUSTMENT PROCEDURES.

WARNING

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

5-47. Remove top and bottom covers from the instrument; set front-panel controls to initial settings (paragraph 5-11); apply power and allow fifteen minutes for instrument to warm up. Test equipment required for adjustment procedures is listed in table 5-1.

5-48. LOW-VOLTAGE POWER SUPPLY ADJUSTMENT. (See figures 5-11 and 8-21.) The +15-volt power supply is the only adjustable low-voltage power supply in the instrument. All other low-voltage power supplies are referenced to the +15-volt supply.

Equipment Required:

Multifunction digital voltmeter
Test leads

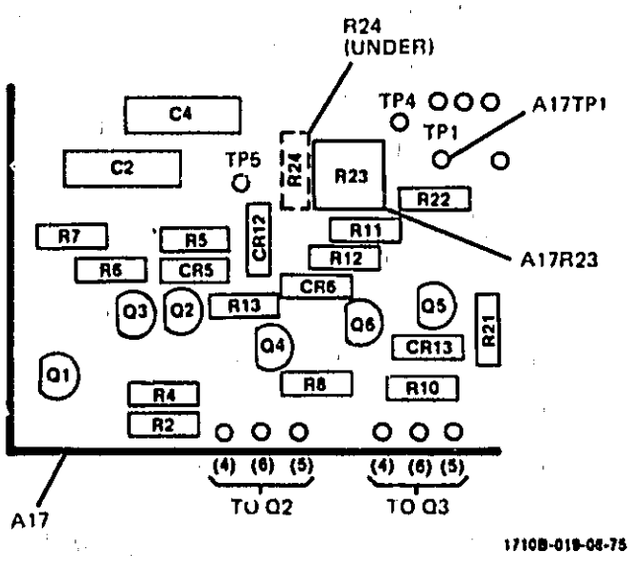


Figure 5-11. Low-voltage Power Supply Adjustment

5-49. Adjust low-voltage power supply as follows:

NOTE

Perform steps a through g only if LVPS Assembly A17 has been replaced. Otherwise adjust LVPS by performing steps f and k through m.

a. Set A17R23, LV ADJ, fully clockwise.

b. Turn off ac input power to Model 1710B.

c. Remove LVPS assembly A17 retaining screws.

d. Raise front of assembly A17 until adjustment A17R24 is accessible.

CAUTION

Be careful not to short A17 assembly to chassis or other assemblies.

e. Turn on ac input power to Model 1710B.

f. Connect multifunction digital-voltmeter (DVM) test lead to test point A17TP1.

g. Adjust A17R24, LV LIMIT, for an indication on DVM of +15.3V.

h. Turn off ac input power to Model 1710B.

i. Remount LVPS assembly A17 with retaining screws removed in step c.

j. Turn on ac input power to Model 1710B.

k. Adjust A17R23 for an indication on DVM of +15V ±50 mV.

l. Check power supply outputs as indicated in table 5-5.

m. Disconnect test equipment.

Table 5-5. Power Supply Outputs

Power Supply Output	Measurement Test Point	Tolerance
+15V	A17TP1	±50 mV
+115V	A17TP5	±2.5V
+53.3V	A17TP4	±0.25V
+5V	A17TP2	±0.6V
+20V	A17TP7	−0.5V, +3.0V
−15V	A17TP3	±.32V
−2950V	A15TP1	<2973V, >2827V

5-50. INTENSITY SET ADJUSTMENT. (See figures 5-12 and 8-19.) The intensity set is adjusted so that the front-panel INTENSITY control will adjust the trace from fully off to maximum brightness for the fastest sweep speeds.

Equipment Required:

Test oscilloscope
10:1 divider probe

5-51. Adjust intensity set as follows:

a. Set front-panel main TIME/DIV control to 5 μs position.

b. Connect test oscilloscope to test point A14TP4 using 10:1 divider probe.

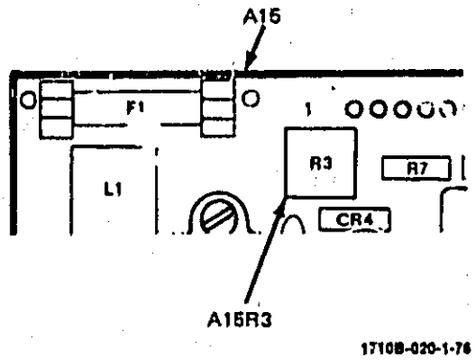


Figure 5-12. Intensity Set Adjustment

c. Connect 10:1 divider probe ground lead to A14TP5.

d. Set front-panel INTENSITY control for a 10V pk-pk gate pulse.

e. Adjust A15R3, INT SET, to just extinguish trace on Model 1710B CRT.

f. Disconnect test equipment.

g. Set Model 1710B front-panel controls to initial settings.

5-52. GATE-RESPONSE, AMPLITUDE, and AUTO-FOCUS ADJUSTMENTS. (See figure 5-13.) The gate amplifier is adjusted for optimum rise time, overshoot, and correct amplitude. The auto-focus circuit is adjusted for optimum focus at all intensity levels.

Equipment Required:

Test oscilloscope
10:1 divider probe

5-53. Adjust gate response, amplitude, and auto-focus as follows:

a. Set Model 1710B front-panel controls as follows:

POSITION (channel A) ... fully clockwise
TIME/DIV (main) ..... .5 μSEC
INTENSITY ..... fully clockwise

b. Connect test oscilloscope to test point A14TP4 using 10:1 divider probe.

c. Connect 10:1 divider probe ground lead to test point A14TP5.

d. Set intensity limit adjust A14R15 fully counterclockwise.

e. Set gate adjust, A14R10, for gate amplitude of +70 volts.

f. Expand sweep time of test oscilloscope to observe leading edge and overshoot of gate pulse.

g. Alternately turn gate-response adjustments A14C7 and A14C8 for fastest rise time and flattest pulse top (A14C7 adjusts fast corner).

h. Set Auto Focus Adj A14R20 fully ccw.

i. Set controls as follows:

TIME/DIV (main) 10μSEC
TIME/DIV (delayed) ..... 10 nSEC
HORIZ DISPLAY ..... DLY'D
INTENSITY ..... maximum
POSITION (channel A) .... trace centered

j. Observe center screen trace width while at optimum focus. Trace width should be 1 mm. If not, adjust Gate Adj A14R10 slightly to make width 1 mm.

k. Set INTENSITY to 10 o'clock position.

l. Set HORIZ DISPLAY to MAIN.

m. Adjust Auto Focus A14R20 for best focus.

n. Set HORIZ DISPLAY to DLY'D.

o. Set INTENSITY to maximum.

p. Refocus, using front panel FOCUS, if necessary.

q. Set INTENSITY to 10 o'clock position.

r. Set HORIZ DISPLAY to MAIN.

s. Readjust Auto Focus A14R20 if necessary for best focus.

t. Set Model 1710B front-panel controls to initial settings except as follows:

POSITION (channel A) ... fully clockwise
TIME/DIV (main) ..... 10 mSEC
INTENSITY ..... fully clockwise

u. Set test oscilloscope TIME/DIV control to 20 mSEC/div.

v. Use test oscilloscope (connected to test point A14TP4 through 10:1 divider probe) to observe waveform as shown in figure 5-14. If necessary, readjust intensity limit A14R15 to make pulse 30V to 50V as shown.

w. Disconnect test equipment.

x. Set Model 1710B front-panel controls to initial settings.

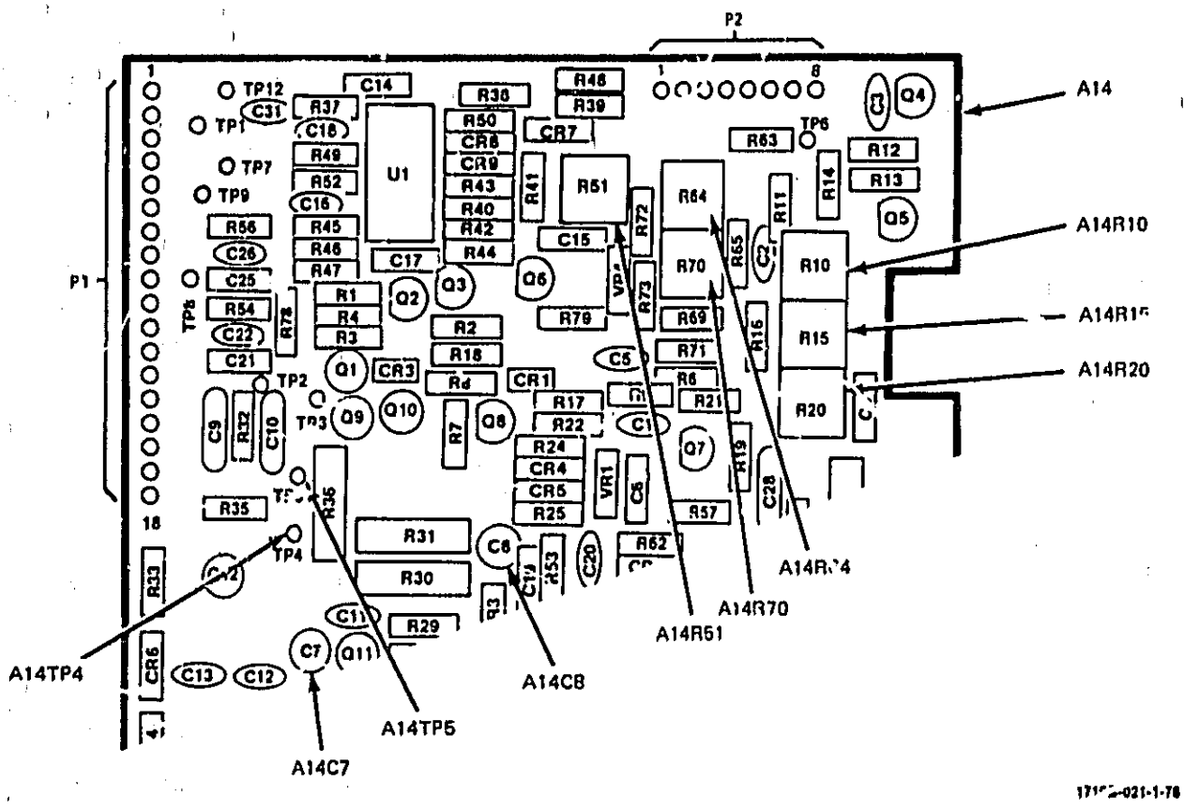


Figure 5-13. Gate Assembly Adjustments

5-54. TRACE ALIGN. (See schematic 18.) The rear-panel TRACE ALIGN control is adjusted to align the horizontal trace parallel to the horizontal-graticule lines.

Equipment Required: None.

5-55. Adjust trace align as follows:

a. Adjust front-panel INTENSITY and FOCUS controls to obtain sharp trace on CRT.

b. Adjust rear-panel TRACE ALIGN control A14R67 so that horizontal trace exactly parallels center horizontal-graticule line.

5-56. ORTHOGONALITY AND PATTERN ADJUSTMENTS. (See schematic 18 and figure 5-13.) The orthognal adjustment aligns the vertical trace with the vertical axis. The pattern adjustment minimizes pincushioning and barreling (trace bow).

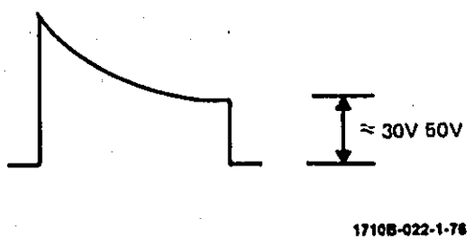


Figure 5-14. Intensity Limit Adjustment

Equipment Required:
Test oscillator
44-in. BNC cable

5-57. Adjust orthogonality and pattern as follows:

a. Connect test oscillator to channel A INPUT connector.

b. Set test oscillator controls for 1 kHz, greater than 6-division output display signal.

c. Set front-panel INT TRIG control for B trigger.

d. Set front-panel HORIZ DISPLAY control for X-Y mode of display.

e. Align vertical trace with center vertical-graticule line using front-panel horizontal POSITION control.

f. Adjust orthogonal control A14R70 so that vertical trace exactly parallels center vertical-graticule line.

g. Set front-panel HORIZ DISPLAY control for MAIN mode of display.

h. Set front-panel INT TRIG control for A trigger.

i. Set test oscillator controls for 500 kHz, 6-division output display signal.

j. Adjust rear-panel PATT control A14R76 to obtain best raster display (minimum pincushioning or barreling at top, Bottom, and both sides of display).

k. Disconnect test equipment.

l. Set Model 1710B front-panel controls to initial settings.

5-58. FLOODGUN PATTERN AND INTENSITY RATIO ADJUSTMENTS. (See schematics 17 and 18; figure 5-13.) The floodgun pattern control is adjusted for the most uniform CRT illumination. The intensity ratio between the normal portion and intensified portion of the sweep is set to the desired contrast.

Equipment Required: None.

5-59. Adjust floodgun pattern and intensity ratio as follows:

a. Set front-panel AUTO/NORM pushbutton switch to NORM.

b. Set front-panel SCALE ILLUM control fully clockwise.

c. Set floodgun pattern control, A14R64, fully counterclockwise.

d. Slowly turn floodgun pattern control A14R64 clockwise until an even intensity pattern is noted.

e. Set Model 1710B front-panel controls as follows:

AUTO/NORM ..... AUTO
HORIZ DISPLAY ..... MAIN INTEN
TIME/DIV (delayed) ..... 20 μSEC

f. Turn rear-panel INTEN RATIO control A14R23 fully clockwise.

g. Turn rear-panel INTEN RATIO control A14R23 counterclockwise until desired contrast between normal and intensified portion of trace is obtained.

h. Return Model 1710B front-panel controls to initial settings.

5-60. ATTENUATOR-BALANCE ADJUSTMENTS. (See schematics 3 and 4; figure 5-15.) The attenuators are balanced, so that the trace does not shift when the attenuators are changed from range to range.

Equipment Required: None.

5-61. Adjust attenuator balance as follows:

a. Set front-panel channel A VOLTS/DIV switch to .05 position.

b. Center trace using front-panel channel POSITION control.

c. Set front-panel channel A VOLTS/DIV switch to .1 position.

d. Center trace by adjusting channel A attenuator-balance control A3R71.

e. Set VERT DISPLAY to B.

f. Repeat steps a through d for channel B using channel B attenuator-balance adjustment A3R85.

g. Set Model 1710B front-panel controls to initial settings.

5-62. VERTICAL-PREAMPLIFIER BALANCE ADJUSTMENTS. (See schematic 5 and figure 5-15.) The main-balance adjustments are set to balance the vertical preamplifier with POSITION control set to midrange.

Equipment Required: None.

5-63. Adjust vertical-preamplifier balance as follows:

a. Set front-panel channel A vertical POSITION control to 12 o'clock position.

b. Center trace by turning channel A main-balance adjustment, A3R12.

c. Turn front-panel channel A VOLTS/DIV vernier fully counterclockwise.

d. Center trace using channel A POSITION control.

e. Turn front-panel channel A VOLTS/DIV vernier fully clockwise to detent position.

f. If necessary, turn main-balance adjustment A3R12 to recenter trace.

g. Repeat steps a through f until trace shift is minimized.

h. Set front-panel VERT DISPLAY control to channel B.

i. Repeat steps a through g for channel B using channel B main-balance adjustment A3R23.

j. Set Model 1710B front-panel controls to initial settings.

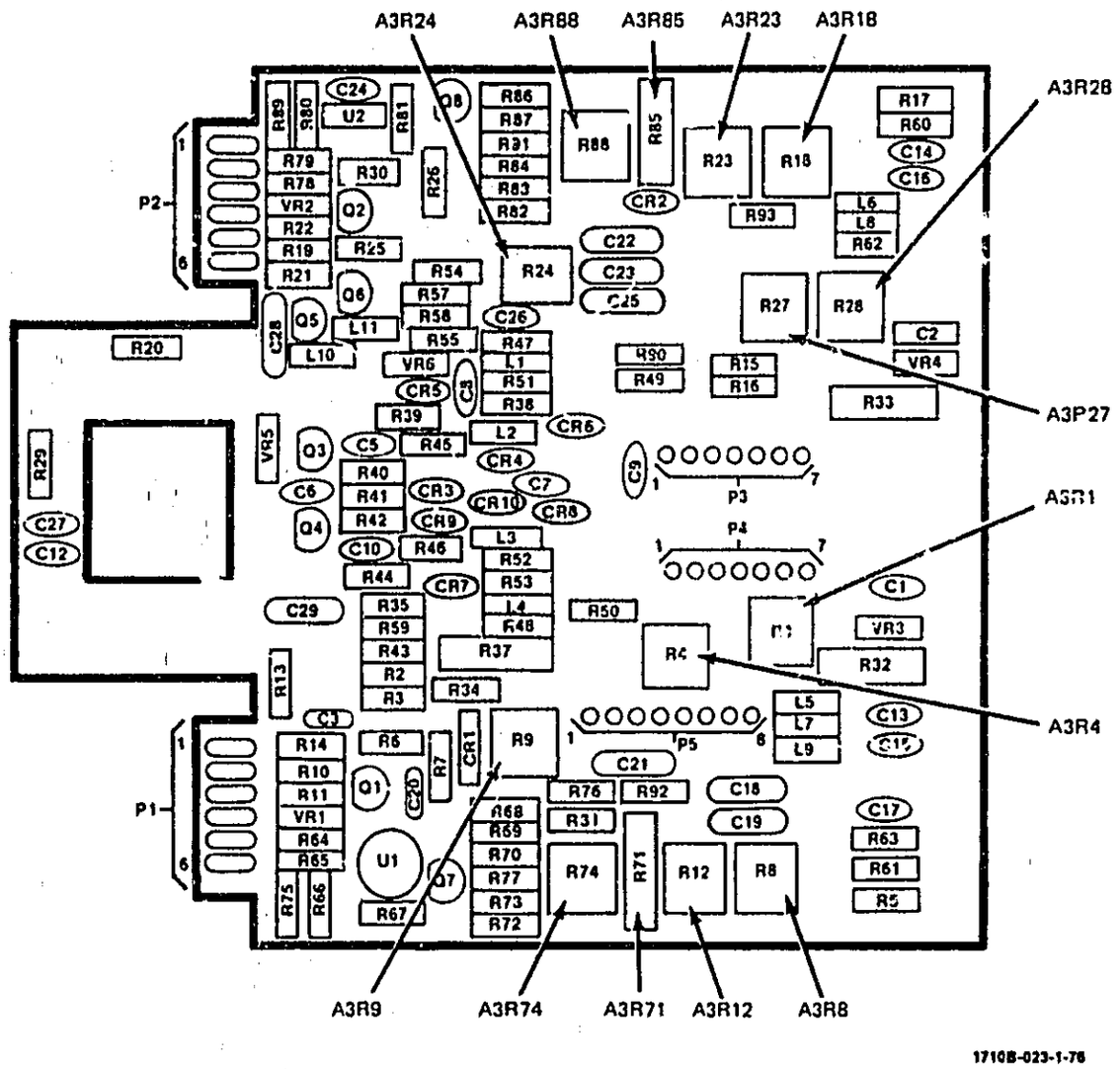


Figure 5-15. Vertical-preamplifier Adjustments

5-64. 5-mV BALANCE ADJUSTMENTS. (See schematic 5 and figure 5-15.) The 5-mV balance adjustments are made to center the trace on the .005 VOLTS/DIV range with the POSITION controls centered.

Equipment Required: None.

5-65. Adjust 5-mV balance as follows:

a. Set Model 1710B controls as follows:

Coupling (both)	GND
VOLTS/DIV (both)	.005
Vertical POSITION (both)	trace centered

b. Adjust channel A 5-mV balance A3R9 for less than 2 mm of vertical shift in base line while switching channel A VOLTS/DIV between .005 and .01.

c. Set VERT DISPLAY to B.

d. Adjust channel B 5-mV balance, A3R24, for less than 2 mm of vertical shift of base line while switching channel B VOLTS/DIV between .005 and .01.

e. Return Model 1710B controls to initial settings.

5-66. SYNC AMPLIFIER BALANCE ADJUSTMENTS. (See schematics 5 and 8; figures 5-15 and 5-16.) With no input, the sync-amplifier circuit is balanced for a 0-volt output.

Equipment Required:

Multifunction digital voltmeter
Test leads

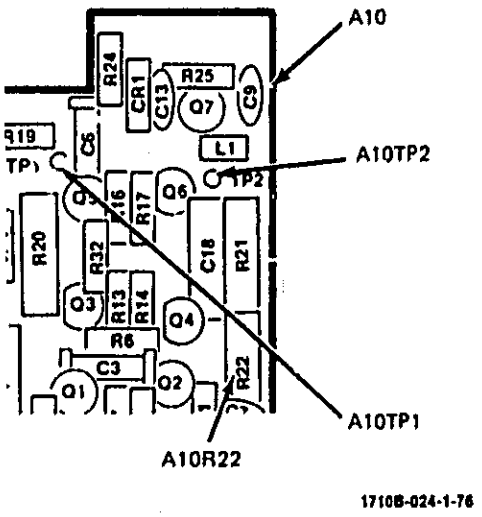


Figure 5-16. Sync Balance Adjustment

5-67. Adjust sync-amplifier balance as follows:

a. Connect multifunction digital voltmeter (DVM) across test points A10TP1 and A10TP2 (DVM ground lead connected to A10TP2).

b. Set channel A sync-balance adjustment, A3R8, for indication of 0 volt ±10 mV.

c. Set front panel INT TRIG control to B trigger.

d. Set channel B sync-balance adjustment, A3R18 for indication of 0 volt ±10 mV.

e. Disconnect DVM ground lead from test point A10TP2.

f. Connect DVM ground lead to chassis ground.

g. Set sync zero adjustment, A10R22, for DVM indication of 0 volt ±20 mV.

h. Disconnect test equipment.

i. Set Model 1710B front-panel controls to initial settings.

5-68. OUTPUT-AMPLIFIER BALANCE ADJUSTMENTS. (See schematic 6 and figure 5-17.) The vertical output amplifier is balanced to center the vertical portion of the display.

Equipment Required: None.

5-69. Perform output-amplifier balance adjustments as follows:

a. Press front-panel BEAM FIND pushbutton switch.

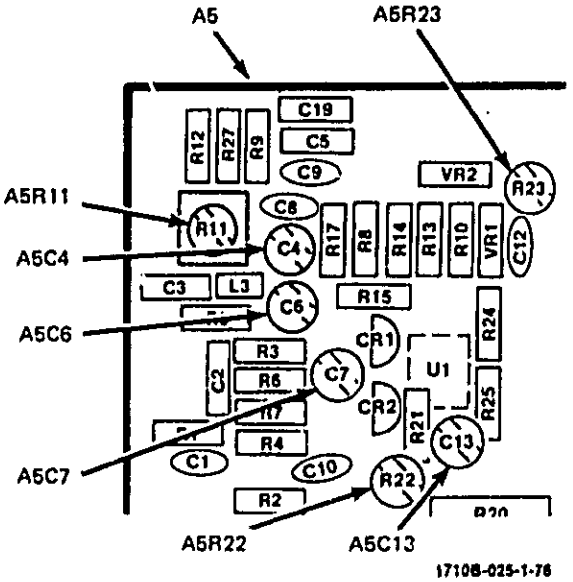


Figure 5-17. Vertical Output Amplifier Adjustments

b. Center trace by adjusting balance control A5R23.

c. Release BEAM FIND switch.

5-70. LOW-FREQUENCY RESPONSE ADJUSTMENTS. (See schematics 3 and 4; figure 5-15.) Using a 100-Hz square-wave input, the low-frequency circuit is adjusted for optimum pulse response.

Equipment Required:

Pulse generator
44-in. BNC cable

5-71. Adjust low-frequency response as follows:

a. Connect output of pulse generator to channel A INPUT connector.

b. Set Model 1710B front-panel controls as follows:

Coupling (both channels)..... 50Ω
TIME/DIV (main) ..... 1 mSEC

c. Set pulse generator controls for ≈100-Hz 6-division output display signal.

d. Adjust front-panel main TRIGGER LEVEL control for stable display.

e. Set channel A low-frequency adjustment A3R74 for best signal response.

f. Connect output from pulse generator to channel B INPUT connector.

g. Set front-panel VERT DISPLAY control to channel B.

h. Set front-panel INT TRIG control to B trigger.

i. Set channel B low-frequency adjustment A3R88 for best signal response.

j. Disconnect test equipment.

k. Set Model 1710B front-panel controls to initial settings.

5-72. ATTENUATOR COMPENSATION ADJUSTMENTS. (See schematics 3 and 4; figure 5-18.) The attenuators are adjusted for optimum signal response using a 10-kHz square-wave input signal.

Equipment Required:

Pulse generator
44-in. BNC cable

5-73. Adjust attenuator-compensation as follows:

a. Connect pulse generator 50-ohm output to channel A INPUT connector.

b. Set Model 1710B front-panel controls as follows:

VOLTS/DIV (channel A) 1
Coupling (both) 50Ω
TIME/DIV (main) ..... 10 μSEC

c. Set pulse generator for 10-kHz ≈0.5V output-display signal.

d. Set channel A .1V attenuator-compensation adjustment A1A1C3 for optimum square-wave response.

e. Set channel A VOLTS/DIV switch to 1 VOLTS/DIV position.

f. Increase pulse generator output to ≈5 volts.

g. Set channel A 1V attenuator compensation-adjustment A1A1C4 for optimum square-wave response.

h. Disconnect pulse generator from channel A INPUT connector.

i. Connect pulse generator 50-ohm output to channel B INPUT connector.

j. Set front-panel VERT DISPLAY control to channel B display.

k. Set front-panel INT TRIG control to B trigger.

l. Repeat steps b through g for channel B attenuator using adjustments A2A1C3 for .1V compensation and A2A1C4 for 1V compensation.

m. Disconnect test equipment.

n. Set Model 1710B front-panel controls to initial settings.

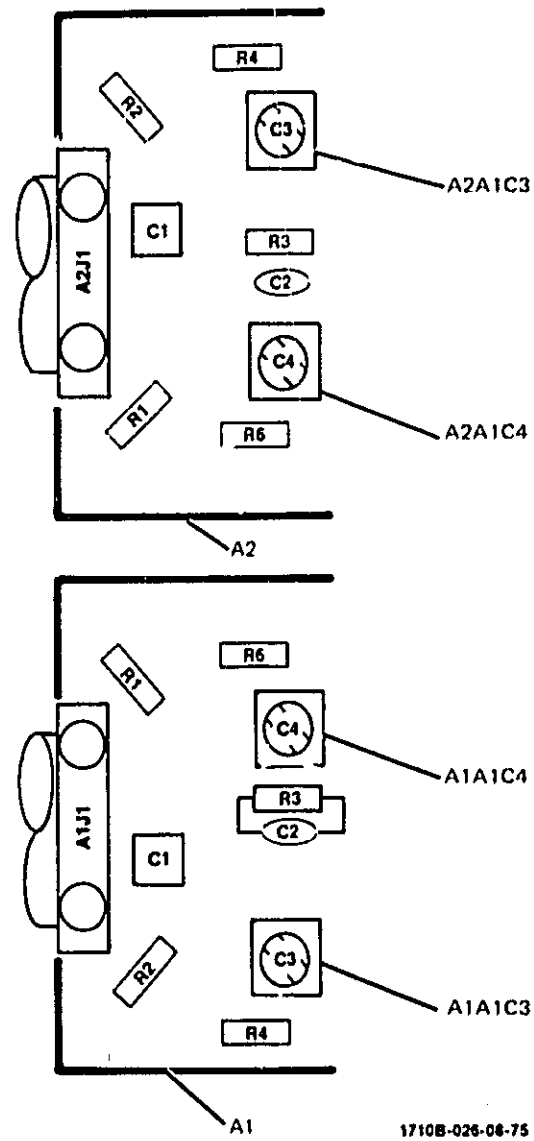


Figure 5-18. Attenuator Adjustments

5-74. CALIBRATOR-AMPLITUDE ADJUSTMENT. (See schematic 17 and figure 5-13.) The calibrator output is compared visually to a known standard and adjusted for exactly —3 volts.

Equipment Required:

DC Standard voltmeter
44-in. BNC cable
Adapter (HP Part No. 1251-2277)

5-75. Adjust calibrator amplitude as follows:

a. Set channel A VOLTS/DIV switch to 0.2V position.

b. Set channel A coupling to DC position.

c. Connect dc standard to channel A INPUT connector.

d. Set dc standard to 3V p-p output.

e. Adjust channel A vernier for display of six divisions.

f. Disconnect dc standard from Model 1710B.

g. Connect CAL 3V output to channel A INPUT connector.

h. Adjust cal ampl adj A14R51 for 6-division display.

i. Disconnect CAL 3V output from channel A INPUT connector.

j. Set Model 1710B front-panel controls to initial settings.

5-76. VERTICAL-GAIN ADJUSTMENTS. (See schematic 5 and figure 5-15.) The gain of the vertical preamplifier is calibrated using the CAL 3V output.

Equipment Required:

Test leads
Adapter (HP Model 10110A)

5-77. Adjust vertical-gain as follows:

a. Using test lead and adapter, connect CAL 3V output to channel A INPUT connector.

b. Set channels A and B VOLTS/DIV switches to .5 position.

c. Set channel A gain adjustment A3R1 for exactly six divisions of vertical deflection.

d. Using test lead and adapter, connect CAL 3V output to channel B INPUT connector.

e. Set front-panel VERT DISPLAY control for channel B display.

f. Set front-panel INT TRIG control for B trigger.

g. Set channel B gain adjustment A3R28 for exactly six divisions of vertical deflection.

h. Disconnect test lead.

i. Set Model 1710B front-panel controls to initial settings.

5-78. 5-mV GAIN ADJUSTMENTS.(See schematic 5 and figure 5-15.) Vertical-amplifier gain is calibrated on the 5-mV range.

Equipment Required:

DC Standard voltmeter
44-in. BNC cable
Adapter (HP Part No. 1251-2277)

5-79. Adjust 5-mV gain as follows:

a. Using adapter and BNC cable, connect the dc standard output to the channel A INPUT.

b. Set dc standard controls for a 30-mV dc signal.

c. Set Model 1710B controls as follows:

VOLTS/DIV (both)	.005
TIME/DIV (main)	1 mSEC
HF REJ (main)	engaged

d. Adjust channel A 5 mV gain A3R4 for exactly six divisions of vertical deflection.

e. Set VERT DISPLAY to B.

f. Set INT TRIG to B.

g. Connect dc standard output to channel B.

h. Adjust channel B 5-mV gain A3R27 for exactly six divisions of vertical deflection.

i. Disconnect test equipment.

j. Set Model 1710B front-panel controls to initial settings.

5-80. TRIGGER-RECOGNITION THRESHOLD ADJUSTMENTS. (See schematics 9 and 11; figure 5-19.) The main- and delayed-trigger recognition circuitry are adjusted for optimum triggering over the triggering spectrum.

Equipment Required:

Test Oscillator
44-in. BNC cable

5-81. Adjust trigger-recognition threshold as follows:

a. Set Model 1710B front-panel controls as follows:

Coupling (channel A)	GND
AUTO/NORM	NORM
TIME/DIV (main)	1 mSEC
INT/EXT (main)	EXT

b. Set main trigger sensitivity adjustment A8R47 fully clockwise.

c. Set test oscillator controls for 30 mV pk-pk, 10 MHz sine wave output.

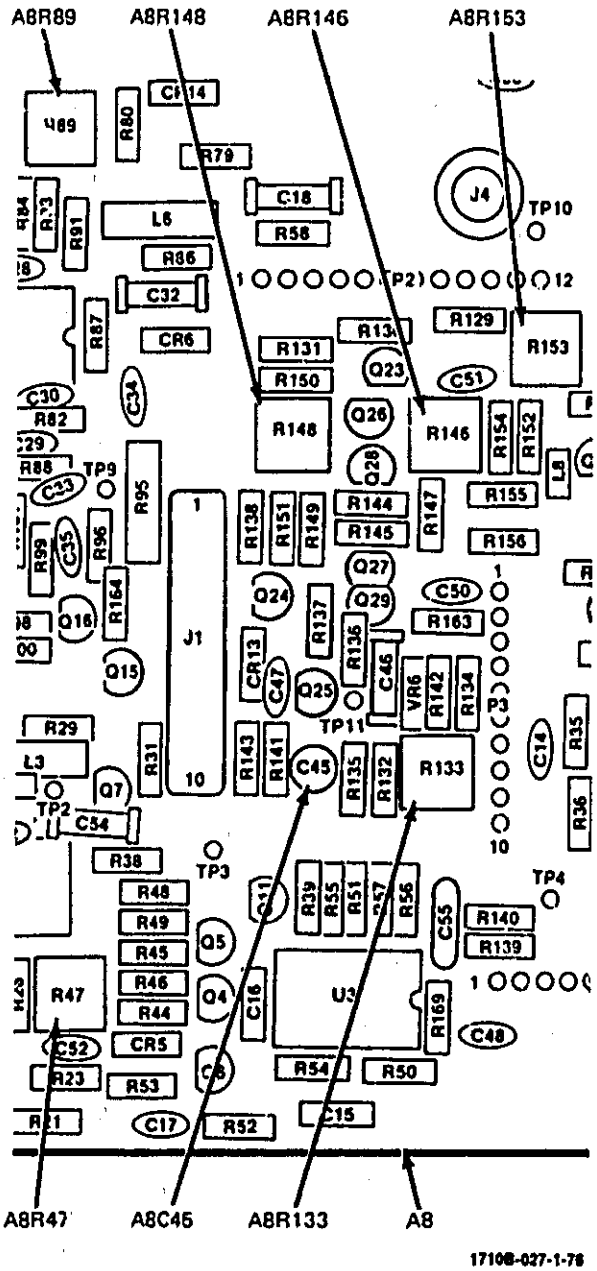


Figure 5-19. Horizontal Sweep Assembly Adjustments

d. Connect test oscillator to main EXT TRIG input connector.

e. Slowly turn main TRIGGER LEVEL control from one extreme to other. Note that one sweep occurs for each direction of rotation.

f. While turning main TRIGGER LEVEL control, slowly adjust A8R47 counterclockwise until sweep occurs for only one direction of rotation of main TRIGGER LEVEL control.

g. Set Model 1710B front-panel controls as follows:

AUTO/NORM	AUTO
HORIZ DISPLAY	DLY'D
INT/EXT (delayed)	EXT
TIME/DIV (delayed)	.5 mSEC
TRIGGER LEVEL (main)	fully cw
TRIGGER LEVEL (delayed)	midrange

h. Set test oscillator controls for 30 mV pk-pk, 10 MHz sine wave output.

i. Connect test oscillator to delayed EXT TRIG input connector.

j. Set delayed trigger sensitivity adjustment A8R89 fully clockwise.

k. While turning delayed TRIGGER LEVEL control from one extreme to other, adjust A8R89 counterclockwise until sweep occurs for only one direction of rotation.

l. Disconnect test equipment.

m. Set Model 1710B front-panel controls to initial settings.

5-82. HORIZONTAL-AMPLIFIER GAIN ADJUSTMENTS. (See schematics 10 and 15; figures 5-19 and 5-20.) The horizontal-amplifier gain in both X1 and X10 is adjusted to a known reference standard.

Equipment Required:

Time-mark generator
44-in. BNC cable

5-83. Adjust horizontal-amplifier gain as follows:

a. Set Model 1710B front-panel controls as follows:

Coupling (channel A)	50Ω
VOLTS/DIV (channel A)	.5
HORIZ DISPLAY	MAIN INTEN
TIME/DIV (main)	5 uSEC
TIME/DIV (delayed)	10 nSEC
DELAY	1.00

b. Using horizontal POSITION control, position intensified dot exactly on second vertical-graticule line.

NOTE

A slight reduction in intensity may be helpful.

c. Set DELAY control to 9.00 position.

d. Using X1 adjustment A8R148 position intensified dot on 10th vertical-graticule line from left.

e. Set DELAY control to 1.00 position.

f. Repeat steps b through e until intensified dot is on second vertical-graticule line when DELAY control is at 1.00 position and is on 10th vertical-graticule line from left when DELAY control is at 9.00 position.

g. Connect time-mark generator to channel A INPUT connector.

h. Set time-mark generator for 5-μs time markers.

i. Using horizontal POSITION control, align time markers with vertical-graticule lines.

j. On main-sweep integrator assembly A11, adjust 200-5 μs adjustment, A11R33, for exactly one time marker per division.

k. Set HORIZ DISPLAY control to MAG X10.

l. Using horizontal POSITION control, align one time marker with first left vertical-graticule line.

m. On main sweep assembly A8, adjust X10 adjustment, A8R146, until one time marker coincides with first left vertical-graticule line and one time marker coincides with last right vertical-graticule line.

n. Disconnect test equipment.

o. Set Model 1710B front-panel controls to initial settings.

5-84. X10 AMPLIFIER BALANCE ADJUSTMENT. (See schematic 15 and figure 5-19.) The horizontal amplifier is balanced so that the display is expanded about center screen when magnifier is engaged.

Equipment Required:

Time mark generator
44-in. BNC cable

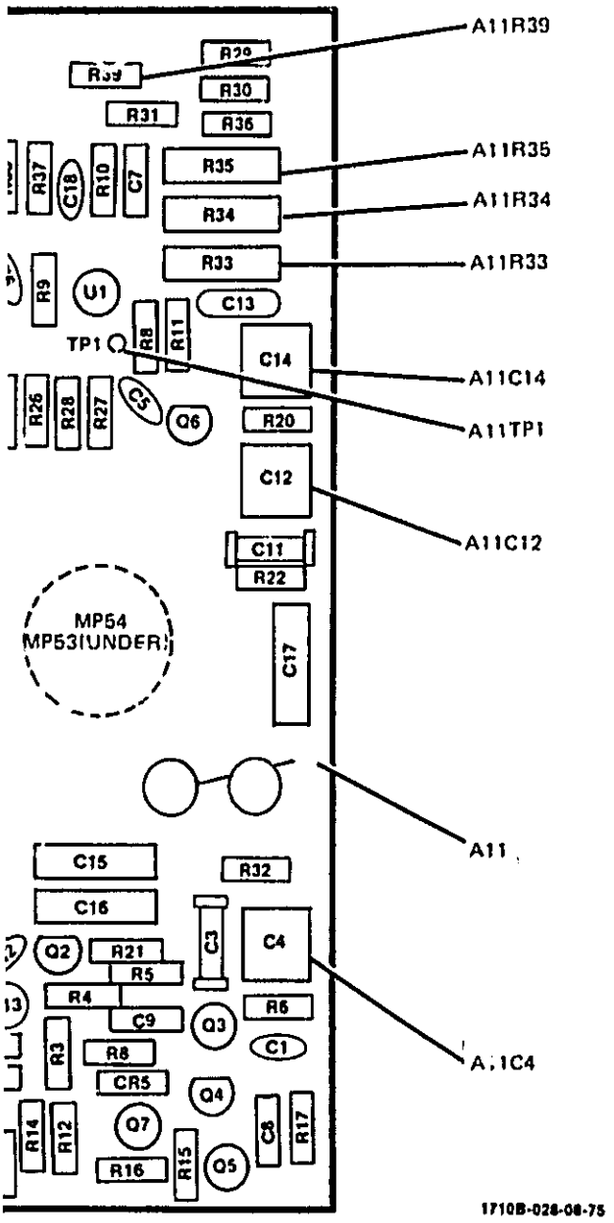


Figure 5-20. Main Sweep Adjustments

5-85. Perform X10 amplifier balance adjustments as follows:

a. Set Model 1710B front-panel controls as follows:

Coupling (channel A) 50Ω
VOLTS/DIV (channel A) 5
TIME/DIV (main) ..... .2 μSEC

b. Connect time-mark generator to channel A INPUT connector.

c. Set time-mark generator for 1-μs time markers.

d. Set HORIZ DISPLAY control to MAG X10.

e. Using horizontal POSITION control, center middle time marker on CRT screen.

f. Set HORIZ DISPLAY control to MAG X1.

g. Using dc balance adjustment, A8R153, position center time marker to center of CRT screen.

h. Repeat steps e through g switching between X1 and X10 displays until middle time marker remains at center of CRT screen when magnified.

i. Disconnect test equipment.

j. Set Model 1710B front-panel controls to initial settings.

5-86. 1, 10, AND 20 NS SWEEP TIME AND LINEARITY ADJUSTMENTS. (See schematic 10; figures 5-20 and 5-21.) The main time base is calibrated to a known time standard and the horizontal amplifier is adjusted for linearity.

Equipment Required:

Time-mark generator
Two 44-in. BNC cables

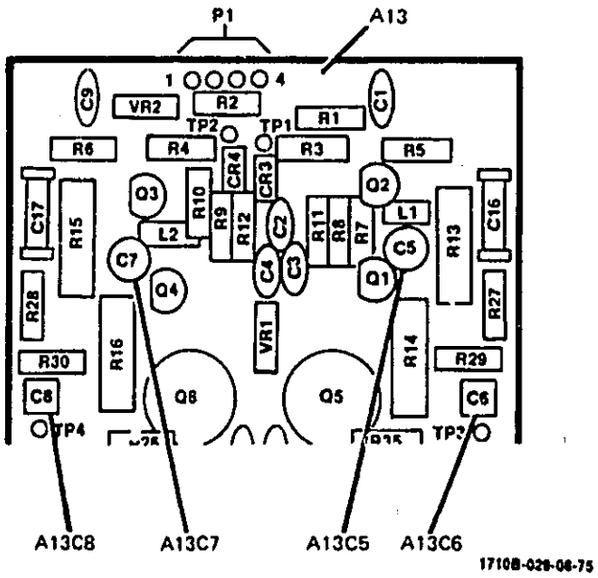


Figure 5-21. Horizontal-linearity Adjustments

5-87. Perform sweep time adjustments as follows:

a. Set Model 1710B front-panel controls as follows:

Coupling (channel A)	50Ω
VOLTS/DIV (channel A)	0.5
INT/EXT (main)	EXT
TIME/DIV (main)	10 nSEC

b. Connect time-mark generator to channel A INPUT connector. Externally trigger main sweep.

c. Set time-mark generator for 10-ns time markers.

d. Turn 10-ns adjustment A11C4 until one marker is on each graticule. (Neglect 1st two major division of sweep.)

e. Set main TIME/DIV control to 20-ns position.

f. Set time-mark generator for 20-ns time markers.

g. Turn 20-ns adjustment A11C12 until one marker is on each graticule. (Neglect 1st major division of sweep.)

h. Set time-mark generator for 2-ns time markers.

i. Center display on CRT using horizontal POSITION control.

j. Engage MAG X10 switch.

k. Note whether 2-ns sweep is slow across right half of CRT (more than two complete cycles for every two major division) or whether sweep is fast (less than two complete cycles for every two major divisions).

l. If sweep is slow, slowly adjust A13C6 and A13C8 clockwise in 180° increments until linearity is within ±0.5 minor division.

m. Repeat steps k and l, as necessary.

n. Observe sweep across left half of CRT. If sweep is slow, adjust A13C5 and A13C7 counterclockwise in 180° increments for best linearity. If sweep is fast, adjust A13C5 and A13C7 clockwise in 180° increments for best linearity.

NOTE

Disregard first 15 ns of sweep.

o. Repeat steps k through n to compensate for interaction.

p. Set Model 1710B front-panel controls as follows:

TIME/DIV (main)	10 nSEC
MAG X10	X1

q. Center display.

r. Engage MAG X10 switch.

s. Adjust A11R39 until one cycle is displayed every two divisions over inside eight divisions (±2 minor divisions).

t. Disconnect test equipment.

u. Set Model 1710B front-panel controls to initial settings.

5-88. COARSE MAIN SWEEP ADJUSTMENTS. (See schematic 10 and figure 5-20.) The main time base is adjusted to a known standard.

Equipment Required:

Time-mark generator
44-in. BNC cable

5-89. Perform preliminary sweep-time adjustments as follows:

a. Connect time-mark generator to channel A INPUT connector.

b. Set Model 1710B front-panel controls as follows:

Coupling (channel A) 50Ω
VOLTS/DIV (channel A) 5
TIME/DIV (main) ..... 10 nSEC

c. Beginning with step 1 in table 5-6, use horizontal POSITION control to set first marker to left edge of graticule.

d. Adjust A11C4 to place 11th time marker on right edge of graticule.

NOTE

A11C4 affects other adjustments and must be adjusted first. Do not readjust separately.

e. Repeat steps c and d for remainder of table 5-6.

NOTE

Omit first 20 nanoseconds of two fastest sweep speeds.

Table 5-6. Preliminary Sweep-time Adjustments

Step	Main Time/DIV and Time-mark Generator Settings	Adjust
1	10 nSEC	A11C4
2	20 nSEC	A11C12
3	.5 μSEC	A11C14
4	5 μSEC	A11R33
5	.5 mSEC	A11R34
5	50 mSEC	A11R35

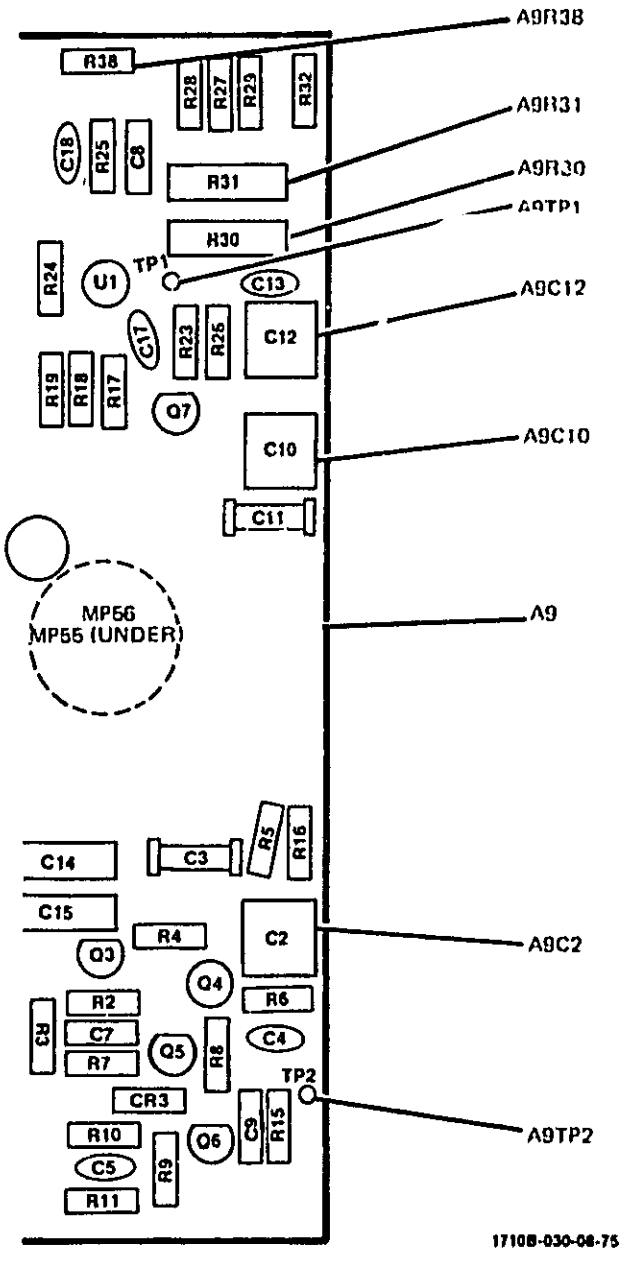


Figure 5-22. Delayed-sweep Adjustments

5-90. DELAYED-SWEEP TIME ADJUSTMENT. (See schematic 12 and figure 5-22.) The delayed time base is calibrated to a known standard.

Equipment Required:

Time-mark generator
44-in. BNC cable

5-91. Adjust delayed sweep time as follows:

a. Connect time-mark generator to channel A INPUT connector.

Table 5-7. Delayed-sweep Calibration Adjustments

Step	Main TIME/DIV	Delayed TIME/DIV	Time-mark Generator	Adjust
1	20 nSEC	10 nSEC	10 nSEC	A9C2
2	50 nSEC	20 nSEC	20 nSEC	A9C10
3	1 μSEC	.5 μSEC	.5 μSEC	A9C12
4	.1 mSEC	50 μSEC	50 μSEC	A9R30
5	10 mSEC	5 mSEC	5 mSEC	A9R31

b. Set Model 1710B front-panel controls as follows:

Coupling (channel A) 50Ω
VOLTS/DIV (channel A) 5
TIME/DIV (main) ..... 20 nSEC
TIME/DIV (delayed) ..... 10 nSEC
HORIZ DISPLAY ..... DLY'D

c. Beginning with step 1 in table 5-7, use horizontal POSITION control to set first marker to left edge of graticule.

d. Adjust A9C2 to place 11th time marker on right edge of graticule.

NOTE

A9C2 affects other adjustments and must be accomplished first. Do not readjust separately.

e. Repeat steps c and d for remainder of table 5-7.

NOTE

Omit first 20 nanoseconds of two fastest sweep speeds.

5-92. FINE MAIN SWEEP ADJUSTMENTS. (See schematic 10 and figure 5-20.) The main time base is calibrated to a chosen tolerance using the delay time dial.

NOTE

These adjustments utilize the accuracy of the DELAY dial to calibrate the main sweep more accurately than is possible using the visual method. These adjustments must be performed if the differential time accuracy specification is to be met.

Equipment Required:

Time-mark generator
44-in. BNC cable

5-93. Adjust main-sweep as follows:

a. Connect time-mark generator to channel A INPUT connector.

b. Set Model 1710B front-panel controls as follows:

Coupling (channel A) 50Ω
VOLTS/DIV (channel A) 5
TIME/DIV (main) ..... 20 nSEC
TIME/DIV (delayed) ..... 10 nSEC
MAG X10 ..... X10
HORIZ DISPLAY ..... DLY'D
AUTO/NORM ..... NORM

c. Set time-mark generator for 20-ns time markers.

d. Set Model 1710B DELAY potentiometer to 1.00 position.

e. Using channel A POSITION control, center vertically time-mark display on CRT.

f. Using horizontal POSITION control, set leading edge of time mark to center CRT graticule line.

g. Set Model 1710B DELAY potentiometer to 9.00 position.

h. Adjusting A11C12, set leading edge of time marker to center CRT graticule line.

i. Repeat steps d through h until leading edge of time marker can be set to center CRT graticule line with DELAY dial set between 8.96 and 9.04.

j. This completes step 1 in table 5-8. Complete remaining steps in table by repeating above procedure for each step.

5-94. VERTICAL PULSE RESPONSE ADJUSTMENTS. (See schematic 15 and figure 5-17.) A pulse of known characteristics (rise time, overshoot, etc.) is applied and the vertical amplifier is adjusted so that the display will resemble the known characteristics.

Equipment Required:

Fast-rise pulse generator.
44-in. BNC cable.

Table 5-8. Main-sweep Calibration Adjustments

Step	Time-mark Generator	Main TIME/DIV	Delayed TIME/DIV	ADJUST	Test Limits Major Div
1	20 nSEC	20 nSEC	10 nSEC	A11C12	±2.0
2	.5 µSEC	.5 µSEC	50 nSEC	A11C14	±5.0
3	50 µSEC	50 µSEC	5 µSEC	A11R33	±5.0
4	5 mSEC	5 mSEC	.5 mSEC	A11R34	±5.0
6	50 mSEC	50 mSEC	5 mSEC	A11R35	±5.0

5-95. Adjust vertical pulse response as follows:

a. Connect pulse generator to channel A INPUT connector.

b. Set Model 1710B front-panel controls as follows:

Coupling (both channels)..... 50Ω
TIME/DIV (main) ..... 10 µSEC

c. Adjust pulse generator output and channel A VOLTS/DIV control to obtain exactly 6 divisions of vertical deflection.

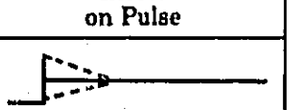
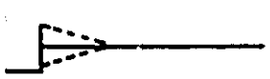
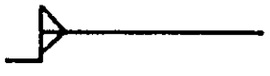
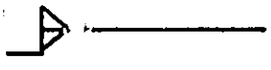
NOTE
Ensure that channel A VOLTS/DIV vernier is in CAL detent position.

d. Make adjustments shown in table 5-9 for A5.

NOTE
If pulse generator being used is specified for 3% overshoot, do not set adjustments for less than 3% since this is effectively detuning the vertical amplifier bandwidth.

e. Disconnect test equipment.

Table 5-9. Vertical Adjustments

Adjustment	Ref Designation	Effect on Pulse
HF1 HF 2	A5R11 A5C6	
HF 3	A5C4	
HF 4 HF 5	A5R22 A5C13	
HF 6	A5C7	
HF Comp	A3C6	

f. Set Model 1710B front-panel controls to initial settings.

5-96. X-Y GAIN ADJUSTMENT. (See schematic 15 and figure 5-19.) A low-frequency signal is applied to channel A and then to channel B. While in the X-Y mode of operation, channel B is adjusted to equal the gain of channel A.

Equipment Required:

Test oscillator
44-in. BNC cable

5-97. Adjust X-Y gain as follows:

a. Connect test oscillator to Model 1710B channel A INPUT connector.

b. Set Model 1710B front-panel controls as follows:

VOLTS/DIV (channels A and B)..... .1
VERT DISPLAY and
INT TRIG ..... X-Y operation
Coupling (channels A and B)..... 50Ω
HORIZ DISPLAY..... X-Y

c. Set oscillator output for approximately 100 kHz.

d. Adjust oscillator output for exactly 6 divisions of Y-axis deflection.

e. Disconnect oscillator from Model 1710B channel A INPUT connector.

f. Connect oscillator to Model 1710B channel B INPUT connector.

g. Set X-Y gain adjustment A8R135 for exactly 6 divisions of Y axis deflection.

h. Disconnect test equipment.

i. Set Model 1710B front-panel controls to initial settings.

5-98. X-Y PHASE ADJUSTMENT. (See schematic 15 and figure 5-19.) A 1-MHz signal is applied and the amplifiers are matched for less than 3° of phase shift.

Equipment Required:
- Test oscillator
- 44-in. BNC cable
- Two 9-in. BNC cable
- 50-ohm power divider

5-99. Adjust X-Y phase as follows:

a. Connect oscillator to both channel A and channel B INPUT connectors using 50-ohm power divider.

NOTE

Cable lengths from TEE connections to channel INPUT connections should be as short as possible and of the same electrical length.

b. Set Model 1710B front-panel controls as follows:

Coupling (both channels)	50Ω
VERT DISPLAY and INT TRIG	X-Y operation
VOLTS/DIV (both channels)	.05
HORIZ DISPLAY	X-Y

c. Adjust oscillator output for 1-MHz, 500-mV p-p.

d. Turn X-Y phase adjustment A8C45 until ellipse most resembles straight diagonal line.

e. Disconnect test equipment.

f. Set Model 1710B front-panel controls to initial settings.

PERFORMANCE CHECK RECORD
MODEL 1710B

Instrument Serial Number _____ Date _____

Check	Specification	Measured
DEFLECTION FACTOR		CH A CH B
.005 VOLTS/DIV	6 div ±2% (±.12)	_____ _____
.01 VOLTS/DIV	5 div ±2% (±.1)	_____ _____
.02 VOLTS/DIV	5 div ±2% (±.1)	_____ _____
.05 VOLTS/DIV	6 div ±2% (±.12)	_____ _____
.1 VOLTS/DIV	5 div ±2% (±.1)	_____ _____
.2 VOLTS/DIV	5 div ±2% (±.1)	_____ _____
.5 VOLTS/DIV	6 div ±2% (±.12)	_____ _____
1 VOLTS/DIV	5 div ±2% (±.1)	_____ _____
2 VOLTS/DIV	5 div ±2% (±.1)	_____ _____
5 VOLTS/DIV	6 div ±2% (±.12)	_____ _____
Channel A vernier	< 2.4 div	_____
Channel B vernier	< 2.4 div	_____
CALIBRATOR		
Accuracy	3V ±1%	_____
Frequency	= 1kHz	_____
Z-AXIS BLANKING		
CRT blanked	+ 8V input	_____
BANDWIDTH		
Channel A bandwidth	> 4.2 div	_____
Channel B bandwidth	> 4.2 div	_____
Channel A bandwidth .005 range	> 4.2 div	_____
Channel B bandwidth .005 range	> 4.2 div	_____
TRIGGERING		
Main Internal Triggering (100 MHz)	(✓)	_____
Main Internal Triggering (200 MHz)	(✓)	_____
Main External Triggering (100 MHz)	(✓)	_____
Main External Triggering (200 MHz)	(✓)	_____
Delayed Internal Triggering (200 MHz)	(✓)	_____
Delayed External Triggering (200 MHz)	(✓)	_____
TRIGGER LEVEL RANGE		
Main Trigger Level (+)	(✓)	_____
Main Trigger Level (—)	(✓)	_____
Main External Trigger Level (+)	+1V	_____
Main External Trigger Level (—)	—1V	_____
Delayed Trigger Level (+)	(✓)	_____
Delayed Trigger Level (—)	(✓)	_____
Delayed External Trigger Level (+)	+1V	_____
Delayed External Trigger Level (—)	—1V	_____

PERFORMANCE CHECK RECORD (Cont'd)

MODEL 1710B

Instrument Serial Number _____ Date _____

Check	Specification	Measured
COMMON MODE REJECTION		
Channels A and B (5 MHz)	< 1 minor div	_____
Channels A and B (50 MHz)	< 1.1 div	_____
SWEEP TIME ACCURACY		
Main TIME/DIV	over 10 div ±3% (with± .3 div)	
10 nSEC		_____
20 nSEC		_____
50 nSEC		_____
.1 uSEC	Over 10 div ±2% (within .2 div)	_____
.2 uSEC		_____
.5 uSEC		_____
1 uSEC		_____
2 uSEC		_____
5 uSEC		_____
10 uSEC		_____
20 uSEC		_____
50 uSEC		_____
.1 mSEC		_____
.2 mSEC		_____
.5 mSEC		_____
1 mSEC		_____
2 mSEC		_____
5 mSEC		_____
10 mSEC		_____
20 mSEC		_____
50 mSEC	Over 10 div ±3% (within .3 div)	_____
.1 SEC		_____
.2 SEC		_____
.5 SEC		_____
Delayed TIME/DIV	Over 10 div ±3% (within .3 div)	
10 nSEC		_____
20 nSEC		_____
50 nSEC		_____

PERFORMANCE CHECK RECORD (Cont'd)

MODEL 1710B

Instrument Serial Number _____ Date _____

Check	Specification	Measured
Delayed TIME/DIV (Cont'd) .1 uSEC .2 uSEC .5 uSEC 1 uSEC 2 uSEC 5 uSEC 10 uSEC 20 uSEC 50 uSEC .1 mSEC .2 mSEC .5 mSEC 1 mSEC 2 mSEC 5 mSEC 10 mSEC 20 mSEC	Over 10 div ±2% (within .2 div)	_____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____
DELAY JITTER Delay Jitter	<1 div	_____
DIFFERENTIAL TIME MEASUREMENT Dial differential	8 ±0.050	_____
RISE TIME Channel A rise time Channel B rise time Channel A rise time (.005 range) Channel B rise time (.005 range)	< 1.75 ns < 1.75 ns < 2.3 ns < 2.3 ns	_____ _____ _____ _____

PARTS LIST

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION.

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

6-3. ORDERING INFORMATION.

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

a. Instrument model and serial number.

b. HP part number of item(s).

c. Quantity of part(s) desired.

d. Reference designator of part(s).

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

a. Instrument model and serial number.

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

c. Quantity desired.

Table 6-1. Abbreviations for Replaceable Parts List

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

COMMON HARDWARE LIST

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
H1	2360-0201	4	SCREW MACH 6-32 .5 IN LG PAN HD POZI	28480	2360-0201
H2	2510-0111	2	SCREW MACH 6-32 .75 IN LG PAN HD	28480	2510-0111
H3	2190-0910	6	WASHER LOCK .12 IN ID, .275 IN OD	04713	SM852200F01
H4	2200-0141	7	SCREW MACH 4-40 .312 IN LG PAN HD	28480	2200-0141
H5	3050-0791	4	WASHER SHLDR NO. 4 .116 IN ID .21 IN OD	28480	3050-0791
H6	2360-0197	2	SCREW MACH 6-32 .375 IN LG PAN HD	28480	2360-0197
H7	2190-0046	4	WASHER LOCK HLCL NO. 6 .141 IN ID .239 IN OD	28480	2190-0046
H8	2420-0003	2	NUT HEX DBL CHAM 6-32 THD .094 THK	28480	2420-0003
H9	3030-0022	4	SCREW SET 6-32 .125 IN LG SMALL CUP PT	28480	3030-0022
H10	2200-0143	3	SCREW MACH 4-40 .375 IN LG PAN HD	28480	2200-0143
H11	2200-0103	38	SCREW MACH 4-40 .25 IN LG PAN HD	28480	2200-0103
H12	3050-0066	4	WASHER FL MTLC NO. 6 .147 IN ID .375 IN OD	28480	3050-0066
H13	2190-0008	6	WASHER LOCK EXT T NO. 6 .141 IN ID .32 IN OD	78189	1806 00
H14	2360-0135	3	SCREW MACH 6-32 1.5 IN LG PAN HD	28480	2360-0135
H15	1400-0090	1	WASHER: RUBBER 5/8 IN OD	00000	OBD
H16	2190-0037	1	WASHER LOCK INTLT .512 IN ID .789 IN OD	78189	1224 08
H17	2950-0038	1	NUT-SPECIALITY 1/2-24 THD .125 THK .688 OD	28480	2950-0038
H18	3050-0235	2	WASHER FL MTLC NO. 8 .172 IN ID .25 IN OD	28480	3050-0235
H19	2190-0030	7	WASHER LOCK HLCL NO. 4 .115 IN ID .173 IN OD	28480	2190-0030
H20	0360-1632	8	TERMINAL, SLDR LUG, 3/8 SCR .375/.109	79963	761-3/8
H21	2950-0043	16	NUT HEX DBL CHAM 3/8-32 THD .094 THK	73734	2X 26200
H22	2200-0107	7	SCREW MACH 4-40 .375 IN LG PAN HD	28480	2200-0107
H23	2510-0138	4	SCREW MACH 8-32 3 IN LG PAN HD POZI	28480	2510-0138
H24	3050-0152	4	WASHER SHLDR NO. 8 .172 IN ID .438 IN OD	28480	3050-0152
H25	3050-0071	4	WASHER FL MTLC NO. 8 .168 IN ID .438 IN OD	28480	3050-0071
H26	2190-0017	4	WASHER LOCK HLCL NO. 8 .168 IN ID .507 IN OD	28480	2190-0017
H27	2660-0001	4	NUT HEX DBL CHAM 8-32 THD .125 THK .344OD	28480	2660-0001
H28	0400-0010	1	GROMMET: VINYL 0.250 IN ID	00000	OBD
H29	2190-0007	2	WASHER LOCK INTL T NO. 6 .141 IN ID .238 IN OD	78189	1906 00
H30	2200-0167	4	SCREW MACH 4-40 .375 IN LG 82 DEG FL HD	28480	2200-0167
H31	2260-0002	6	NUT HEX DBL CHAM 4-40 THD .062 THK	28480	2260-0002
H32	0624-0279	8	SCREW TPG B 32 .75 IN LG PAN HD POZI	28480	0624-0279
H33	2190-0102	2	WASHER LOCK INTL T NO. 7/16 .472 IN ID	78189	1822 01
H34	2950-0035	2	NUT HEX DBL CHAM 15/32-32 THD .078 THK	28480	2950-0035
H35	2190-0084	4	WASHER LOCK INTLT NO. 1/4 .256 IN ID .406 IN OD	78189	1214 06
H36	2950-0072	3	NUT HEX DBL CHAM 1/4-32 THD .062 THK	82389	P-1975
H37	0360-0040	1	TERMINAL, SLDR LUG, 1/4 SCR, .251.093	73734	1958
H38	0360-0024	3	TERMINAL, SLDR LUG, 3/8 SCR, .38/.062	79963	608 H360
H39	2190-0016	5	WASHER LOCK INTL T .377 IN ID .507 IN OD	78189	1920 02
H40	3050-0050	1	WASHER FL MTLC NO. 7/16 .5 IN ID .75 IN OD	28480	3050-0050
H41	2360-0117	4	SCREW MACH 6-32 .375 IN LG PAN HD	28480	2360-0117

Figure 6-1. Chassis Parts Identification (Sheet 1 of 2)

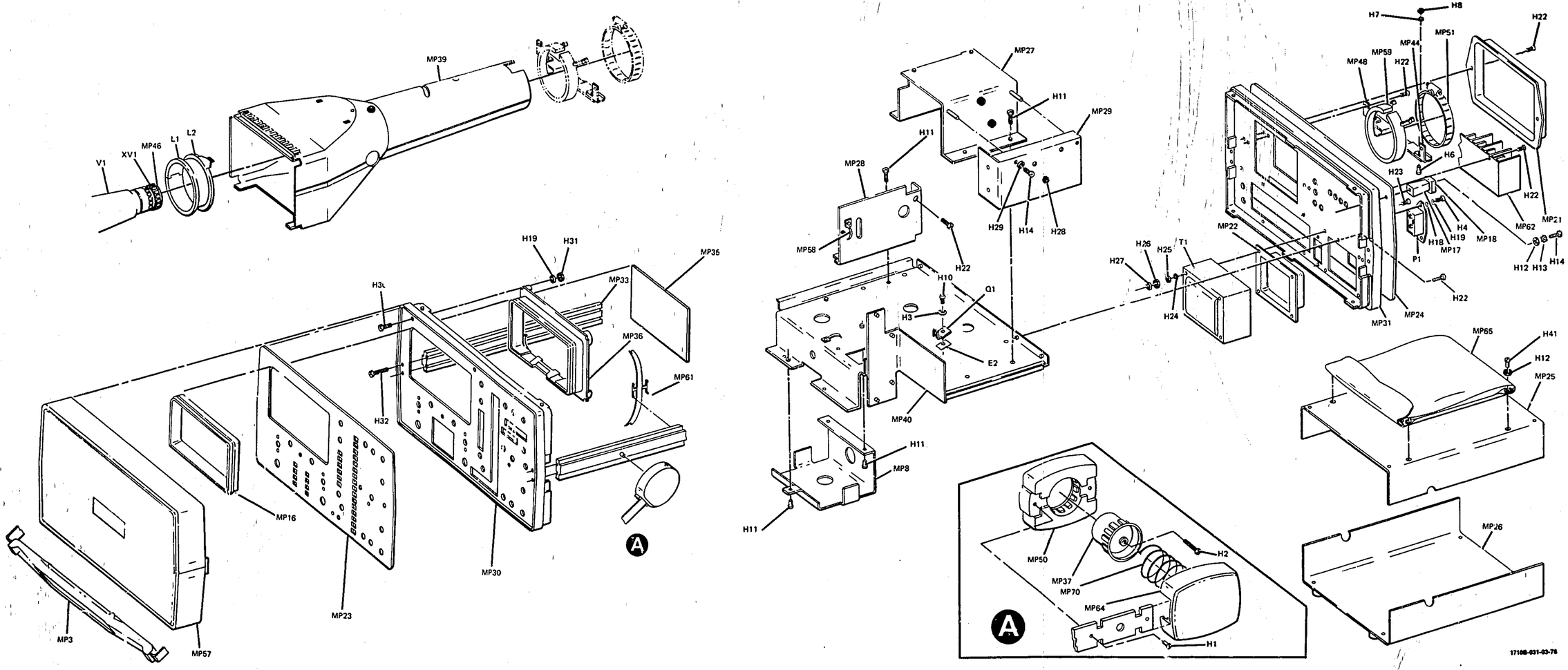
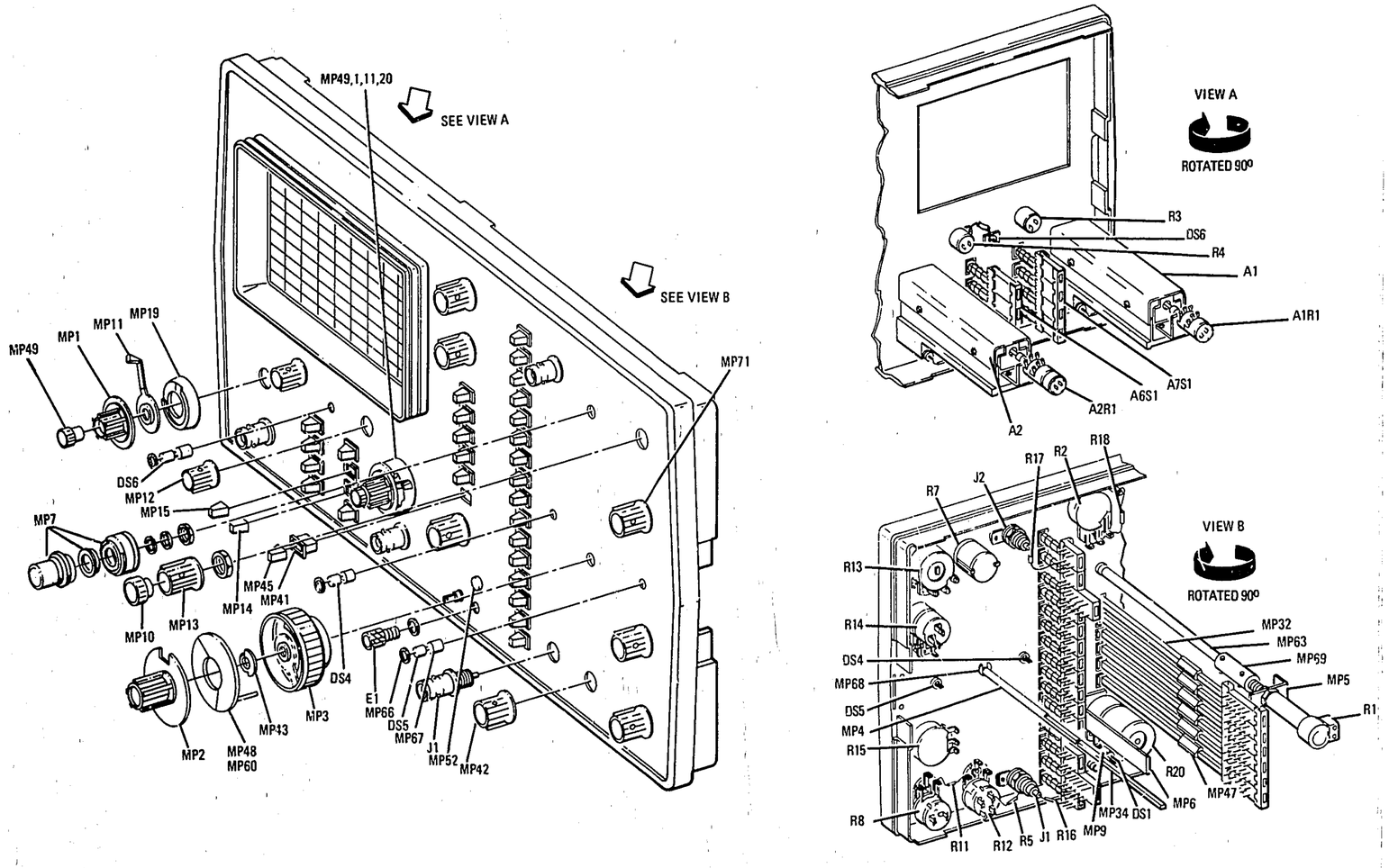


Figure 6-1.
Chassis Parts Identification (Sheet 2 of 2)



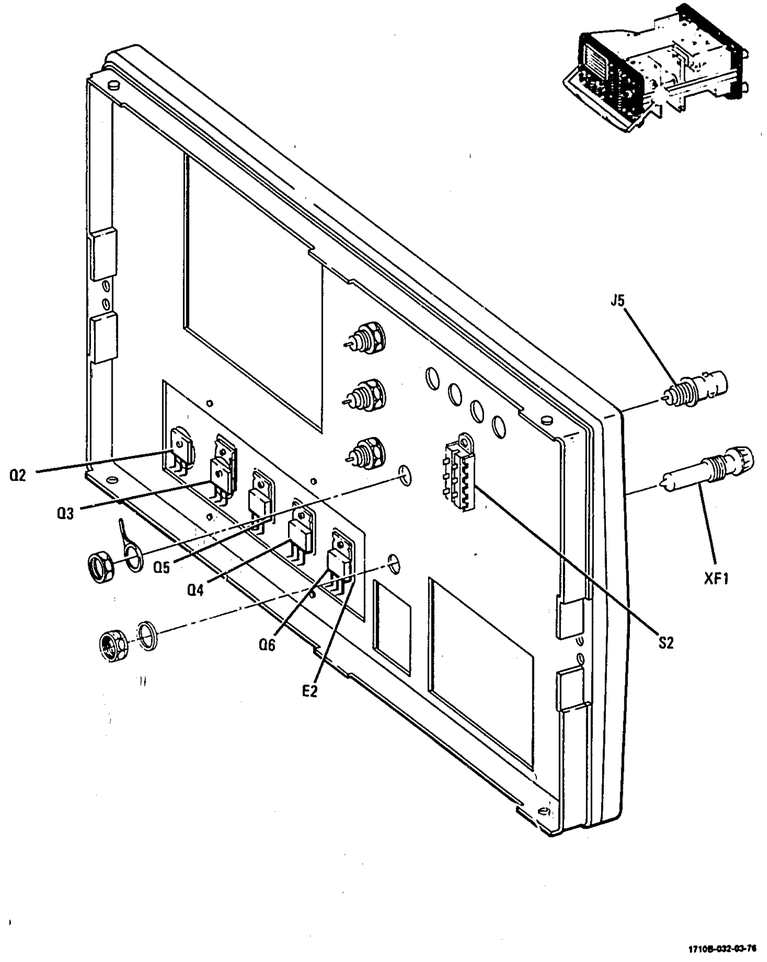


Figure 6-2. Front/Rear Panel Component Identification

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	01710-63408		ATTENUATOR ASSY, CHANNEL A	28480	01710-63409
A2	01710-63410		ATTENUATOR ASSY, CHANNEL B	28480	01710-63410
A3	01710-66552		BOARD ASSY, VERTICAL PREAMPLIFIER	28480	01710-66552
A4	01720-61626		CABLE ASSY, DELAY LINE	28480	01720-61626
A5	01720-66538		BOARD ASSY, VERTICAL OUTPUT	28480	01720-66538
A6	01720-66534		BOARD ASSY, INT TRIGGER SWITCH	28480	01720-66534
A7	01720-66535		BOARD ASSY, VERTICAL DISPLAY SWITCH	28480	01720-66535
A8	01720-66530		BOARD ASSY, HORIZONTAL SWEEP	28480	01720-66530
A9	01720-66547		BOARD ASSY, DELAYED SWEEP SWITCH	28480	01720-66547
A10	01720-66536		BOARD ASSY, HORIZONTAL DISPLAY SWITCH	28480	01720-66536
A11	01720-66546		BOARD ASSY, MAIN SWEEP SWITCH	28480	01720-66546
A12	01720-66529		BOARD ASSY, HOLDOFF/COMPARATOR	28480	01720-66529
A13	01720-66537		BOARD ASSY, HORIZONTAL OUTPUT	28480	01720-66537
A14	01720-66533		BOARD ASSY, GATE	28480	01720-66533
A15	01720-66532		BOARD ASSY, HVPS	28480	01720-66532
A16	0960-0117		ASSY: H.V. MULTIPLIER (NOT REPAIRABLE)	28480	0960-0117
A17	01720-66528		BOARD ASSY, LVPS	28480	01720-66528
DS1	2140-0391	1	LAMP, GLOW	08806	ANSI G28
DS2			DELETED		
DS3			DELETED		
DS4	1990-0324	3	PHOTO-DEVICE, DIO VSBL LT EMTR 200MW PD	28480	1990-0324
DS5	1990-0324		PHOTO-DEVICE, DIO VSBL LT EMTR 200MW PD	28480	1990-0324
DS6	1990-0324		PHOTO-DEVICE, DIO VSBL LT EMTR 200MW PD	28480	1990-0324
E1	1510-0038	1	BINDING-POST; SINGLE; 1/4-32	28480	1510-0038
E2	0340-0611	1	INSULATOR, TRANSISTOR	13103	43-77-2
F1	2110-0304	1	FUSE: 1.5A 250V SLO-BLO	71400	MDX-1-1/2A
J1	1250-0118	6	CONNECTOR-COAX, BNC, 50 OHM FEMALE	95712	30384-1
J2	1250-0118		CONNECTOR-COAX, BNC, 50 OHM FEMALE	95712	30384-1
J3	1250-0118		CONNECTOR-COAX, BNC, 50 OHM FEMALE	95712	30384-1
J4	1250-0118		CONNECTOR-COAX, BNC, 50 OHM FEMALE	95712	30384-1
J5	1250-0118		CONNECTOR-COAX, BNC, 50 OHM FEMALE	95712	30384-1
J6	1250-0118		CONNECTOR-COAX, BNC, 50 OHM FEMALE	95712	30384-1
J7	1251-3073		CONNECTOR: 3F	28480	1251-3073
J8	1251-3201		CONNECTOR: 3F	28480	1251-3201
L1	5060-0436	1	COIL: ALIGNMENT Z AXIS	28480	5060-0436
L2	00181-66004	1	COIL: ALIGNMENT, Y AXIS	28480	00181-66004
MP1	0370-2787	2	KNOB, VOLTS/DIV	28480	0370-2787
MP2	01740-67402	1	KNOB, MAIN SWEEP	28480	01740-67402
MP3	01720-67403	1	KNOB, DELAYED SWEEP	28480	01720-67403
MP4	01720-63703	1	SHAFT ASSY, MAIN SWITCH	28480	01720-63703
MP5	01720-01207	1	BRACKET, FOCUS	28480	01720-01207
MP6	01720-00603	1	SHIELD, SCALE ILLUM	28480	01720-00603
MP7	1140-0036	1	COUNTING-DISPLAY, TURNS DIAL 10 TURNS	28480	1140-0036
MP8	01720-04101	1	BRACKET, DELAY LINE	28480	01720-04101
MP9	5060-0451	1	LENS ASSY	28480	5060-0451
MP10	0370-0963	1	KNOB, CONC, RND, (FINE)	28480	0370-0963
MP11	5040-7598	2	LEVER, COUPLING	28480	5040-7598
MP12	0370-1006	2	KNOB, BASE, PTR, .375 IN, JGK, GI	28480	0370-1006
MP13	0370-1100	1	KNOB, BASE-CONC PTR, .5 IN, JG,	28480	0370-1100
MP14	0370-0603	3	PUSHBUTTON, M GRAY SP	28480	0370-0603
MP15	0370-2630	14	PUSHBUTTON, WILLOW GRN	28480	0370-2630
MP16	4040-0814	1	BEZEL: OLIVE, BLACK	28480	4040-0814
MP17	5040-5861	1	FOOT: BASE	28480	5040-5861
MP18	5040-5862	1	FOOT: REAR, CAP	28480	5040-5862
MP19	5020-8745	1	SPACER, DIAL, LEFT COUPLING	28480	5020-8745
MP20	5020-8744	1	SPACER, DIAL, RIGHT COUPLING	28480	5020-8744
MP21	01701-04108	1	COVER: CRT	28480	01701-04108
MP22	01710-04103	1	COVER: TRANSFORMER	28480	01710-04103
MP23	01710-00206	1	PANEL, FRONT, FINISHED	28480	01710-00206
MP24	01720-00212	1	PANEL, REAR	28480	01720-00212
MP25	01720-04102	1	COVER, TOP	28480	01720-04102
MP26	01720-04103	1	COVER, BOTTOM	28480	01720-04103
MP27	01720-04104	1	BRACKET, GATE/HV	28480	01720-04104
MP28	01720-04105	1	BRACKET, VERTICAL OUTPUT	28480	01720-04105
MP29	01720-04106	1	COVER, HV	28480	01720-04106
MP30	01720-20501	1	FRAME, FRONT	28480	01720-20501
MP31	01720-20502	1	FRAME, REAR	28480	01720-20502
MP32	01720-23201	8	EXTENDER, SWITCH	28480	01720-23201
MP33	01720-23701	2	RAIL, SIDE	28480	01720-23701
MP34	01720-23705	1	SHAFT, MAIN SWEEP INNER	28480	01720-23705
MP35	01720-24101	1	SHIELD, SAFETY, CRT	28480	01720-24101
MP36	01720-24702	1	SUPPORT, CRT CAMERA	28480	01720-24702
MP37	5020-8733	2	GEAR, HANDLE	28480	5020-8733
MP38	5040-0515	1	ASSY, HANDLE	28480	5040-0515
MP39	01720-60601	1	SHIELD ASSY, CRT	28480	01720-60601
MP40	01720-60101	1	DECK, MAIN	28480	01720-60101
MP41	0370-2626	30	BEZEL: PUSHBUTTON KNOB M GRAY SQ	28480	0370-2626
MP42	0370-1099	7	KNOB, BASE, JADE GRAY	28480	0370-1099
MP43	01720-22501	1	RING, ANTI-RUN	28480	01720-22501
MP44	01720-01209	1	BRACKET, CRT LEFT REAR AND RIGHT REAR	28480	01720-01209

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
MP45	0370-0671	13	PUSHBUTTON, LEGAL BLU, SQ	28480	0370-0671
MP46	5040-7648	1	PLATE, CRT SOCKET	28480	5040-7648
MP47	01830-23201	6	COUPLER: BAL SHAFT	28480	01830-23201
MP48	5040-5942	1	CORE DIAL TIME/DIV	28480	5040-5942
MP49	01720-67405	2	KNOB, CONCENTRIC	28480	01720-67405
MP50	5020-8734	2	RING, HANDLE	28480	5020-8734
MP51	1400-0634	1	CLAMP: HOSE; 2.37 DIA .37 W STL	28480	1400-0634
MP52	5060-0458	1	HEADER: LAMP	28480	5060-0458
MP53	01720-61901	1	SWITCH, ROTOR, MALE	28480	01720-61901
MP54	01720-61902	1	SWITCH, ROTOR, FEMALE	28480	01720-61902
MP55	01720-61903	1	SWITCH, ROTOR, FEMALE	28480	01720-61903
MP56	01720-61904	1	SWITCH, ROTOR, FEMALE	28480	01720-61904
MP57	5040-0516	1	COVER, PANEL	28480	5040-0516
MP58	00180-00105	1	CLIP: GROUND	28480	00180-00105
MP59	01220-42301	1	HOLDER: TUBE	28480	01220-42301
MP60			DELETED		
MP61	0360-0984	1	DECAL, CORE, TIME/DIV DIAL	28480	01720-09101
MP62	01720-20503	1	HEAT SINK	28480	0360-0984
MP63	01720-23706	1	SHAFT, EXTENSION	28480	01720-23706
MP64	5040-0511	2	CAP, TRIM	28480	5040-0511
MP65	1540-0292		POUCH, ACCESSORY	28480	1540-0292
MP66	1400-0540	3	CLAMP; RETAINER RING: LED MTG; .27-IN	28480	1400-0540
MP67	1400-0647	3	CLAMP; CLIP LED PANEL MT; BLK POLYP	28480	1400-0647
MP68	0510-0515	1	RETAINER, RING, .33 DIA, NI PLT BE CU	28480	0510-0515
MP69	1500-0215	1	COUPLER: SOLID	28480	1500-0215
MP70	1460-0604	2	SPRING; COMPRESSION; CYLINDER	28480	1460-0604
MP71	0370-1099		KNOB: OLIVE BLACK	28480	0370-1099
MP72	10115-22701		FILTER: CONTRAST	28480	10115-22701
P1	1251-4070	1	CONNECTOR, AC PWR, HP-9 MALE FLANGE	82389	FAC301
Q1	1854-0320	1	TRANSISTOR NPN SI PD=83.5W FT=4MHZ	28480	1854-0320
Q2	1854-0330	1	TRANSISTOR NPN SI PD=21W FT=10MHZ	28480	1854-0330
Q3	1854-0737	1	TRANSISTOR, NPN, SI	28480	1854-0737
Q4	1854-0370	3	TRANSISTOR NPN 2N5294 SI PD=1.8W	02735	2N5294
Q5	1854-0370		TRANSISTOR NPN 2N5294 SI PD=1.8W	02735	2N5294
Q6	1854-0370		TRANSISTOR NPN 2N5294 SI PD=1.8W	02735	2N5294
R1	2100-0665	1	RESISTOR: VAR, CONT, 5M 20% CC (FOCUS)	71590	MODEL 2 HV
R2	2100-0663	1	RESISTOR: VAR, CONT, 10K 10% CC (INTENSITY)	71590	MODEL 2
R3	2100-3385	2	RESISTOR: VAR, CONT, 2K 20% CC (VERT POSITION)	28480	2100-3385
R4	2100-3385		RESISTOR: VAR, CONT, 2K 20% CC (VERT POSITION)	28480	2100-3385
R5	0687-3311	1	RESISTOR; FXD; 330 OHM 10% .5W CC	01121	EB3311
R6	0684-1221		RESISTOR; FXD; 1.2K 10% .25W CC TUBULAR	01121	CB1221
R7	2100-1443	1	RESISTOR: VAR, CONT, 50K 3% WW (DELAY)	28480	2100-1443
R8	2100-0660	1	RESISTOR: VAR, 100K 20% SPST SW (TRIG HOLDOFF)	28480	2100-0660
R9	0684-1001	2	RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
R10	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
R11	0757-0458		RESISTOR; FXD; 51.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-5112-F
R12	2100-0627	1	RESISTOR: VAR, 100K, CW SW (SWP VERNIER)	28480	2100-0627
R13	2100-3014	1	RESISTOR: VAR, CNTRC, 20K/20K 20% (HORIZ POS)	28480	2100-3014
R14	2100-0662	1	RESISTOR: VAR, 50K 30% SPST SW DLYD TRIG LEVEL)	28480	2100-0662
R15	2100-0661	1	RESISTOR: VAR, CONT, 50K 30% CC (MAIN TRIG LEVEL)	71590	MODEL 2
R16	0698-7096	2	RESISTOR; FXD; 10 OHM 10% .125W CC	01121	BB1001
R17	0698-7096		RESISTOR; FXD; 10 OHM 10% .125W CC	01121	BB1001
R18	0687-8211	1	RESISTOR; FXD; 820 OHM 10% .5W CC	01121	EB8211
R19	0687-3931	1	RESISTOR; FXD; 39K 10% .5W CC TUBULAR	01121	EB3931
R20	2100-3387		RESISTOR: VAR, 5K CC SW (SCALE ILLUM)	28480	2100-3387
R21	0757-0401		RESISTOR; FXD; 100 OHM 1% .125W F	24546	C4-1/8-T0-101-F
R22	0698-7196		RESISTOR 21.5 OHM 2% .125W (FACTORY SELECTED) (PART OF R20)	28480	0698-7196
S1					
S2	3101-0625	1	SWITCH: SW SL 2 SEC 2 POS (POWER SELECT)	28480	3101-0625
T1	9100-3410	1	TRANSFORMER, POWER	28480	9100-3410
V1	5083-4062	1	CRT, P31	28480	5083-4062
W1	8120-1521	1	CABLE, UNSHLD 3-COND 18AWG	70903	KH 147
W2	01720-61622	1	CABLE ASSY, SYNC	28480	01720-61622
W3	01720-61623	1	CABLE ASSY, HORIZONTAL INPUT	28480	01720-61623
W4	01720-61624	1	CABLE ASSY, HORIZONTAL OUTPUT	28480	01720-61624
W5	01720-61629	1	CABLE ASSY, CRT BASE	28480	01720-61629
W6	01720-61605	1	CABLE ASSY, CRT NECK PINS	28480	01720-61605
XF1	1400-0084	1	HOLDER: FUSE	28480	1400-0084
XV1	5040-7649	1	SOCKET, CRT (PART OF W5)	28480	5040-7649

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
A1	01710-63409	1	ATTENUATOR ASSY, CHANNEL A	28480	01710-63409
A1A1	01720-66544	1	BOARD ASSY, CH A ATTENUATOR (PARTS NOT LISTED ARE NSR-REFER TO SECTION VIII.)	28480	01720-66544
A1R1	2100-0664	2	RESISTOR: VAR, 5K 10%, SPST SW (VERNIER)	28480	2100-0664
A1R2	0698-3132	2	RESISTOR; FXD; 261 OHM 1% 1/8W	28480	0698-3132
A1A1Q1	5080-9691		TSTR: MATCHED PR-INCLUDES A2A1Q1 (NOT P/O A1A1-ORDER SEPARATELY.)	28480	5080-9691
A1A1Q2	1854-0636	10	TRANSISTOR NPN SI TO-92 PD=350MW	28480	1854-0636
A1A1Q3	1854-0632	2	TRANSISTOR NPN SI PD=180MW FT=4GHZ	25403	BFR 91
A1A1R1	0698-6433	4	RESISTOR; FXD; 100 OHM 1% .25W F TUBULAR	28480	0698-6433
A1A1R2	0698-6433		RESISTOR; FXD; 100 OHM 1% .25W F TUBULAR	28480	0698-6433
A2	01710-63410	1	ATTENUATOR ASSY, CHANNEL B	28480	01710-63410
A2A1	01720-66545	1	BOARD ASSY, CH B ATTENUATOR (PARTS NOT LISTED ARE NSR-REFER TO SECTION VIII.)	28480	01720-66545
A2R1	2100-3453	1	RESISTOR-VAR 2.5K/5K 10% DPST SW	28480	2100-3453
A2R2	0698-3132		RESISTOR; FXD; 261 OHM 1% 1/8W	28480	0698-3132
A2A1Q1			TRANSISTOR: MATCHED PR (P/O A1A1Q1)		
A2A1Q2	1854-0636		TRANSISTOR NPN SI TO-92 PD=350MW	28480	1854-0636
A2A1Q3	1854-0632		TRANSISTOR NPN SI PD=180MW FT=4GHZ	25403	BFR 91
A2A1R1	0698-6433		RESISTOR; FXD; 100 OHM 1% .25W F TUBULAR	28480	0698-6433
A2A1R2	0698-6433		RESISTOR; FXD; 100 OHM 1% .25W F TUBULAR	28480	0698-6433
A3	01710-66552	1	BOARD ASSY, ALERT PREAMPL (DOES NOT INCLUDE A3A1)	28480	01710-66552
A3C1	0180-0230		CAPACITOR; FXD; 1UF ±20% 50 WVDC TA SOLID	56289	1500105X0050A2
A3C2	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	1500226X9020A2
A3C3	0160-3470		CAPACITOR; FXD; .01UF +80–20% 50WVDC	28480	0160-3470
A3C4			NOT USED		
A3C5	0140-0196		CAPACITOR; FXD; 150PF 5% 300WVDC MICA	72136	RDM15F151J3C
A3C6	0121-0467		CAPACITOR: VAR CER 3.0-9.0 PF 100WVDC	72982	511-000-3-9A
A3C7	0160-3647		CAPACITOR, 22PF ±5% 100WVDC	28480	0160-3647
A3C8	0140-0190		CAPACITOR; FXD; MICA 39 PF 5%	72136	RDM15E390J3C
A3C9	0140-0190		CAPACITOR; FXD; MICA 39PF 5%	72136	RDM15E390J3C
A3C10	0140-0196		CAPACITOR; FXD; 150PF 5% 300WVDC MICA	72136	RDM15F151J3C
A3C11			NOT USED		
A3C12	0160-3470		CAPACITOR; FXD; .01UF +80–20% 50WVDC	28480	0160-3470
A3C13	0180-0230		CAPACITOR; FXD; 1UF ±20% 50WVDC TA SOLID	56289	1500105X0050A2
A3C14	0180-0230		CAPACITOR; FXD; 1UF ±20% 50WVDC TA SOLID	56289	1500105X0050A2
A3C15	0180-0230		CAPACITOR; FXD; 1UF ±20% 50WVDC TA SOLID	56289	1500105X0050A2
A3C16	0180-0230		CAPACITOR; FXD; 1UF ±20% 50WVDC TA SOLID	56289	1500105X0050A2
A3C17	0180-0230		CAPACITOR; FXD; 1UF ±20% 50WVDC TA SOLID	56289	1500105X0050A2
A3C18	0180-0228		CAPACITOR; FXD; 22UF ±10% 15WVDC TA SOLID	56289	1500226X9015B2
A3C19	0180-0228		CAPACITOR; FXD; 22UF ±10% 15WVDC TA SOLID	56289	1500226X9015B2
A3C20	0160-3446		CAPACITOR; FXD; 220PF ±10% 1000WVDC	28480	0160-3446
A3C21	0180-0229		CAPACITOR; FXD; 33UF ±10% 10WVDC TA SOLID	56289	1500336X9010B2
A3C22	0180-0228		CAPACITOR; FXD; 22UF ±10% 15WVDC TA SOLID	56289	1500226X9015B2
A3C23	0180-0228		CAPACITOR; FXD; 22UF ±10% 15WVDC TA SOLID	56289	1500226X9015B2
A3C24	0160-3446		CAPACITOR; FXD; 220PF ±10% 1000WVDC	28480	0160-3446
A3C25	0180-0229		CAPACITOR; FXD; 33UF ±10% 10WVDC TA SOLID	56289	1500336X9010B2
A3C26	0160-3448		CAPACITOR; FXD; 1000PF ±10% 1000WVDC	28480	0160-3448
A3C27	0160-3802		CAPACITOR; FXD; 150PF ±10% 100WVDC	28480	0160-3802
A3C28			DELETED		
A3C29	0160-2204		CAPACITOR; FXD; 100PF 5% 300WVDC MICA	72136	RDM15F101J3C
A3CR1	1901-0040		DIODE: SWITCHING, 30V MAX VRM 50MA	28480	1901-0040
A3CR2	1901-0040		DIODE: SWITCHING, 30V MAX VRM 50MA	28480	1901-0040
A3CR3 thru A3CR10	5080-0442		DIODES MATCHED SET OF 8	28480	5080-0442
A3L1	9100-2257		COIL: FXD MOLDED RF CHOKE, .82 UH 10%	24226	10/820
A3L2	9100-2247		COIL: FXD MOLDED RF CHOKE, .1 UH 10%	24226	10/100
A3L3	9100-2247		COIL: FXD MOLDED RF CHOKE, .1 UH 10%	24226	10/100
A3L4	9100-2257		COIL: FXD MOLDED RF CHOKE, .82 UH 10%	24226	10/820
A3L5 thru A3L9	9140-0142		COIL: FXD MOLDED RF CHOKE, 2.2 UH 10%	24226	10/221
A3L10	9170-0016		CORE, MAG, SHIELDING BEAD .138 OD .047	02114	56-590-65A 1/38
A3L11	9170-0016		CORE, MAG, SHIELDING BEAD .138 OD .047	02114	56-590-65A 1/38
A3L12	9170-0029		CORE, MAG, SHIELDING BEAD	02114	56-590-65A2/4A
A3Q1	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250 MHZ	28480	1853-0036
A3Q2	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250 MHZ	28480	1853-0036
A3Q3	1854-0646		TRANSISTOR NPN SI PD=200MW FT=1.4 GHZ	28480	1854-0646
A3Q4	1854-0646		TRANSISTOR NPN SI PD=200MW FT=1.4 GHZ	28480	1854-0646
A3Q5	1854-0345		TRANSISTOR NPN 2N5179 SI PD=200MW	04713	2N5179
A3Q6	1854-0345		TRANSISTOR NPN 2N5179 SI PD=200MW	04713	2N5179
A3Q7	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250 MHZ	28480	1853-0036
A3Q8	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250 MHZ	28480	1853-0036
A3R1	2100-3252		RESISTOR: VAR, TRMR 5K OHM 10% C	32997	3389P-1-502
A3R2	0757-0419		RESISTOR; FXD; 681 OHM 1% .125W F	24546	C4-1/8-T0-681R F
A3R3	0757-0419		RESISTOR; FXD; 681 OHM 1% .125W F	24546	C4-1/8-T0-681R F
A3R4	2100-3210		RESISTOR: VAR, TRMR 10K OHM 10% C	32997	3389P-1-103
A3R5	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	19701	MFC4-1/8-T0-6191 F
A3R6	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A3R7	0757-0431		RESISTOR 2.43K 1% .125W F TUBULAR	24546	C4-1/8-T0-2431 F
A3R8	2100-3252		RESISTOR: VAR, TRMR 5K OHM 10% C	32997	3389P-1-502
A3R9	2100-0567		RESISTOR: VAR, TRMR, 2K OHM 10% C	73138	72PR2K

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3R10	0684-4741		RESISTOR; FXD; 470K 10% .25W CC TUBULAR	01121	CB4741
A3R11	0684-1031		RESISTOR; FXD; 10K 10% .25W CC TUBULAR	01121	CB1031
A3R12	2100-3211		RESISTOR: VAR, TRMR, 1K OHM 10% C	32997	3389P-1-102
A3R13	0757-0438		RESISTOR 6.11K 1% .125W F TC 0+-100	24546	C4-1/8-T0-6111-F
A3R14	0684-1041		RESISTOR; FXD; 100K 10% .25W CC TUBULAR	01121	CB1041
A3R15	0757-0407	4	RESISTOR 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-201 F
A3R16	0757-0407		RESISTOR 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-201-F
A3R17	0757-0290		RESISTOR 6.19K 1% .125W F TUBULAR	19701	MFC4-1/8-T0-6191 F
A3R18	2100-3262		RESISTOR: VAR, TRMR 5K OHM 10% C	32997	3389P-1-502
A3R19	0684-4741		RESISTOR; FXD; 470K 10% .25W CC TUBULAR	01121	CB4741
A3R20	0757-0438		RESISTOR 6.11K 1% .125W F TC 0+-100	24546	C4-1/8-T0-6111 F
A3R21	0684-1041		RESISTOR; FXD; 100K 10% .25W CC TUBULAR	01121	CB1041
A3R22	0684-1031		RESISTOR; FXD; 10K 10% .25W CC TUBULAR	01121	CB1031
A3R23	2100-3211		RESISTOR: VAR, TRMR 1K OHM 10% C	73138	72PR1K
A3R24	2100-0667		RESISTOR: VAR, TRMR 2K OHM 10% C	73138	72PR2K
A3R25	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A3R26	0757-0431		RESISTOR 2430 OHM 1% .125W F TUBULAR	25480	0757-0431
A3R27	2100-3210		RESISTOR: VAR, TRMR 10K OHM 10% C	32997	3389P-1-103
A3R28	2100-3262		RESISTOR: VAR, TRMR 5K OHM 10% C	32997	3389P-1-502
A3R29	0757-0419		RESISTOR; FXD; 681 OHM 1% .125W F	24546	C4-1/8-T0-681R-F
A3R30	0757-0419		RESISTOR; FXD; 681 OHM 1% .125W F	24546	C4-1/8-T0-681R-F
A3R31	0683-1535		RESISTOR; FXD; 15K 5% .25W CC TUBULAR	01121	CB1535
A3R32	0761-0025		RESISTOR; FXD; 120 OHM 5% 1W MO TUBULAR	24546	FP32-1-700-121-J
A3R33	0761-0025		RESISTOR; FXD; 120 OHM 5% 1W MO TUBULAR	24546	FP32-1-700-121-J
A3R34	0683-1535		RESISTOR; FXD; 15K 5% .25W CC TUBULAR	01121	CB1535
A3R35	0757-0407		RESISTOR 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-201 F
A3R36			NOT USED		
A3R37	0757-0820		RESISTOR; FXD; 1.1K 1% .5W F TUBULAR	30983	MF7C-1/2-T0-1101-F
A3R38	0757-0280		RESISTOR 1K OHM 1% .125W F TUBULAR	28480	0757-0280
A3R39	0757-0412		RESISTOR; FXD; 365 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-365R-F
A3R40	0698-7196		RESISTOR; FXD; 21.5 OHM 2% .05W F	24546	C3-1/8-T00-21R5-G
A3R41	0689-3378		RESISTOR; FXD; 51 OHM 5% .125W CC TUBULAR	01121	CB5105
A3R42	0689-7196		RESISTOR; FXD; 21.5K OHM 2% .05W F	24546	C3-1/8-T00-21R5-G
A3R43	0684-5621		RESISTOR; FXD; 5.6K 10% .25W CC TUBULAR	01121	CB5621
A3R44	0757-0412		RESISTOR; FXD; 365 OHM .125W F TUBULAR	24546	C4-1/8-T00-365R-F
A3R45	0698-7208		RESISTOR; FXD; 68.1 OHM 2% .05W F TUBULAR	01121	C3-1/8-T00-68R1
A3R46	0689-7208		RESISTOR; FXD; 68.1 OHM 2% .05W F TUBULAR	01121	C3-1/8-T00-68R1
A3R47	0684-1811		RESISTOR; FXD; 180 OHM 10% .25W CC	01121	CB1811
A3R48	0684-1811		RESISTOR; FXD; 180 OHM 10% .25W CC	01121	CB1811
A3R49	0757-0280		RESISTOR 1K OHM 1% .125W F TUBULAR	28480	0757-0280
A3R50	0757-0280		RESISTOR 1K OHM 1% .125W F TUBULAR	28480	0757-0280
A3R51	0757-1094		RESISTOR; FXD; 1.47K 1% .125W F TUBULAR	24546	C4-1/8-T0-1471-F
A3R52	0757-0280		RESISTOR 1K OHM 1% .125W F TUBULAR	28480	0757-0280
A3R53	0757-1094		RESISTOR; FXD; 1.47K 1% .125W F TUBULAR	24546	C4-1/8-T0-1471-F
A3R54	0698-7236		RESISTOR; FXD 1.21K 1% .125W F TUBULAR	24546	C3-1/8-T0-1211-G
A3R55	0698-7236		RESISTOR; FXD; 1.21K 1% .125W F TUBULAR	24546	C3-1/8-T0-1211 G
A3R56			NOT USED		
A3R57	0757-0419		RESISTOR; FXD; 681 OHM 1% .125W F	24546	C4-1/8-T0-681R-F
A3R58	0757-0280		RESISTOR; FXD; 1K OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A3R59	0757-0407		RESISTOR 200 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0 201 F
A3R60 thru A3R63	-0271		RESISTOR; FXD; 2.7 OHM 10% .2W CC	01121	CB27G1
A3R64	0698-3236		RESISTOR; FXD; 500K OHM 1% .125W F TUBULAR	19701	MF5C-1/8-T0-5003-F
A3R65	0757-0394		RESISTOR; FXD; 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A3R66	0698-6426		RESISTOR; FXD; 213K 1% .125W F TUBULAR	24546	C4, T 0
A3R67	0698-6439		RESISTOR; FXD; 10M 5% .125W F TUBULAR	28480	0698-6439
A3R68	0757-0431		RESISTOR, FXD, 2.43K 1% .125W F TUBULAR	24546	C4-1/8-T0-2431-F
A3R69	0757-0274		RESISTOR; FXD; 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A3R70	0757-0274		RESISTOR; FXD; 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213 F
A3R71	2100-3094		RESISTOR; VAR, TRMR 100K OHM 10% C	32997	3006P-1-104
A3R72	0757-0462		RESISTOR; FXD; 75.0 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-7502-F
A3R73	0757-0394		RESISTOR; FXD, 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A3R74	2100-3253		RESISTOR; VAR, TRMR 50K OHM 10% C	32997	3389P-1-503
A3R75	0698-4525		RESISTOR; FXD; 187K .125W F TUBULAR	24546	C4-1/8-T0-1873-F
A3R76	0684-5601		RESISTOR; FXD; 56 OHM 10% .25W CC	01121	CB5601
A3R77	0757-0429		RESISTOR 1.82K 1% .125W F TUBULAR	24546	C4-1/8-T0-1821-F
A3R78	0698-3263		RESISTOR; FXD; 500K OHM 1% .125W F TUBULAR	19701	MF5C-1/8-T0-5003-F
A3R79	0757-0394		RESISTOR; FXD, 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A3R80	0698-6426		RESISTOR; FXD; 213K 1% .125W F TUBULAR	24546	C4, T-0
A3R81	0698-6439		RESISTOR; FXD; 10M 5% .125W F TUBULAR	28480	0698-6439
A3R82	0757-0431		RESISTOR; FXD; 2.43K 1% .125W F TUBULAR	24546	C4-1/8-T0-2431-F
A3R83	0757-0274		RESISTOR; FXD; 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A3R84	0757-0274		RESISTOR; FXD 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A3R85	2100-3094		RESISTOR; VAR, TRMR 100K OHM 10% C	32997	3006P-1-104
A3R86	0757-0462		RESISTOR; FXD; 75K OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-7502 F
A3R87	0757-0394		RESISTOR; FXD; 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A3R88	2100-3253		RESISTOR; VAR, TRMR 50K OHM 10% C	32997	3389P-1-503
A3R89	0698-4525		RESISTOR; FXD; 187K 1% .125W F TUBULAR	24546	C4-1/8-T0-1873-F
A3R90	0684-5601		RESISTOR; FXD; 56 OHM 10% .25W CC	01121	CB5601

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3R81	0757-0429		RESISTOR 1.82K 1% .125W F TUBULAR	24546	C4-1/8-T0-1821-F
A3R82	0757-0280		RESISTOR 1K OHM 1% .125W F TUBULAR	28480	0757-0280
A3R83	0757-0280		RESISTOR 1K OHM 1% .125W F TUBULAR	28480	0757-0280
A3U1	1826-0187	2	IC, LINEAR	28480	1826-0187
A3U2	1826-0187		IC, LINEAR	28480	1826-0187
A3VR1	1902-3245		DIODE; ZENER; 21.5V VZ; .4W MAX PD	04713	SZ10939-278
A3VR2	1902-3245		DIODE; ZENER; 21.5V VZ .4W MAX PD	04713	SZ10939-278
A3VR3	1902-0049		DIODE; ZENER; 5.19V VZ; .4W MAX PD	28480	1902-0049
A3VR4	1902-0049		DIODE; ZENER; 5.19V VZ; .4W MAX PD	28480	1902-0049
A3VR5	1902-3070		DIODE; ZENER; 4.22V VZ; .4W MAX PD	04713	SZ10939-74
A3VR6	1902-3002		DIODE; ZENER; 2.37V VZ; .4W MAX PD	04713	SZ10939-2
A3A1	5081-3028	1	ASSY, SUBSTRATE (NOT SUPPLIED WITH A3, ORDER SEPARATELY)	28480	5081-3028
A4	01720-61626	1	CABLE ASSY, DELAY LINE	28480	01720-61626
A5	01720-66538	1	BOARD ASSY, VERT OUTPUT (DOES NOT INCLUDE A5A1, A5U1, A5U2)	28480	01720-66538
A5C1	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A5C2	0160-3507		CAPACITOR; FXD; 10PF ±5% 100WVDC	28480	0160-3507
A5C3	0160-2264	2	CAPACITOR; FXD; 20PF ±5% 500WVDC	28480	0160-2264
A5C4	0121-0467		CAPACITOR; VAR, TRMR, CER .9PF	28480	0121-0467
A5C5	0160-0160		CAPACITOR; FXD; MY 0.0082 UF 10% 200VDCW	56289	132P82292 PTS
A5C6	0121-0046	2	CAPACITOR; VAR; TRMR, CER, 8/35PF	73899	DV11P5350
A5C7	0121-0466		CAPACITOR; VAR; TRMR, CER 1/3PF	28480	0121-0466
A5C8	0140-0193		C: FXD MICA 82 PF 5%	28480	0140-0193
A5C9	0160-0297		CAPACITOR; FXD; 1200PF 10% 200WVDC	56289	192P12292 PTS
A5C10	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A5C11	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A5C12	0160-3443	1	CAPACITOR; FXD; .1UF +80–20% 50WVDC	28480	0160-3443
A5C13	0121-0467		CAPACITOR; VAR; TRMR, CER, .9PF	28480	0121-0467
A5C14	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A5C15	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A5C16	0180-0230		CAPACITOR; FXD; 1UF +–20% 50VDC TA SOLID	56289	150D105X0050A2
A5C17	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A5C18	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A5C19	0180-1735		CAPACITOR; FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A5C20	0160-2198		CAPACITOR; FXD; 20PF ±5% 300WVDC	72136	RDM15C200J3C
A5CR1	0122-0077	2	DIODE	28480	0122-0077
A5CR2	0122-0077		DIODE	28480	0122-0077
A5CR3	1901-0047		DIODE: SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A5CR4	1901-0047		DIODE: SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A5L1	9140-0098	2	COIL; FXD; MOLDED RF CHOKE, 2.2UH 10%	24226	15/221
A5L2	9140-0098		COIL; FXD; MOLDED RF CHOKE, 2.2UH 10%	24226	15/221
A5L3	9170-0029	8	CORE, MAG, SHIELDING BEAD, .138 OD .047	24226	56 590-65A2/4A
A5R1	0757-0288	1	RESISTOR; FXD; 30.1 OHM 1% .125W F	24546	C4-1/8-T0-30R1-F
A5R2	0684-1001	22	RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A5R3	0757-0276		RESISTOR; FXD; 61.9 OHM 1% .125W F	24546	C4-1/8-T0-61R2-F
A5R4	0757-0276		RESISTOR; FXD; 61.9 OHM 1% .125W F	24546	C4-1/8-T0-61R2-F
A5R5	0757-0424	1	RESISTOR; FXD; 1.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1101-F
A5R6	0698-7203	3	RESISTOR; FXD; 42.2 OHM 2% .05W F	24546	C3-1/8-T00-42R2-G
A5R7	0698-7203		RESISTOR; FXD; 42.2 OHM 2% .05W F	24546	C3-1/8-T00-42R2-G
A5R8	0698-3441		RESISTOR; FXD; 215 OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-215R-F
A5R9	0698-0084		RESISTOR 2.15K OHM 1% .125W METFLM	28480	0698-0084
A5R10	0757-0278	1	R: FXD METFLM 7.68K OHM 1% 1/8W	28480	0757-0278
A5R11	2100-0567	1	RESISTOR; VAR; TRMR, 2K OHM 10% C	73138	72PR2K
A5R12	0698-3132	2	RESISTOR; FXD; 261 OHM 1% .125W F	16299	C4-1/8-T0-2610-F
A5R13	0698-3150		RESISTOR 2.37K OHM 1% .125W METFLM	28480	0698-3150
A5R14	0757-0429		RESISTOR 1.82K OHM 1% .125W METFLM	28480	0757-0429
A5R15	0698-7236	1	RESISTOR; FXD; 1K 2% .05W F TUBULAR	24546	C3-1/8-T0-1001-G
A5R16	0757-0455	2	RESISTOR; FXD; 36.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-3652-F
A5R17	0757-0437		RESISTOR; FXD METFLM 4750 OHM 1% 1/8W	28480	0757-0437
A5R18	0757-0274		RESISTOR; FXD; 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A5R19	0757-0618	1	RESISTOR; FXD; 825 OHM 1% .5W F TUBULAR	30983	MF7C-1/2-T0-825R-F
A5R20	0757-0798	1	RESISTOR; FXD; 110 OHM 1% .5W F TUBULAR	30983	MF7C-1/2-T0-111-F
A5R21	0698-7203		RESISTOR, FXD, 42.2 OHM 2% .05W F	24546	C3-1/8-T00-42R2-G
A5R22	2100-2061	1	RESISTOR; VAR; TRMR, 200 OHM 10% C	73138	2100-2061
A5R23	2100-2060		R: VAR FLM 50 OHM 20% LIN 1/2W	28480	2100-2060
A5R24	0757-0398		RESISTOR; FXD; METFLM 75 OHM 1% 1/8W	28480	0757-0398
A5R25	0757-0398		RESISTOR; FXD; METFLM 75 OHM 1% 1/8W	28480	0757-0398
A5R26	0698-3394	1	RESISTOR; FXD; 31.6 OHM 1% .5W F TUBULAR	19701	MF7C-1/2-T0-31R6-F
A5R27	0757-0437	1	RESISTOR; FXD METFLM 4750 OHM 1% 1/8W	28480	0757-0437
A5R28	0761-0025	3	RESISTOR; FXD; METOX 120 OHM 5% 1W	28480	0761-0025
A5R29	0761-0025		RESISTOR; FXD; METOX 120 OHM 5% 1W	28480	0761-0025
A5R30	0761-0025		RESISTOR; FXD; METOX 120 OHM 5% 1W	28480	0761-0025
A5RT1	0837-0113	1	THERMISTOR, DISC TYPE 100K OHM 10%	28480	0837-0113
A5U1	5081-3022	1	ASSY, SUBSTRATE (NOT SUPPLIED W/A5, ORDER SEPARATELY)	28480	5081-3022
A5U2	5081-3024	1	ASSY, SUBSTRATE (NOT SUPPLIED W/A5, ORDER SEPARATELY)	28480	5081-3024
A5VR1	1902-0025	2	DIODE; ZENER; 10V VZ; .4W MAX PD	04713	SZ10939-182

See Introduction to this section for ordering information

Table 3-2. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A6VR2	1902-3069		DIODE; ZNR; 1.83V 5% DO-7 PD=.4 TC=.061%	15818	CD35586
A6XU1	1200-0438	3	SOCKET, ELEC, IC 16 CONT DIP SLDR TERM	24995	583029-1
A6A1	5081-3021	1	ASSY, SUBSTRATE (NOT SUPPLIED W/A6, ORDER SEPARATELY)	28480	5081-3021
A6	01720-66534	1	BOARD ASSY, INT TRIGGER SWITCH	28480	01720-66534
A6CR1	1901-0040	25	DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A6J1	1251-0628	1	CONNECTOR, POST TYPE 10-FEMALE CONTACT	27264	09-52-3103
A6J2	1251-3472	2	CONNECTOR, 8-CONT; FEM; P[illegible] TYPE	27264	09-52-3081
A6R1	0684-2731	2	RESISTOR; FXD; 27K 10% .25W CC TUBULAR	01121	CB2731
A6R2	0684-2731		RESISTOR; FXD; 27K 10% .25W CC TUBULAR	01121	CB2731
A6S1	3101-0658	1	SWITCH	28480	3101-0658
A7	01720-66535	1	BOARD ASSY, VERTICAL DISPLAY SWITCH	28480	01720-66535
A7C1	0180-0230		CAPACITOR; FXD; 1UF ±20% 50VDC TA SOLID	56289	150D106X0050A2
A7C2	0180-0230		CAPACITOR; FXD; 1UF ±20% 50VDC TA SOLID	56289	150D106X0050A2
A7C3	0160-2209		CAPACITOR; FXD; 360PF ±5% 300WVDC	28480	0160-2209
A7C4	0160-3470		CAPACITOR; FXD; .01UF +80-20% 50WVDC	28480	0160-3470
A7C5	0160-2204		CAPACITOR; FXD; 100PF 5% 300WVDC	72136	RDM15F101J3C
A7CR1	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A7CR2	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A7J1	1251-3472		CONNECTOR; 8-CONT; FEM; POST TYPE	27264	09-52-3081
A7P1	1251-0629	1	CONNECTOR; 10-CONT; MALE; POST TYPE	27264	09-64-1103
A7Q1	1854-0071	10	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7Q2	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A7R1	0698-3150	1	RESISTOR; FXD; 2.37K 1% .125W F TUBULAR	16299	C4-1/8-T0-2371-F
A7R2	0757-0441	2	RESISTOR; FXD; 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F
A7R3	0757-0273	2	RESISTOR; FXD; 3.01K 1% .125W F TUBULAR	24546	C4-1/8-T0-3011-F
A7R4	0757-0407	3	RESISTOR; FXD; 200 OHM 1% .125W F	24546	C4-1/8-T0-201-F
A7R5	0757-0398	4	RESISTOR; FXD; 75 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-75R0-F
A7R6	0757-0398		RESISTOR; FXD; 75 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-75R0-F
A7R7	0757-0809	1	RESISTOR; FXD; 332 OHM 1% .5W F TUBULAR	30983	MF7C-1/2-T0-332R-F
A7R8	0757-0740	2	RESISTOR; FXD; 2.21K 1% .25W F TUBULAR	24546	C5-1/4-T0-2211-F
A7R9	0757-0740		RESISTOR; FXD; 2.21K 1% .25W F TUBULAR	24546	C5-1/4-T0-2211-F
A7R10	0683-1825	3	RESISTOR; FXD; 1.8K 5% .25W CC TUBULAR	01121	CB1825
A7R11	0684-2211		RESISTOR 220 OHM 10% .25W CC	01121	CB2211
A7R12	0684-2211		RESISTOR 220 OHM 10% .25W CC	01121	CB2211
A7S1	3101-0661	1	SWITCH	28480	3101-0661
A7U1	1820-0102	1	INTEGRATED CIRCUIT, DGTL, ECL J-K FLIP	04713	MC1013P
A7U2	1820-0142	1	INTEGRATED CIRCUIT, DGTL, ECL DUAL 4	04713	MC1004P
A7U3	1811-0001	6	IC; LIN; TRANSISTOR ARRAY	02735	CA3046
A7XU1	1200-0441	8	SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	24995	583527-1
A7XU2	1200-0441		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	24995	583527-1
A7XU3	1200-0441		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	24995	583527-1
A8	01720-66530	1	BOARD ASSY, HORIZ SWP (DOES NOT INDLUDE A8U2 AND A8U5.)	28480	01720-66530
A8C1	0150-0070	2	CAPACITOR; FXD; .02UF ±20% 500WVDC	28480	0150-0070
A8C2	0160-3446		CAPACITOR; FXD; 220PF ±10% 1000WVDC	28480	0160-3446
A8C3	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C4	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C5	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C6			DELETED		
A8C7	0160-2246	2	CAPACITOR; FXD; 3.6PF ±.25PF 500WVDC	28480	0160-2243
A8C8	0160-3318	2	CAPACITOR; FXD; .047UF ±10% 100WVDC CER	61637	K06SK473K
A8C9	0160-3451	4	CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C10	0160-3569	2	CAPACITOR; FXD; 27PF ±5% 100WVDC	28480	0160-3569
A8C11	0160-3318	5	CAPACITOR; FXD .047UF ±10% 100WVDC CER	61637	K06SK473K
A8C12	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C13	0160-2265		CAPACITOR; FXD; 22PF ±5% 500WVDC	28480	0160-2265
A8C14	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C15	0160-0168	1	CAPACITOR; FXD; .1UF ±10% 200WVDC	56289	292P10492
A8C16	0180-0197	20	CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A8C17	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C18	0160-2257	4	CAPACITOR; FXD; 10PF ±5% 500WVDC	28480	0160-2257
A8C19	0160-3446		CAPACITOR; FXD; 220PF ±10% 1000WVDC	28480	0160-3446
A8C20	0150-0070		CAPACITOR; FXD; .02UF ±20% 500WVDC	28480	0150-0070
A8C21	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C22	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C23	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C24	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C25	0160-2246		CAPACITOR; FXD; 3.6PF ±.25PF 500WVDC	28480	0160-2246
A8C26	0160-3318		CAPACITOR; FXD; .047UF ±10% 100WVDC CER	28480	0160-3318
A8C27			NOT USED		
A8C28	0160-3569		CAPACITOR; FXD; 27PF ±5% 100WVDC	28480	0160-3569
A8C29	0160-3318		CAPACITOR; FXD; .047UF ±10% 100WVDC CER	61637	K06SK473K
A8C30	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C31	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C32	0160-2257		CAPACITOR; FXD; 10PF ±5% 500WVDC	28480	0160-2257
A8C33	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C34	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C35	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C36	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C37	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C38	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451

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
A8C39	0160-2265		CAPACITOR; FXD; 22PF ±5% 500WVDC	28480	0160-2265
A8C40	0160-2265		CAPACITOR; FXD; 22PF ±5% 500WVDC	28480	0160-2265
A8C41	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C42	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C43	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A8C44	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A8C45	0121-0046		CAPACITOR; VAR; TRMR, CER, 9/35PF	73899	DV11PS35D
A8C46	0160-2257		CAPACITOR; FXD; 10PF ±5% 500WVDC	28480	0160-2257
A8C47	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C48	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C49	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A8C50	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C51	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C52	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A8C53	0160-3451		CAPACITOR; FXD .01UF +80-20% 100WVDC	28480	0160-3451
A8C54	0150-0115		CAPACITOR; FXD; 27PF ±10% 500WVDC	28480	0150-0115
A8C55			DELETED		
A8C56	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	56289	C0238101F1032S25-CDH
A8C57	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	56289	C0238101F1032S25-CDH
A8C58	0160-2202		CAPACITOR; FXD; 75PF ±5% 300WVDC MICA	28480	0160-2202
A8CR1	1901-0376	2	DIODE; GEN PRP; 35V MAX VRM 50MA	28480	1901-0376
A8CR2	1901-0047	10	DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR3	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR4	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR5	1910-0016	2	DIODE; SWITCHING; 60V MAX VRM 50MA	28480	1910-0016
A8CR6	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR7	1901-0376		DIODE; GEN PRP; 35V MAX VRM 50MA	28480	1901-0376
A8CR8	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR9	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR10	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR11	1910-0016		DIODE; SWITCHING; 60V MAX VRM 50MA	28480	1910-0016
A8CR12	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR13	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8CR14	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A8J1	01722-27601	3	CONNECTOR, PC EDGE, 10-CONT, DIP SOLDER	28480	01722-27601
A8J2	01722-27601		CONNECTOR, PC EDGE, 10-CONT, DIP SOLDER	28480	01722-27601
A8J3	01722-27601		CONNECTOR, PC EDGE, 10-CONT, DIP SOLDER	28480	01722-27601
A8J4	1250-0083	1	CONNECTOR-COAX, BNC, 50 OHM FEMALE	24931	28JR-130-1
A8L1	01921-61303	2	BEAD	28480	01921-61303
A8L2	9170-0029		CORE; MAG; SHIELDING BEAD, .138 OD .047	02114	56-590-65A2/4A
A8L3	9140-0115	4	COIL; FXD; MOLDED RF CHOKE, 22UH 10%	82142	22-4422-8K
A8L4	01921-61303		BEAD	28480	01921-61303
A8L5	9170-0029		CORE; MAG; SHIELDING BEAD, .138 OD .047	02114	56-590-65A2/4A
A8L6	9140-0115		COIL; FXD; MOLDED RF CHOKE, 22UH 10%	82142	22-4422-8K
A8L7	9140-0138	1	COIL; FXD; MOLDED RF CHOKE; 180UH 5%	24226	15/183
A8L8	9100-2256		COIL; FXD; MOLDED RF CHOKE, .56UH 10%	24226	10/560
A8P1	1251-3475	4	CONNECTOR; 10-CONT, MALE, POST TYPE	28264	1251-3475
A8P2	1251-3072	1	CONNECTOR; 12-CONT; MALE, POST TYPE	27264	09-56-1121(2183-12A)
A8P3	1251-3319	3	CONNECTOR; 10-CONT, MALE, POST TYPE	27264	09-64-1101(A2402-10A)
A8P4	1251-3197	1	CONNECTOR; 12 CONT; MALE, POST TYPE	27264	09-60-1121(2403-12A)
A8P5	1251-3276	1	CONNECTOR; 6-CONT, MALE, POST TYPE	27264	09-60-1061(A2403-6A)
A8Q1	1855-0061		TRANSISTOR; JFET N-CHAN D-MODE SI	01295	2N5245
A8Q2	1854-0646	6	TRANSISTOR NPN SI PD=200MW FT=1.4GHZ	28480	1854-0646
A8Q3	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A8Q4	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q5	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q6	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A8Q7	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q8	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q9	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q10	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q11	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A8Q12	1855-0061		TRANSISTOR; JFET N-CHAN D-MODE SI	01295	2N5245
A8Q13	1854-0646		TRANSISTOR NPN SI PD=200MW FT=1.4GHZ	28480	1854-0646
A8Q14	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A8Q15	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q16	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q17			DELETED		
A8Q18	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q19	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q20	1854-0092	8	TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A8Q21	1854-0092		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A8Q22	1854-0092		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A8Q23	1854-0092		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A8Q24	1854-0092		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A8Q25	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A8Q26	1853-0015		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A8Q27	1853-0015		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A8Q28	1853-0015		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A8Q29	1853-0015		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015

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
A8Q30	1854-0092		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A8Q31	1854-0092		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A8Q32	1854-0092		TRANSISTOR NPN SI PD=200MW FT=600MHZ	28480	1854-0092
A8Q33	1853-0015		TRANSISTOR PNP SI PD=200MW FT=600MHZ	28480	1853-0015
A8R1	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A8R2	0684-1021		RESISTOR 1K 10% .25W CC TUBULAR	01121	CB1021
A8R3	0757-0468	4	RESISTOR; FXD; 909K 1% .125W F TUBULAR	19701	MFF-1/8-T-1
A8R4	0757-0465	4	RESISTOR; FXD; 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A8R5	0757-0468		RESISTOR; FXD; 909K 1% .125W F TUBULAR	19701	MFF-1/8-T-1
A8R6	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A8R7	0684-1061	3	RESISTOR; FXD; 10M 10% .25W CC TUBULAR	01121	CB1061
A8R8	0684-3321	9	RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R9	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A8R10	0757-0284	2	RESISTOR 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A8R11	0757-0487	2	RESISTOR 825K 1% .125W F TUBULAR	28480	0757-0487
A8R12	0757-0464		RESISTOR 90.9K 1% .125W F TUBULAR	24546	C4-1/8-T0-9002-F
A8R13	0757-0468	2	RESISTOR 909K 1% .125W F TUBULAR	28480	0757-0468
A8R14	0684-2221	17	RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R15	0757-0486	2	RESISTOR 681K 1% .125W F TUBULAR	28480	0757-0486
A8R16	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R17	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R18	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A8R19	0684-2211		RESISTOR; FXD; 220 OHM 10% .25W CC	01121	CB2211
A8R20	0684-2721	2	RESISTOR; FXD; 2.7K 10% .25W CC TUBULAR	01121	CB2721
A8R21	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A8R22	0683-2705	2	RESISTOR; FXD; 27 OHM 5% .25W CC TUBULAR	01121	CB2705
A8R23	0757-0734	2	RESISTOR; FXD; 1.21K 1% .25W F TUBULAR	24546	C5-1/4-T0-1211-F
A8R24	0757-0416	6	RESISTOR; FXD; 511 OHM 1% .125W F	24546	C4-1/8-T0-511R-F
A8R25	0698-3431	4	RESISTOR; FXD; 23.7 OHM 1% .125W F	03888	PME55-1/8-T0-23R7-F
A8R26	0698-3431		RESISTOR; FXD; 23.7 OHM 1% .125W F	03888	PME55-1/8-T0-23R7-F
A8R27	0757-0429	5	RESISTOR; FXD; 1.82K 1% .125W F TUBULAR	24546	C4-1/8-T0-1821-F
A8R28	0757-0404	2	RESISTOR; FXD; 130 OHM 1% .125W F	24546	C4-1/8-T0-131-F
A8R29	0684-0271		RESISTOR; FXD; 2.7 OHM 10% .25W CC	01121	CB27G1
A8R30	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A8R31	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R32	0698-3153	4	RESISTOR; FXD; 3.83K 1% .125W F TUBULAR	16299	C4-1/8-T0-3831-F
A8R33	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A8R34	0757-0409	5	RESISTOR; FXD; 274 OHM 1% .125W F	24546	C4-1/8-T0-274R-F
A8R35	0684-3901	6	RESISTOR; FXD; 39 OHM 10% .25W CC	01121	CB3901
A8R36	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A8R37	0757-0427	6	RESISTOR; FXD; 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A8R38	0684-2211		RESISTOR; FXD; 220 OHM 10% .25W CC	01121	CB2211
A8R39	0684-3311	14	RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A8R40	0684-3901		RESISTOR; FXD; 39 OHM 10% .25W CC	01121	CB3901
A8R41	0757-0410		RESISTOR; FXD; 301 OHM 1% .125W F	24546	C4-1/8-T0-301R-F
A8R42	0698-3153		RESISTOR; FXD; 3.83K 1% .125W F TUBULAR	16299	C4-1/8-T0-3831-F
A8R43	0757-0409		RESISTOR; FXD; 274 OHM 1% .125W F	24546	C4-1/8-T0-274R-F
A8R44	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R45	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A8R46	0757-0281	1	RESISTOR 2.74K 1% .125W F TUBULAR	24546	C4-1/8-T0-2741-F
A8R47	2100-0554	4	RESISTOR; VAR; TRMR, 500 OHM 10% C	73138	72PR500K
A8R48	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A8R49	0757-0274		RESISTOR; FXD; 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A8R50	0757-0421	5	RESISTOR; FXD; 825 OHM 1% .125W F	24546	C4-1/8-T0-826R-F
A8R51	0757-0260		RESISTOR 1K 1% .125W F	24546	C4-1/8-T0-1001-F
A8R52	0684-2211		RESISTOR; FXD; 220 OHM 10% .25W CC	01121	CB2211
A8R53	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A8R54	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A8R55	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A8R56	0757-0419		RESISTOR; FXD; 681 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-681R-F
A8R57	0684-1031		RESISTOR 10K 10% .25W FC	01121	CB1031
A8R58	0698-0085	2	RESISTOR; FXD; 2.61K 1% .125W F TUBULAR	16299	C4-1/8-T0-2611-F
A8R59	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A8R60			DELETED		
A8R61	0757-0468		RESISTOR; FXD; 909K 1% .125W F TUBULAR	19701	MFF-1/8-T-1
A8R62	0757-0465		RESISTOR; FXD; 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A8R63	0757-0464		RESISTOR 90.9K 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A8R64	0757-0468		RESISTOR; FXD; 909K 1% .125W F TUBULAR	19701	MFF-1/8-T-1
A8R65	0684-1061		RESISTOR; FXD; 10M 10% .25W CC TUBULAR	01121	CB1061
A8R66	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A8R67	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R68	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A8R69	0757-0284		RESISTOR 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A8R70	0757-0487		RESISTOR 825K 1% .125W F TUBULAR	28480	0757-0487
A8R71	0757-0468		RESISTOR 909K 1% .125W F TUBULAR	28480	0757-0468
A8R72	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R73	0757-0486		RESISTOR 681K 1% .125W F TUBULAR	28480	0757-0486
A8R74	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R75	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R76	0684-2211		RESISTOR; FXD; 220 OHM 10% .25W CC	01121	CB2211

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8R77	0683-2705		RESISTOR; FXD; 27 OHM 5% .25W CC TUBULAR	01121	CB2705
A8R78	0684-2721		RESISTOR; FXD; 2.7K 10% .25W CC TUBULAR	01121	CB2721
A8R79	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A8R80	0757-0734		RESISTOR; FXD; 1.21K 1% .25W F TUBULAR	24546	C5-1/4-T0-1211-F
A8R81	0757-0416		RESISTOR; FXD; 511 OHM 1% .125W F	24546	C4-1/8-T0-511R-F
A8R82	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A8R83	0698-3431		RESISTOR; FXD; 23.7 OHM 1% .125W F	03888	PME55-1/8-T0-23R7-F
A8R84	0698-3431		RESISTOR; FXD; 23.7 OHM 1% .125W F	03888	PME55-1/8-T0-23R7-F
A8R85	0684-3901		RESISTOR 39 OHM 10% .25W CC TUBULAR	01121	CB3901
A8R86	0684-0271		RESISTOR; FXD; 2.7 OHM 10% .25W CC	01121	CB27G1
A8R87	0757-0409		RESISTOR; FXD; 274 OHM 1% .125W F	24546	C4-1/8-T0-274R-F
A8R88	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A8R89	2100-0654		RESISTOR; VAR; TRMR, 500 OHM 10% C	73138	72PR500K
A8R90	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R91	0698-3153		RESISTOR; FXD; 3.83K 1% .125W F TUBULAR	16299	C4-1/8-T0-3831-F
A8R92	0684-3901		RESISTOR; FXD; 39 OHM 10% .25W CC	01121	CB3901
A8R93	0684-2211		RESISTOR; FXD; 220 OHM 10% .25W CC	01121	CB2211
A8R94	0684-2211		RESISTOR; FXD; 220 OHM 10% .25W CC	01121	CB2211
A8R95	0757-0834	2	RESISTOR; FXD; 5.62K 1% .5W F TUBULAR	30983	MF7C-1/2-T0-5621-F
A8R96	0757-0419		RESISTOR; FXD; 681 OHM 1% .125W F	24546	C4-1/8-T0-681R-F
A8R97	0757-0417	2	RESISTOR; FXD; 562 OHM 1% .125W F	24546	C4-1/8-T0-562R-F
A8R98	0698-0084	1	RESISTOR; FXD; 2.15K 1% .125W F TUBULAR	16299	C4-1/8-T0-2151-F
A8R99	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R100	0684-3901		RESISTOR; FXD; 39 OHM 10% .25W CC	01121	CB39K
A8R101	0684-1031		RESISTOR; FXD; 10K 10% .25W CC TUBULAR	01121	CB1031
A8R102	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R103	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A8R104			DELETED		
A8R105	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R106	0757-0428	3	RESISTOR; FXD; 1.62K 1% .125W F TUBULAR	24546	C4-1/8-T0-1621-F
A8R107	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R108	0698-6612		RESISTOR; FXD; 2K .1% .125W F TUBULAR	19701	MF4C-1/8-T2-2001-B
A8R109	0698-6612		RESISTOR; FXD; 2K .1% .125W F TUBULAR	19701	MF4C-1/8-T2-2001-B
A8R110	0698-3441		RESISTOR; FXD; 215 OHM 1% .125W F	16299	C4-1/8-T0-215R-F
A8R111	0757-0417		RESISTOR; FXD; 562 OHM 1% .125W F	24546	C4-1/8-T0-562R-F
A8R112	0757-0420	1	RESISTOR; FXD; 750 OHM 1% .125W F	24546	C4-1/8-T0-751-F
A8R113	0757-0428		RESISTOR; FXD; 1.62K 1% .125W F TUBULAR	24546	C4-1/8-T0-1621-F
A8R114	0698-7401		RESISTOR; FXD; 1.71K .1% .125W F TUBULAR	30983	MF4C-1/8-T2-1711-B
A8R115	0698-6612	1	RESISTOR; FXD; 2K .1% .125W F TUBULAR	19701	MF4C-1/8-T2-2001-B
A8R116	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A8R117	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R118	0683-3901	1			
A8R119	0698-3136	2	RESISTOR; FXD; 17.8K 1% .125W F TUBULAR	16299	C4-1/8-T0-1782-F
A8R120	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A8R121	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R122	0684-3901		RESISTOR; FXD; 39 OHM 10% .25W CC	01121	CB3901
A8R123	0698-3445	1	RESISTOR; FXD; 348 OHM 1% .125W F	16299	C4-1/8-T0-348R-F
A8R124	0757-0406	1	RESISTOR; FXD; 162 OHM 1% .125W F	24546	C4-1/8-T0-162R-F
A8R125	0684-3901		RESISTOR; FXD; 39 OHM 10% .25W CC	01121	CB3901
A8R126	0684-3321		RESISTOR; FXD; 3.3K 10% .25W CC TUBULAR	01121	CB3321
A8R127	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A8R128	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A8R129	0757-0278	1	RESISTOR; FXD; 1.78K 1% .125W F TUBULAR	24546	C4-1/8-T0-1781-F
A8R130	0757-0422	1	RESISTOR; FXD; 909 OHM 1% .125W F	24546	C4-1/8-T0-909R-F
A8R131	0684-1031		RESISTOR; FXD; 10K 10% .25W CC TUBULAR	01121	CB1031
A8R132	0757-0447		RESISTOR; FXD; 16.2K 1% .125W F TUBULAR	24546	C4-1/8-T0-1622-F
A8R133	2100-0654		RESISTOR; VAR; TRMR, 500 OHM 10% C	73138	72PR500K
A8R134	0757-0404		RESISTOR; FXD; 130 OHM 1% .125W F	24546	C4-1/8-T0-131-F
A8R135	0757-0407		RESISTOR; FXD; 200 OHM 1% .125W F	24546	C4-1/8-T0-201-F
A8R136	0757-0401	6	RESISTOR; FXD; 100 OHM 1% .125W F	24546	C4-1/8-T0-101-F
A8R137	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A8R138	0684-1031		RESISTOR; FXD; 10K 10% .25W CC TUBULAR	01121	CB1031
A8R139	0757-0455		RESISTOR; FXD; 36.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-3652-F
A8R140	0698-0085	3	RESISTOR 2.61K OHM 1% .125W F TUBULAR	16299	C4-1/8-T0-2611-F
A8R141	0757-0435	3	RESISTOR 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A8R142	0757-0436	4	RESISTOR; FXD; 4.32K 1% .125W F TUBULAR	24546	C4-1/8-T0-4321-F
A8R143	0757-0440	2	RESISTOR; FXD; 7.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-7501-F
A8R144	0757-0451	6	RESISTOR; FXD; 24.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-2432-F
A8R145	0757-0451		RESISTOR; FXD; 24.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-2432-F
A8R146	2100-0658	1	RESISTOR; VAR; TRMR, 100 OHM 10% C	73138	72PR100K
A8R147	0757-0284	6	RESISTOR; FXD; 150 OHM 1% .125W F	24546	C4-1/8-T0-151-F
A8R148	2100-3211		RESISTOR; VAR; TRMR, 1K OHM 10% C	32997	3389P-1-102
A8R149	0757-0427		RESISTOR; FXD; 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A8R150	0757-0451		RESISTOR; FXD; 24.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-2432-F
A8R151	0757-0451		RESISTOR; FXD; 24.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-2432-F
A8R152	0757-0124	1	RESISTOR; FXD; 39.2K 1% .125W F TUBULAR	24546	C5-1/4-T0-3922-F
A8R153	2100-3250		RESISTOR; VAR; TRMR, 50K OHM 10% C	32997	3389P-1-503
A8R154	0757-0124	1	RESISTOR; FXD; 39.2K 1% .125W F TUBULAR	24546	C5-1/4-T0-3922-F
A8R155	0757-0410		RESISTOR; FXD; 301 OHM 1% .125W F	24546	C4-1/8-T0-301R-F
A8R156	0757-0410		RESISTOR; FXD; 301 OHM 1% .125W F	24546	C4-1/8-T0-301R-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
A8R157	0757-0398		RESISTOR; FXD; 75 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-75R0-F
A8R158	0757-0398		RESISTOR; FXD; 75 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-75R0-F
A8R159	0757-0417		RESISTOR; FXD; 562 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-562R-F
A8R160	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A8R161	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A8R162	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A8R163	0684-1221	3	RESISTOR; FXD; 1.2K 10% .25W CC TUBULAR	01121	CB1221
A8R164	0698-3439		RESISTOR; FXD; 178 OHM 1% .125W F TUBULAR	28480	0698-3439
A8R165	0757-0416	2	RESISTOR; FXD; 511 OHM 1% .125W	28480	0757-0416
A8R166	0757-0416		RESISTOR; FXD; 511 OHM 1% .125W	28480	0757-0416
A8R167	0757-0282		RESISTOR; FXD; 221 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-221R-F
A8R168			DELETED		
A8R169	0757-0398		RESISTOR; FXD; 75 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-1211-F
A8R170	0757-0480		RESISTOR 432K 1% .125W F TUBULAR	28480	0757-0480
A8R171	0757-0480		RESISTOR 432K 1% .125W F TUBULAR	28480	0757-0480
A8R172	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A8R173	0684-1021		RESISTOR; FXD; 1K 10% .25W	01121	CB1021
A8R174	0683-2225		RESISTOR 2 X OHM 5% .25W CC	01121	CB2225
A8R175	0683-5615		RESISTOR 560 OHM 5% .25W CC	01121	CB5615
A8R178	0684-1061		RESISTOR 1M OHM 10% .25W CC	01121	CB1061
A8R179	0684-1011		RESISTOR 100 OHM 10% .25W CC TUBULAR	01121	CB1011
A8S1	3101-0659	1	SWITCH	28480	3101-0659
A8U1	1826-0066	5	IC; LIN; OPERATIONAL AMPLIFIER	07263	776HC
A8U2	5061-3019	2	ASSY, SUBSTRATE (NOT SUPPLIED W/A8, ORDER SEPARATELY)	28480	5061-3019
A8U3	1821-0001		IC; LIN; TRANSISTOR ARRAY	02735	CA3046
A8U4	1826-0066		IC; LIN; OPERATIONAL AMPLIFIER	07263	776HC
A8U5	5061-3019		ASSY, SUBSTRATE (NOT SUPPLIED W/A8, ORDER SEPARATELY)	28480	5061-3019
A8U6	1821-0001		IC; LIN; TRANSISTOR ARRAY	02735	CA3046
A8U7	1821-0001		IC; LIN; TRANSISTOR ARRAY	02735	CA3046
A8VR1	1902-3048	4	DIODE; ZENER; 3.48V VZ; .4W MAX PD	04713	SZ 10939-50
A8VR2	1902-3048		DIODE; ZENER; 3.48V VZ; .4W MAX PD	04713	SZ 10939-50
A8VR3	1902-3048		DIODE; ZENER; 3.48V VZ; .4W MAX PD	04713	SZ 10939-50
A8VR4	1902-3048		DIODE; ZENER; 3.48V VZ; .4W MAX PD	04713	SZ 10939-50
A8VR5	1902-3104	1	DIODE; ZENER; 5.62V VZ; .4W MAX PD	04713	SZ 10939-110
A8VR6	1902-0025		DIODE; ZENER; 10V VZ; .4W MAX PD	04713	SZ 10939-182
A8W1	01720-61620	1	CABLE ASSY, COAX	28480	01720-61620
A8XU1	1200-0763	5	SOCKET, ELEC, IC 8-CONT DIP SLDR TERM	71785	133-98-92-061
A8XU2	1200-0438		SOCKET, ELEC, IC 16-CONT DIP SLDR TERM	24995	583529-1
A8XU3	1200-0441		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	24995	583527-1
A8XU4	1200-0763		SOCKET, ELEC, IC 8-CONT DIP SLDR TERM	71785	133-98-92-061
A8XU5	1200-0438		SOCKET, ELEC, IC 16-CONT DIP SLDR TERM	24995	583529-1
A8XU6	1200-0441		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	24995	583527-1
A8XU7	1200-0441		SOCKET, ELEC, IC 14-CONT DIP SLDR TERM	24995	583527-1
A9	01720-66547	1	BOARD ASSY, DELAYED SWEEP SWITCH	28480	01720-66547
A9C1	0150-0116		CAPACITOR; FXD; 47PF ±10% 500WVDC	16299	C4-1/8-T0-178R-F
A9C2	0121-0496	6	CAPACITOR-VAR 1.9/15.7 PF	28480	0121-0496
A9C3	0150-0063	1	CAPACITOR; FXD; 10PF ± .5% 500WVDC	28480	0150-0063
A9C4	0140-0218	4	CAPACITOR; FXD; 160PF ±2% 300WVDC	72136	DM15F161G0300WV1CR
A9C5	0140-0218		CAPACITOR; FXD; 160PF ±2% 300WVDC	72136	DM15F161G0300WV1CR
A9C6	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A9C7	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A9C8	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A9C9	0180-0197		CAPACITOR; FXD; 2.2UF ± 10% 20VDC TA	56289	150D225X9020A2
A9C10	0121-0496		CAPACITOR-VAR 1.9/15.7 PF	28480	0121-0496
A9C11	0160-2261	3	CAPACITOR; FXD; 15PF ± 5% 500WVDC	28480	0160-2261
A9C12	0121-0496		CAPACITOR-VAR 1.9/15.7 PF	28480	0121-0496
A9C13	0160-0974	2	CAPACITOR; FXD 80PF ±2% 300WVDC	28480	0160-0974
A9C14	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A9C15	0160-3324	2	CAPACITOR; FXD; 1UF ±5% 100WVDC	28480	0160-3324
A9C16	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A9C17	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A9C18	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A9C19	0160-2250		CAPACITOR; FXD; 5.1PF ±.25PF 500WVDC CER	72982	301-000-C0H0-579C
A9CR1	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A9CR2	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A9CR3	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A9L1	9140-0115		COIL; FXD; MOLDED RF CHOKE, 22UH 10%	82142	22-4422-8K
A9L2	9170-0029		CORE; MAG SHIELDING BEAD	02114	56-590-65A2/4A
A9L3	9170-0029		CORE, MAG SHIELDING BEAD	02114	56-590-65A2/4A
A9L4	9170-0029		CORE, MAG SHIELDING BEAD	02114	56-590-65A2/4A
A9L5	9170-0029		CORE, MAG SHIELDING BEAD	02114	56-590-65A2/4A
A9MP1	1460-1148	2	SPRING; TORSION	[illegible]	OBD
A9MP2	01840-22502	2	ROLLER; DETENT	28480	01840-22502
A9Q1	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9Q2	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9Q3	1853-0244	2	TRANSISTOR PNP SI PD=310MW FT=500MHZ	28480	1853-0244
A9Q4	1855-0081		TRANSISTOR; JFET N-CHAN D-MODE SI	01295	2N5245
A9Q5	1854-0019	5	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A9Q6	1854-0678		TRANSISTOR NPN SI TO-92 PD=625MW	04713	MPS-H17
A9Q7	1854-0691	2	TRANSISTOR NPN SI	28480	1854-0691

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
A9Q8	1853-0036	1	TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A9Q9	1854-0691		TRANSISTOR NPN SI	28480	1854-0691
A9R1	0698-3446	1	RESISTOR; FXD; 383 OHM 1% .125W F	16299	C4-1/8-T0-383R-F
A9R2	0757-0280		RESISTOR; FXD; 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A9R3	0757-0288	2	RESISTOR; FXD; 9.09K 1% .125W F TUBULAR	30983	MF4C-1/8-T0-9091-F
A9R4	0684-2201	4	RESISTOR; FXD; 22 OHM 10% .25W CC	01121	CB2201
A9R5	0698-0082	1	RESISTOR; FXD; 464 OHM 1% .125W F	16299	C4-1/8-T0-4640-F
A9R6	0757-0420	1	RESISTOR; FXD; 750 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-751R-F
A9R7	0683-1035	2	RESISTOR; FXD; 10K 5% .25W CC TUBULAR	01121	CB1035
A9R8	0684-5601		RESISTOR; FXD; 56 OHM 10% .25W CC	01121	CB5601
A9R9	0684-5601		RESISTOR; FXD; 56 OHM 10% .25W CC	01121	CB5601
A9R10	0667-1821	2	RESISTOR; FXD; 1.8K 10% .5W CC TUBULAR	01121	EB1821
A9R11	0684-4721	2	RESISTOR; FXD; 4.7K 10% .25W CC TUBULAR	01121	CB4721
A9R12	0687-3321	2	RESISTOR; FXD; 3.3K 10% .5W CC TUBULAR	01121	EB3321
A9R13	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A9R14	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A9R15	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A9R16	0687-2721	2	RESISTOR; FXD; 2.7K 10% .5W CC TUBULAR	01121	EB2721
A9R17	0698-6450	2	RESISTOR; FXD; 2.5K .1% .125W F TUBULAR	03888	PME55-T-2
A9R18	0698-5449	2	RESISTOR; FXD; 5K .1% .125W F TUBULAR	30983	MF4C-1/8-T2-5001-B
A9R19	0698-6360	2	RESISTOR; FXD; 10K .1% .125W F TUBULAR	19701	MF4C-1/8-T9-1002-B
A9R20	0698-6942	2	RESISTOR; FXD; 25K .1% .125W F TUBULAR	19701	MF4C-1/8-T2-2502-B
A9R21	0698-5450	2	RESISTOR; FXD; 50K .1% .125W F TUBULAR	30983	MF4C-1/8-T2-5002-B
A9R22	0698-4158	2	RESISTOR; FXD; 100K .1% .125W F TUEULAR	19701	MF4C-1/8-T2-1003-B
A9R23	0757-0427		RESISTOR; FXD; 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A9R24	0684-5601		RESISTOR; FXD; 56 OHM 10% .25W CC	01121	CB5601
A9R25	0684-4751	3	RESISTOR; FXD; 4.7M 10% .25W CC TUBULAR	01121	CB4751
A9R26	0757-0427		RESISTOR; FXD; 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A9R27	0757-0426		RESISTOR; FXD; 1.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-1301-F
A9R28	0757-0435		RESISTOR; FXD; 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A9R29	0698-0085		RESISTOR; FXD; 2.61K 1% .125W F TUBULAR	16299	C4-1/8-T0-2611-F
A9R30	2100-3056	5	RESISTOR; VAR; TRMR, 5K OHM 10% C	32997	3006P-1-502
A9R31	2100-3056		RESISTOR; VAR; TRMR, 5K OHM 10% C	32997	3006P-1-502
A9R32	0757-0439	1	RESISTOR; FXD; 6.81K 1% .125W F TUBULAR	24546	C4-1/8-T0-6811-F
A9R33	0757-0836		RESISTOR; FXD; 7.5K 1% .5W F TUBULAR	28480	0757-0836
A9R34	0684-5601		RESISTOR; FXD; 56 OHM 10% .25W	28480	0684-5601
A9R35	0757-0434		RESISTOR; FXD; 3.65K 1% .125W F TUBULAR	28480	0757-0434
A9R36	0757-0416		RESISTOR; FXD; 511 OHM 1% .125W F TUBULAR	28480	0757-0416
A9R37	0757-0446		RESISTOR FXD 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F
A9R38	2100-3364		RESISTOR; VAR; TRMR, 50K OHM 10% C	73138	72XR504
A9R39	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A9U1	1826-0086		IC; LIN; OPERATIONAL AMPLIFIER	07263	776HC
A9XU1	1200-0763		SOCKET, ELEC, IC 8 CONT DIP SLDR TERM	71785	133-88-92-061
A10	01720-66536	1	BOARD ASSY, HORIZONTAL DISPLAY SWITCH	28480	01720-66536
A10C1	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C2	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C3	0160-2253		CAPACITOR; FXD; 6.8PF ±.25PF 500WVDC	72982	301-000-C0H0-689C
A10C4	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C5	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C6	0160-2261		CAPACITOR; FXD; 15PF ±5% 500WVDC	28480	0160-2261
A10C7	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C8	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C9	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C10	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C11			DELETED		
A10C12	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C13	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C14	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C15	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C16	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C17	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C18	0160-0160		CAPACITOR; FXD; .0082UF ±10% 200WVDC	56289	292P82292
A10C19	0160-345		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10C20	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A10CR1	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A10CR2	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A10J1	1251-3272	2	CONNECTOR; 6 CONT, FEM, POST TYPE	27264	09-52-3063(2145-6C)
A10J2	1251-3274	2	CONNECTOR; 4 CONT, FEM, POST TYPE	27264	09-52-3043(2145-4C)
A10L1	9170-0029		CORE; MAG; SHIELDING BEAD, .138 OD .047	02114	56-590-65A2/4A
A10L2	9170-0029		CORE; MAG, SHIELDING BEAD, .138 OD .047	02114	56-590-65A2/4A
A10L3	9170-0029		CORE; MAG, SHIELDING BEAD .138 OD .047	02114	56-590-65A2/4A
A10L4	9170-0029		CORE; MAG, SHIELDING BEAD .138 OD .047	02114	56-590-65A2/4A
A10Q1	1854-0646		TRANSISTOR NPN SI PD=200MW FT=1.4GHZ	28480	1854-0646
A10Q2	1854-0646		TRANSISTOR NPN SI PD=200MW FT=1.4GHZ	28480	1854-0646
A10Q3	1853-0352	4	TRANSISTOR PNP SI PD=350MW FT=1GHZ	28480	1853-0352
A10Q4	1853-0352		TRANSISTOR PNP SI PD=350MW FT=1GHZ	28480	1853-0352
A10Q5	1853-0352		TRANSISTOR PNP SI PD=350MW FT=1GHZ	28480	1853-0352
A10Q6	1853-0352		TRANSISTOR PNP SI PD=350MW FT=1GHZ	28480	1853-0352
A10Q7	1854-0646		TRANSISTOR NPN SI PD=200MW FT=1.4GHZ	28480	1854-0646
A10Q8	1854-0646		TRANSISTOR NPN SI PD=200MW FT=1.4GHZ	28480	1854-0646

See introduction to this section for ordering information

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

Reference Designation	mber	Qty	Description	Mfr Code	Mfr Part Number
A10R1	0757-0434	4	RESISTOR; FXD; 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A10R2	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A10R3	0698-3447	1	RESISTOR; FXD; 422 OHM 1% .125W F	16299	C4-1/8-T0-422R-F
A10R4	0757-0284		RESISTOR; FXD; 150 OHM 1% .125W F	24546	C4-1/8-T0-151-F
A10R5	0757-0284		RESISTOR; FXD; 150 OHM 1% .125W F	24546	C4-1/8-T0-151-F
A10R6	0757-0284		RESISTOR; FXD; 150 OHM 1% .125W F	24546	C4-1/8-T0-150R-F
A10R7	0757-0394		RESISTOR 51.1 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-51R1-F
A10R8	0757-0394		RESISTOR 51.1 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-51R1-F
A10R9	0757-0815		RESISTOR 562 OHM 1% .5W F TUBULAR	28480	0757-0815
A10R10	0757-1060		RESISTOR 196 OHM 1% .5W F TUBULAR	28480	0757-1060
A10R11	0757-0401		RESISTOR; FXD; 100 OHM 1% .125W F	24546	C4-1/8-T0-101-F
A10R12	0757-0401		RESISTOR; FXD; 100 OHM 1% .125W F	24546	C4-1/8-T0-101-F
A10R13	0698-3429	2	RESISTOR; FXD; 19.6 OHM 1% .125W F	03888	PME55-1/8-T0-19R6-F
A10R14	0698-3429		RESISTOR; FXD; 19.6 OHM 1% .125W F	03888	PME55-1/8-T0-19R6-F
A10R15	0757-0069	1	RESISTOR; FXD; 121 OHM 1% .25W F TUBULAR	30983	MF52C-1/4-T0-121R-F
A10R16	0684-2201		RESISTOR; FXD; 22 OHM 10% .25W CC	01121	CB2201
A10R17	0684-2201		RESISTOR; FXD; 22 OHM 10% .25W CC	01121	CB2201
A10R18	0684-6811	1	RESISTOR; FXD; 680 OHM 10% .25W CC	01121	CB6811
A10R19	0757-0401		RESISTOR; FXD; 100 OHM 1% .125W F	24546	C4-1/8-T0-101-F
A10R20	0757-0817	2	RESISTOR; FXD; 750 OHM 1% .5W F TUBULAR	30983	MF7C-1/2-T0-751-F
A10R21	0757-0817		RESISTOR; FXD; 750 OHM 1% .5W F TUBULAR	30983	MF7C-1/2-T0-751-F
A10R22	2100-3351	1	RESISTOR; VAR; TRMR, 500 OHM 10% C	73138	72XR501
A10R23	0757-0401		RESISTOR; FXD; 100 OHM 1% .125W F	24546	C4-1/8-T0-101-F
A10R24	0684-6811	2	RESISTOR; FXD; 680 OHM 10% .25W CC	01121	CB6811
A10R25	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A10R26	0684-6811		RESISTOR; FXD; 680 OHM 10% .25W CC	01121	CB6811
A10R27	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A10R28	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A10R29	0757-0263		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A10R30	0757-0416		RESISTOR; FXD; 511 OHM 1% .125W F	24546	C4-1/8-T0-511R-F
A10R31	0757-0434		RESISTOR; FXD; 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A10R32	0757-0422		RESISTOR; FXD; 909 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-909R-F
A10R33	0757-0393		RESISTOR 47.5 OHM 1% .125W F TUBULAR	28480	0757-0393
A10R34	0757-0393		RESISTOR 47.5 OHM 1% .125W F TUBULAR	28480	0757-0393
A10S1	3101-0678	1	SWITCH	28480	3101-0678
A11	01720-66546	1	BOARD ASSY, MAIN SWEEP SWITCH	28480	01720-66546
A11C1	0140-0203		CAPACITOR; FXD; 30PF ±5% 500WVDC	72136	DM15E300J0500WV1CR
A11C2	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVD	28480	0160-3451
A11C3	0160-2257		CAPACITOR; FXD; 10PF ±5% 500WVDC	28480	0160-2257
A11C4	0121-0496		CAPACITOR-VAR 1.9/15.7 PF	28480	0121-0496
A11C5	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A11C6	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A11C7	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A11C8	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A11C9	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A11C10	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A11C11	0160-2261		CAPACITOR; FXD; 15PF ±5% 500WVDC	28480	0160-2261
A11C12	0121-0496		CAPACITOR-VAR 1.9/15.7 PF	28480	0121-0496
A11C13	0160-0674		CAPACITOR; FXD; 80PF ±2% 300WVDC	28480	0160-0674
A11C14	0121-0496		CAPACITOR-VAR 1.9/15.7 PF	28480	0121-0496
A11C15	0160-3541		CAPACITOR; FXD; .01UF ±5% 100WVDC	84411	HEW-192
A11C16	0160-3324		CAPACITOR; FXD; 1UF ±5% 100WVDC	28480	0160-3324
A11C17	0180-0481		CAPACITOR; FXD; 100UF ±10% 30VDC TA-WET	28480	0180-0481
A11C18	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A11C19			DELETED		
A11C20	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A11CR1			DELETED		
A11CR2			DELETED		
A11CR3	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A11CR4	1906-0042		DIODE; MULT; SILICON, DUAL	28480	1906-0042
A11CR5	1910-0030		DIODE; SWITCHING; 15V MAX VRM 50MA	28480	1910-0030
A11J1	1251-3272		CONNECTOR, 6-CONT, FEM, POST TYPE	27264	09-52-3063(2145-6C)
A11J2	1251-3274		CONNECTOR, 4-CONT, FEM, POST TYPE	27264	09-52-3043(2145-4C)
A11L1	9140-0144		COIL, FXD; MOLDED RF CHOKE, 4.7UH 10%	24226	10/471
A11L2	9170-0029		CORE; MAG; SHIELDING BEAD	02114	56-590-65A2/4A
A11MP1	1460-1148		SPRING; TORSION	00000	OBD
A11MP2	01840-22502		ROLLER; DETENT	28480	01840-22502
A11MP3	1205-0235		HEAT-DISSIPATOR, SGL, TO-36 PKG	28480	1205-0235
A11Q1	1853-0316	1	TRANSISTOR; BIPOL: SI; PNP DUAL	28480	1853-0316
A11Q2	1853-0244		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0244
A11Q3	1855-0061		TRANSISTOR; J-FET N-CHAN, D-MODE SI	01295	2N5245
A11Q4	1854-0723		TRANSISTOR NPN SI	28480	1854-0723
A11Q5	1854-0628		TRANSISTOR NPN SI PD=625MW FT=800MHZ	04713	MPS-H17
A11Q6	1854-0691		TRANSISTOR NPN SI	28480	1854-0691
A11Q7	1853-0354		TRANSISTOR PNP SI CHIP PD=350MW	28480	1853-0354
A11Q8	1854-0691		TRANSISTOR NPN SI	28480	1854-0691
A11R1	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A11R2	0757-0282		RESISTOR; FXD; 221 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-221R-F
A11R3	0757-0288		RESISTOR; FXD; 9.09K 1% .125W F TUBULAR	30983	MF4C-1/8-T0-9019-F
A11R4	0757-0280		RESISTOR; FXD; 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-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
A11R6	0684-2201		RESISTOR; FXD; 22 OHM 10% .25W CC TUBULAR	01121	CB2201
A11R6	0757-0280		RESISTOR; FXD; 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A11R7	0757-0427		RESISTOR; FXD; 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A11R8	0683-1035		RESISTOR; FXD; 10K 5% .25W CC TUBULAR	01121	CB1035
A11R9	0684-5601		RESISTOR; FXD; 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A11R10	0684-4751		RESISTOR; FXD; 4.7M 10% .25W CC TUBULAR	01121	CB4751
A11R11	0757-0427		RESISTOR; FXD; 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A11R12	0684-3321		RESISTOR; FXD; 3.3K OHM 10% .25W CC TUBULAR	01121	CB3321
A11R13	0684-1031		RESISTOR; FXD; 10K 10% .25W CC TUBULAR	01121	CB1031
A11R14	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A11R15	0684-5601		RESISTOR; FXD; 56 OHM 10% .25W CC TUBULAR	01121	CB5601
A11R16	0684-4721		RESISTOR; FXD; 4.7K OHM 10% .25W CC TUBULAR	01121	CB4721
A11R17	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A11R18	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A11R19	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A11R20	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A11R21	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A11R22	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A11R23	0698-4158		RESISTOR; FXD; 100K .1% .125W F TUBULAR	19701	MF4C-1/8-T2-1003-B
A11R24	0698-5460		RESISTOR; FXD; 50K .1% .125W F TUBULAR	30983	MF4C-1/8-T2-5002-B
A11R25	0698-6842		RESISTOR; FXD; 25K .1% .125W F TUBULAR	19701	MF4C-1/8-T2-2502-B
A11R26	0698-6360		RESISTOR; FXD; 10K .1% .125W F TUBULAR	19701	MF4C-1/8-T2-1002-B
A11R27	0698-5449		RESISTOR; FXD; 5K .1% .125W F TUBULAR	30983	MF4C-1/8-T2-500 -B
A11R28	0698-6450		RESISTOR; FXD; 2.5K .1% .125W F TUBULAR	03888	PME55-T2
A11R29	0757-0426		RESISTOR; FXD; 1.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-1301-F
A11R30	0757-0435		RESISTOR; FXD; 3.92K % .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A11R31	0757-0283		RESISTOR; FXD; 2K 1% 125W F TUBULAR	24546	C4-1/8-T0-2001-F
A11R32	0687-2721		RESISTOR; FXD; 2.7K 1' % .5W CC TUBULAR	01121	CB2721
A11R33	2100-3056	6	RESISTOR; VAR; TRMR 5K OHM 10% C	32997	3006P-1-502
A11R34	2110-3056		RESISTOR; VAR; TRMR, 5K OHM 10% C	32997	3006P-1-502
A11R35	2100-3056		RESISTOR; VAR; TRMR, 5K OHM 10% C	32997	3006P-1-502
A11R36	0757-0438		RESISTOR; FXD; 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A11R37	0757-0446		RESISTOR; FXD; 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F
A11R38	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A11R39	2100-3354		RESISTOR; VAR; TRMR, 50K OHM C	73138	72XR504
A11U1	1826-0066		IC; LIN; OPERATIONAL AMPLIFIER	07263	776HC
A11VR1	1902-0041		DIODE; ZENER; 5.11V VZ; .4W MAX PD	04713	SZ-10939 96
A11XQ1	1200-0777	1	SOCKET; ELEC; IC 8-CONT DIP SLDR TERM	71785	133 96 02 060
A11XU1	1200-0763		SOCKET; ELEC; IC 8-CONT DIP SLDR TERM	71785	133 96 92 061
A12	01720-66529	1	BOARD ASSY, HOLDOFF/COMPARATOR	28480	01720-66529
A12C1	0140-0191		CAPACITOR; FXD; 56PF ±5% 300WVDC	72136	DM15E560J0300WV1CR
A12C2	0160-2204	1	CAPACITOR; FXD; 100PF ±5% 300WVDC MICA	28480	0160-2204
A12C3	0160-0298	1	CAPACITOR; FXD; 1500PF ±10% 200WVDC POLYE	56289	292P15292
A12C4	0160-0161	1	CAPACITOR; FXD; .01UF ±10% 200WVDC POLYE	56289	292P10392 PTS
A12C5	0160-0162	2	CAPACITOR; FXD; .022UF ±10% 200WVDC	56289	292P22392
A12C6	0180-0230		CAPACITOR; FXD; 1UF ±20% 50VDC TA-SOLID	56289	150D105X0050A2
A12C7	0180-0197	1	CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150C225X9020A2
A12C8	0180-0064	1	CAPACITOR; FXD; 100UF +75–10% 25VDC AL	56289	30D107G025002
A12C9	0180-0059	2	CAPACITOR; FXD; 10UF +75–10% 25VDC AL	56289	30D106G025BB2
A12C10	0180-0059		CAPACITOR; FXD; 10UF +75–10% 25VDC AL	56289	30D106G025BB2
A12C11	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A12C12	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A12C13	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A12C14	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A12C15	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A12C16	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A12C17	0160-3451		CAPACITOR; FXD; .01UF +80–20% 100WVDC	28480	0160-3451
A12CR1	1901-0513	1	DIODE, MULT, SILICON, DUAL	28480	1901 0513
A12CR2	1901 0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A12CR3	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A12P1	1251-3319		CONNECTOR; 10-CONT, MALE, POST TYPE	27264	09-64-1101(A2402-10A)
A12Q1	1854-0636		TRANSISTOR NPN SI PD=350MW FT=300MHZ	28480	1854-0636
A12Q2	1854-0636		TRANSISTOR NPN SI PD=350MW FT=300MHZ	28480	1854-0636
A12Q3	1854-0636		TRANSISTOR NPN SI PD=350MW FT=300MHZ	28480	1854-0636
A12Q4	1854-0636		TRANSISTOR NPN SI PD=350MW FT=300MHZ	28480	1854-0636
A12Q5	1854-0636		TRANSISTOR NPN SI PD=350MW FT=300MHZ	28480	1854-0636
A12Q6	1854-0636		TRANSISTOR NPN SI PD=350MW FT=300MHZ	28480	1854-0636
A12Q7	1854-0636		TRANSISTOR NPN SI PD=350MW FT=300MHZ	28480	1854-0636
A12Q8	1853-0086	2	TRANSISTOR PNP SI PD=310MW FT=40MHZ	28480	1853-0086
A12Q9	1853-0086		TRANSISTOR PNP SI PD=310MW FT=40MHZ	28480	1853-0086
A12Q10	1854-0642	3	TRANSISTOR; NPN, SI	04713	MPS A17
A12Q11	1854-0642		TRANSISTOR; NPN, SI	04713	MPS-A17
A12Q12	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A12Q13	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A12Q14	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A12Q15	1854-0642		TRANSISTOR; NPN, SI	04713	MPS-A17
A12R1	0757-0446	3	RESISTOR; FXD; 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F
A12R2	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A12R3	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A12R4	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311

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
A12R5	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A12R6	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A12R7	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A12R8	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A12R9	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A12R10	0757-0274		RESISTOR; FXD; 1.21K 1% .125W F TUBULAR	24546	C4-1/8-T0-1213-F
A12R11	0757-0427		RESISTOR 1.5K OHM 1% .125W	28480	0757-0427
A12R12	0698-3153		RESISTOR; FXD; 3.83K 1% .125W F TUBULAR	16299	C4-1/8-T0-3831-F
A12R13	0757-0437	3	RESISTOR; FXD; 4.75K 1% .125W F TUBULAR	24546	C4-1/8-T0-4751-F
A12R14	0757-0437		RESISTOR; FXD; 4.75K 1% .125W F TUBULAR	24546	C4-1/8-T0-4751-F
A12R15	0757-0416		RESISTOR; FXD; 511 OHM 1% .125W F	24546	C4-1/8-T0-511R-F
A12R16	0757-0451		RESISTOR; FXD; 24.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-2432-F
A12R17	0757-0440		RESISTOR; FXD; 7.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-7501-F
A12R18	0757-0444	1	RESISTOR; FXD; 12.1K 1% .125W F TUBULAR	24546	-1/8-T0-1212-F
A12R19	0684-4751		RESISTOR; FXD; 4.7M 10% .25W CC TUBULAR	01121	' J4751
A12R20	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A12R21	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A12R22	0757-0437		RESISTOR; FXD; 4.75K 1% .125W F TUBULAR	24546	C4-1/8-T0-4751-F
A12R23	0757-0441		RESISTOR; FXD; 8.25K 1% .125W F TUBULAR	24546	C4-1/8-T0-8251-F
A12R24	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A12R25	0684-3311		RESISTOR; FXD; 330 OHM 10% .25W CC	01121	CB3311
A12R26	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A12R27	0757-0399	1	RESISTOR; FXD; 82.5 OHM 1% .125W F	24546	C4-1/8-T0-82R5-F
A12R28	0757-0409		RESISTOR; FXD; 274 OHM 1% .125W F	24546	C4-1/8-T0-274R-F
A12R29	0757-0434		RESISTOR; FXD; 3.65K 1% .125W F TUBULAR	24546	C4-1/8-T0-3651-F
A12R30	0757-0429		RESISTOR; FXD; 1.82K 1% .125W F TUBULAR	24546	C4-1/8-T0-1821-F
A12R31	0757-0407		RESISTOR; FXD; 200 OHM 1% .125W F	24546	C4-1/8-T0-201-F
A12R32	0757-0273		RESISTOR; FXD; 3.01K 1% .125W F TUBULAR	24546	C4-1/8-T0-3011-F
A12R33	0698-3132		RESISTOR; FXD; 261 OHM 1% .125W F	16299	C4-1/8-T0-2610-F
A12R34	0684-3921	3	RESISTOR; FXD; 3.9K 10% .25W CC TUBULAR	01121	CB3921
A12R35	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A12R36			DELETED		
A12R37	0684-3921		RESISTOR; FXD; 3.9K 10% .25W CC TUBULAR	01121	CB3921
A12R38	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A12R39	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A12R40	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A12R41	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A12R42	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W CC	01121	CB1001
A12U1	1826-0066		IC; LIN; OPERATIONAL AMPLIFIER	07263	776HC
A12U2	1821-0001		IC; LIN; TRANSISTOR ARRAY	02735	CA3046
A12VR1	1902-3182		DIODE; ZNR; 12.1V 5% DO-7 PD=.4W TC=+.064%	15818	CD35730
A12XU1	1200-0763		SOCKET; ELEC; IC 8-CONT DIP SLDR TERM	71785	133-98-92-061
A12XU2	1200-0441		SOCKET; ELEC; IC 14-CONT DIP SLDR TERM	24995	583527-1
A13	01720-66537	1	BOARD ASSY, HORIZONTAL OUTPUT	28480	01720-66537
A13C1	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A13C2	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A13C3	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A13C4	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A13C5	0121-0168	4	CAPACITOR; VAR; TRMR, PSTN, .2/1.5PF	28480	0121-0168
A13C6	0132-0004	2	CAPACITOR; VAR; TRMR, PSTN, .7/3PF	72982	535-009-4R
A13C7	0121-0168		CAPACITOR; VAR; TRMR, PSTN, .2/1.5PF	28480	0121-0168
A13C8	0132-0004		CAPACITOR; VAR; TRMR, PSTN, .7/3PF	72982	535-009-4R
A13C9	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A13C10	0160-3665	2	CAPACITOR; FXD; .01UF +80-20% 500WVDC	28480	0160-3665
A13C11	0160-3665		CAPACITOR; FXD; .01UF +80-20% 500WVDC	28480	0160-3665
A13C12	0160-3665		CAPACITOR; FXD; .01UF +80-20% 500WVDC	28480	0160-3665
A13C13	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A13C14	0160-3665		CAPACITOR; FXD; .01UF +80-20% 500WVDC	28480	0160-3665
A13C15	0160-3665		CAPACITOR; FXD; .01UF +80-20% 500WVDC	28480	0160-3665
A13C16	0160-2240		CAPACITOR; FXD; 2PF ±.25PF 500WVDC	28480	0160-2240
A13C17	0160-2240		CAPACITOR; FXD; 2PF ±.25PF 500WVDC	28480	0160-2240
A13CR1	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A13CR2	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A13CR3	1901-0047		DIODE; SWITCHING; 20VA MAX VRM 75MA	28480	1901-0047
A13CR4	1901-0047		DIODE; SWITCHING; 20V MAX VRM 75MA	28480	1901-0047
A13L1			DELETED		
A13L2			DELETED		
A13L3	9140-0179	1	COIL; FXD; MOLDED RF CHOKE, 22UH 10%	24226	15/222
A13MP1	1205-0033	2	HEAT-DISSIPATOR, SGL, TO-5 PKG	28480	1205-0033
A13Q1	1853-0354	2	TRANSISTOR PNP SI PD=350MW FT=600MHZ	28480	1853-0354
A13Q2	1854-0019	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A13Q3	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A13Q4	1853-0354		TRANSISTOR PNP SI PD=350MW FT=600MHZ	28480	1853-0354
A13Q5	1854-0419	3	TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0419
A13Q6	1853-0232	3	TRANSISTOR PNP SI PD=1W FT=200MHZ	28480	1853-0232
A13Q7	1853-0232		TRANSISTOR PNP SI PD=1W FT=200MHZ	28480	1853-0232
A13Q8	1854-0419		TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0419
A13R1	0757-0442	2	RESISTOR; FXD; 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A13R2	0757-0442	1	RESISTOR; FXD; 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A13R3	0757-0284		RESISTOR; FXD; 150 OHM 1% .125W F	24546	C4-1/8-T0-151-F

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A13R4	0757-0284		RESISTOR; FXD; 150 OHM 1% .125W F	24546	C4-1/8-T0-151-F
A13R5	0757-0421		RESISTOR; FXD; 825 OHM 1% .125W F	24546	C4-1/8-T0-825R-F
A13R6	0757-0421		RESISTOR; FXD; 825 OHM 1% .125W F	24546	C4-1/8-T0-825R-F
A13R7	0757-0394		RESISTOR; FXD; 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A13R8	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A13R9	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A13R10	0757-0394		RESISTOR; FXD; 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A13R11	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A13R12	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A13R13	0698-6542	2	RESISTOR; FXD; 3.6K 2% 1.0W MET OX	07716	0698-6542
A13R14	0760-0017	2	RESISTOR; FXD; 3.9K 2% 1W MO TUBULAR	FR003	C32
A13R15	0698-6542		RESISTOR; FXD; 3.6K 2% 1.0W MET OX	07716	0698-6542
A13R16	0760-0017		RESISTOR; FXD; 3.9K 2% 1W MO TUBULAR	FR003	C32
A13R17	0757-0853	3	RESISTOR; FXD; 51.1K 1% .5W F TUBULAR	30983	MF7C-1/2-T0-5112-F
A13R18	0757-0853		RESISTOR; FXD; 51.1K 1% .5W F TUBULAR	30983	MF7C-1/2-T0-5112-F
A13R19	0757-0436		RESISTOR; FXD; 4.32K 1% .125W F TUBULAR	24546	C4-1/8-T0-4321-F
A13R20	0757-0436		RESISTOR; FXD; 4.32K 1% .125W F TUBULAR	24546	C4-1/8-T0-4321-F
A13R21	0757-0726	2	RESISTOR; FXD; 511 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-511R-F
A13R22	0757-0726		RESISTOR; FXD; 511 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-511R-F
A13R23	0761-0006	2	RESISTOR; FXD; 10K 5% 1W MO TUBULAR	24546	FP32-1-1002-J
A13R24	0761-0006		RESISTOR; FXD; 10K 5% 1W MO TUBULAR	24546	FP32-1-1002-J
A13R25	0757-0394		RESISTOR; FXD; 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A13R26	0757-0394		RESISTOR; FXD; 51.1 OHM 1% .125W F	24546	C4-1/8-T0-51R1-F
A13R27	0698-3162		RESISTOR; FXD; 46.4K 1% .125W F TUBULAR	16299	C4-1/8-T0-4642-F
A13R28	0698-3162		RESISTOR; FXD; 46.4K 1% .125W F TUBULAR	16299	C4-1/8-T0-4642-F
A13R29	0757-0442		RESISTOR; FXD; 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A13R30	0757-0442		RESISTOR; FXD; 10K 1% .125W F TUBULAR	24546	C4-1/8-T0-1002-F
A13VR1	1902-0041	2	DIODE; ZENER; 5.11V VZ; .4W MAX PD	04713	SZ-10939-96
A13VR2	1902-0041		DIODE; ZENER; 5.11V VZ; .4W MAX PD	04713	SZ-10939-96
A14	01720-66533	1	BOARD ASSY, GATE	28480	01720-66533
A14C1	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C2	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C3	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C4	0180-0291	6	CAPACITOR; FXD; 1UF ±10% 35VDC TA-SOLID	56289	150D105X9035A2
A14C5	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C6	0180-0291		CAPACITOR; FXD; 1UF ±10% 35VDC TA-SOLID	56289	150D105X9035A2
A14C7	0121-0168		CAPACITOR; VAR; TRMR, PSTN, .2/1.5PF	28480	0121-0168
A14C8	0121-0168		CAPACITOR; VAR; TRMR, PSTN, .2/1.5PF	28480	0121-0168
A14C9	0160-2903	2	CAPACITOR; FXD; .05UF ±20% 500WVDC	28480	0160-2903
A14C10	0160-2903		CAPACITOR; FXD; .05UF ±20% 500WVDC	28480	0160-2903
A14C11	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C12	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C13	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C14	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A14C15	0180-0291		CAPACITOR; FXD; 1UF ±10% 35VDC TA-SOLID	56289	150D105X9035A2
A14C16	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C17	0180-1745	1	CAPACITOR; FXD; 1.5UF ±10% 20VDC TA	56289	150D155X9020A2
A14C18	0130-0291		CAPACITOR; FXD; 1UF ±10% 35VDC TA-SOLID	56289	150D105X9035A2
A14C19	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A14C20	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C21	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A14C22	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C23	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A14C24	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C25	0180-0197		CAPACITOR; FXD; 2.2UF ±10% 20VDC TA	56289	150D225X9020A2
A14C26	0160-3451		CAPACITOR; FXD; .01UF +80-20% 100WVDC	28480	0160-3451
A14C27	0180-1746		CAPACITOR; FXD; 15UF ±10% 20VDC TA-SOLID	56289	150D156X902082
A14C28	0160-3453	2	CAPACITOR; FXD; .06UF +80-20% 100WVDC	28480	0160-3453
A14C29	0170-0040		CAPACITOR; FXD; .047UF ±10% 200WVDC	56289	292P47392
A14C30	0180-0291		CAPACITOR; FXD; 1UF ±10% 35VDC TA-SOLID	56289	150D105X9035A2
A14CJ1	0160-2198	1	CAPACITOR; FXD; 20PF ±5% 300WVDC	28480	0160-2198
A14C32	0180-0094		CAPACITOR; FXD; 100UF +75-10% 25VDC AL	56289	30D107G025DD2
A14CR1	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR2	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR3	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR4	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR5	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR6	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR7	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR8	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR9	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR10	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR11	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR12	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR13	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR14	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50MA	28480	1901-0040
A14CR15	1901-0376		DIODE-GEN PRP 35V 50 MA	28480	1901-0376
A14CR16	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50 MA	28480	1901-0040
A14CR17	1901-0040		DIODE; SWITCHING; 30V MAX VRM 50 MA	28480	1901-0040
A14L1	9140-0129	1	COIL; FXD; MOLDED RF CHOKE, 220 UH 5%	24226	15/223
A14L2	9170-0029		CORE; MAG SHIELDING BEAD	02114	56-590-65A2/4A
A14L3	9170-0029		CORE; MAG SHIELDING BEAD	02114	56-590-65A2/4A
A14MP1	1205-0033		HEAT-DISSIPATOR; SGL, TO-5 PKG	28480	1205-0033

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
A14Q1	1854-0019	3	TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A14Q2	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A14Q3	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-003.
A14Q4	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A14Q5	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A14Q6	1854-0063		TRANSISTOR: NPN SI	28480	1854-0063
A14Q7	1853-0036	1	TRANSISTOR PNP SI PD=6.25MW FT=50MHZ	28480	1853-0036
A14Q8	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A14Q9	1854-0019		TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A14Q10	1854-0019		TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A14Q11	1853-0203	1	TRANSISTOR PNP SI PD=360MW FT=700MHZ	28480	1853-0203
A14Q12	1853-0232		TRANSISTOR PNP SI PD=1W FT=200MHZ	28480	1853-0232
A14Q13	1854-0019		TRANSISTOR NPN SI PD=360MW FT=500MHZ	28480	1854-0019
A14Q14	1854-0419		TRANSISTOR NPN SI PD=1W FT=200MHZ	28480	1854-0419
A14Q15	1854-0023	1	TRANSISTOR NPN SI PD=360MW FT=15MHZ	28480	1854-0023
A14Q16	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS-3611
A14Q17	1853-0036		TRANSISTOR PNP SI PD=310MW FT=250MHZ	28480	1853-0036
A14Q18	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS-3611
A14Q19	1884-0074		THYRISTOR; SCR JEDEC 2N5060	04713	2N5060
A14R1	0684-2211		RESISTOR; FXD; 220 OHM 10% .25W CC	01121	CB2211
A14R2	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A14R3	0757-0418	1	RESISTOR; FXD; 619 OHM 1% .125W F	24546	C4-1/8-T0-619R-F
A14R4	0757-0429		RESISTOR; FXD; 1.82K 1% .125W F TUBULAR	24546	C4-1/8-T0-1821-F
A14R5	0684-4711		RESISTOR; FXD; 470 OHM 10% .25W CC	01121	CB4711
A14R6	0684-4711		RESISTOR; FXD; 470 OHM 10% .25W CC	01121	CB4711
A14R7	0698-3450	1	RESISTOR; FXD; 42.2K 1% .125W F TUBULAR	16299	C4-1/8-T0-4222-F
A14R8	0684-5621	1	RESISTOR; FXD; 5.6K 10% .25W CC TUBULAR	01121	CB5621
A14R9	0684-1031		RESISTOR; FXD; 10K 10% .25W CC TUBULAR	01121	CB1031
A14R10	2100-0658	2	RESISTOR; VAR; TRMR, 20K OHM 10% C	73138	72P
A14R11	0698-3136		RESISTOR; FXD; 17.8K 1% .125W F TUBULAR	16299	C4-1/8-T0-1782-F
A14R12	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A14R13	0757-0469	1	RESISTOR; FXD; 150K 1% .125W F TUBULAR	24546	C4-1/8-T0-1503-F
A14R14	0757-0451		RESISTOR; FXD; 24.3K 1% .125W F TUBULAR	24546	C4-1/8-T0-2432-F
A14R15	2100-3213	2	RESISTOR; VAR; TRMR, 200K OHM 10% C	32997	3339P-1-204
A14R16	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A14R17	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A14R18	0757-0820		RESISTOR; FXD; 1.1K 1% .5W F TUBULAR	30983	MF7C-1/2-T0-1101-F
A14R19	0757-4751	1	RESISTOR; FXD; 4.7M 10% .5W CC TUBULAR	01121	EB-4751
A14R20	2100-3213		RESISTOR; VAR; TRMR, 200K OHM 10% C	32997	3339P-1-204
A14R21	0684-4731	1	RESISTOR 47K OHM 10% .25W CC	01121	CB4731
A14R22	0683-5615		RESISTOR 560 OHM 5% .25W CC	01121	CB5615
A14R23	2100-3274	1	RESISTOR; VAR; TRMR, 10K OHM 10% C	28480	2100-3274
A14R24	0757-0280		RESISTOR; FXD; 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A14R25	0757-1094		RESISTOR; FXD; 1.47K 1% .125W F TUBULAR	24546	C4-1/8-T0-1471-F
A14R26	0684-4701	1	RESISTOR; FXD; 47 OHM 10% .25W CC	01121	CB4701
A14R27	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A14R28	0684-1811		RESISTOR; FXD; 180 OHM 10% .25W CC	01121	CB1811
A14R29	0684-2221		RESISTOR; FXD; 2.2K 10% .25W CC TUBULAR	01121	CB2221
A14R30	0757-0811	1	RESISTOR; FXD; 4.32K 1% .5W F TUBULAR	30983	MF7C-1/2-T0-4321-F
A14R31	0757-0834		RESISTOR; FXD; 5.62K 1% .5W F TUBULAR	30983	MF7C-1/2-T0-5621-F
A14R32	0699-0002	1	RESISTOR; FXD; 6.8 OHM 10% .5W CC	01121	EB68G1
A14R33	0757-0436		RESISTOR; FXD; 4.32K 1% .125W F TUBULAR	24546	C4-1/8-T0-4321-F
A14R34	0757-0853		RESISTOR; FXD; 51.1K 1% .5W F TUBULAR	30983	MF7C-1/2-T0-5112-F
A14R35	0757-0728	1	RESISTOR; FXD; 619 OHM 1% .25W F TUBULAR	24546	C5-1/4-T0-619R-F
A14R36	0781-0073	1	RESISTOR; FXD; 13K 5% 1W MO TUBULAR	24546	FP32-1-T00-1302-J
A14R37	0757-0438		RESISTOR; FXD; 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A14R38	0757-0448	2	RESISTOR; FXD; 18.2K 1% .125W F TUBULAR	24546	C4-1/8-T0-1822-F
A14R39	0757-0435		RESISTOR; FXD; 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A14R40	0684-2711	1	RESISTOR; FXD; 270 OHM 10% .25W CC	01121	CB2711
A14R41	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A14R42	0757-0416		RESISTOR; FXD; 511 OHM 1% .125W F	24546	C4-1/8-T0-511R-F
A14R43	0757-0280		RESISTOR; FXD; 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A14R44	0757-1094		RESISTOR; FXD; 1.47K 1% .125W F TUBULAR	24546	C4-1/8-T0-1471-F
A14R45	0757-0283		RESISTOR; FXD; 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A14R46	0757-0435		RESISTOR; FXD; 3.92K 1% .125W F TUBULAR	24546	C4-1/8-T0-3921-F
A14R47	0698-3154		RESISTOR; FXD; 4.22K 1% .125W F TUBULAR	16299	C4-1/8-T0-4221-F
A14R48	0757-0448		RESISTOR; FXD; 18.2K 1% .125W F TUBULAR	24546	C4-1/8-T0-1822-F
A14R49	0757-0438		RESISTOR; FXD; 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A14R50	0757-0317	1	RESISTOR; FXD; 1.33K 1% .125W F TUBULAR	24546	C4-1/8-T0-1331-F
A14R51	2100-3212		RESISTOR; VAR; TRMR, 200 OHM 10% C	32997	3339P-1-201
A14R52	0721-0001	1	RESISTOR; FXD; 450 OHM 1% .1W CF TUBULAR	91637	DC-1/10-451-F
A14R53	0683-0475	4	RESISTOR; FXD; 4.7 OHM 5% .25W CC	01121	CB47G5
A14R54	0683-0475		RESISTOR; FXD; 4.7 OHM 5% .25W CC	01121	CB47G5
A14R55	0683-0475		RESISTOR; FXD; 4.7 OHM 5% .25W CC	01121	CB47G5
A14R56	0683-0475		RESISTOR; FXD; 4.7 OHM 5% .25W CC	01121	CB47G5
A14R57	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A14R58	0757-0458	2	RESISTOR; FXD; 61.1K 1% .125W F TUBULAR	24546	C4-1/8-T0-6112-F
A14R59	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A14R60	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A14R61	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021

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
A14R62	0757-0439		RESISTOR; FXD; 5.11K 1% .125W F TUBULAR	24546	C4-1/8-T0-5111-F
A14R63	0684-3921		RESISTOR; FXD; 3.9K 10% .25W CC TUBULAR	01121	CB3921
A14R64	2100-3210	1	RESISTOR; VAR; TRMR, 10K OHM 10% C	32997	3389P-1-103
A14R65	0684-1221		RESISTOR; FXD; 1.2K 10% .25W CC TUBULAR	01121	CB1221
A14R66	0758-0028	4	RESISTOR 270 OHM 5% .25W F TUBULAR	24546	C5-1/4-T0-271-J
A14R67	2100-3353	1	RESISTOR; VAR; TRMR, 20K OHM 10% C	73138	2XR203
A14R68	0758-0028		RESISTOR 270 OHM 5% .25W F TUBULAR	24546	C5-1/4-T0-271-J
A14R69	0758-0028		RESISTOR 270 OHM 5% .25W F TUBULAR	24546	C5-1/4-T0-271-J
A14R70	2100-0658		RESISTOR; VAR; TRMR, 20K OHM 10% C	73138	72P
A14R71	0758-0028		RESISTOR 270 OHM 5% .25W F TUBULAR	24546	C5-1/4-T0-271-J
A14R72	0757-0446		RESISTOR; FXD; 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F
A14R73	0698-3162	1	RESISTOR; FXD; 46.4K 1% .125W F TUBULAR	16299	C4-1/8-T0-4642-F
A14R74	2100-3355	1	RESISTOR; VAR; TRMR, 100K OHM 10% C	73138	72XR104
A14R75	0684-5631	1	RESISTOR; FXD; 56K 10% .25W CC TUBULAR	01121	CB5631
A14R76	2100-3354	1	RESISTOR; VAR; TRMR, 50K OHM 10% C	73138	72XR504
A14R77	0684-3931	1	RESISTOR; FXD; 39K 10% .25W CC TUBULAR	01121	CB3931
A14R78	0684-1001		RESISTOR; FXD; 10 OHM 10% .25W TUBULAR	01121	CB1001
A14R79	0684-1521	2	RESISTOR; FXD; 1.5K 10% .25W CC	01121	CB1521
A14R80	0757-0397		RESISTOR 68.1 OHM 1% .125W F TUBULAR	28480	0757-0397
A14R81	0684-1041		RESISTOR 100K 10% .25W CC TUBULAR	01121	CB1041
A14U1	1821-0001		IC; LIN; TRANSISTOR ARRAY	02735	CA3046
A14VR1	1902-3036	2	DIODE; ZENER; 3.16V VZ; .4W MAX PD	04713	SZ-10939-33
A14VR2	1902-3096	3	DIODE; ZENER; 5.23V VZ; .4W MAX PD	04713	SZ-10939-101
A14VR3	1902-3096		DIODE; ZENER; 5.23V VZ; .4W MAX PD	04713	SZ-10939-101
A14VR4	1902-3096		DIODE; ZENER; 5.23V VZ; .4W MAX PD	04713	SZ-10939-101
A14VR5	1902-3149		DIODE; ZNR; 9.09V VZ, 5% .4W MAX	04713	SZ-10939-170
A14XU1	1200-0441		SOCKET; ELEC, IC 14 CONT DIP SLDR TERM	24995	548527-1
A15	01720-66532	1	BOARD ASSY, HVPS	28480	01720-66532
A15C1	0180-0116	1	CAPACITOR; FXD; 5.6 [illegible] ±10% 35VDC TA	56289	150D685X9035B2
A15C2	0160-2264		CAPACITOR; FXD; 20PF ±5% 500WVDC	28480	0160-2264
A15C3	0160-3665		CAPACITOR; FXD; .01UF +80–20% 50WVDC	28480	0160-3665
A15C4	0160-4079	3	CAPACITOR; FXD; .0015UF ±20% 4000WVDC	28480	0160-4079
A15C5	0160-0644	1	CAPACITOR; FXD; .022UF ±20% 400CWVDC	84411	HEW-337
A15C6	0160-4200	1	CAPACITOR; FXD; .047UF ±20% 400WVDC	28480	0160-4200
A15C7	0160-4079		CAPACITOR; FXD; .0015UF ±20% 4000WVDC	28480	0160-4079
A15C8	0160-3453		CAPACITOR; FXD; .05UF +80–20% 100WVDC	28480	0160-3453
A15C9	0160-4079		CAPACITOR; FXD; .0015UF ±20% 4000WVDC	28480	0160-4079
A15CR1	1901-0028	13	DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A15CR2	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A15CR3	1901-0683	1	DIODE; HV RECT; 10KV MAX VRM 5MA	28480	1901-0683
A15CR4	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A15CR5	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A15CR6	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A15CR7	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A15DS1	2140-0013	5	LAMP, GLOW, BULB T-2, 57V	74276	NE23A
A15DS2	2140-0013		LAMP, GLOW, BULB T-2, 57V	74276	NE23A
A15DS3	2140-0013		LAMP, GLOW, BULB T-2, 57V	74276	NE23A
A15DS4	2140-0013		LAMP, GLOW, BULB T-2, 57V	74276	NE23A
A15DS5	2140-0013		LAMP, GLOW, BULB T-2, 57V	74276	NE23A
A15E1	2110-0269	2	FUSEHOLDER; CLIP TYPE	28480	2110-0269
A15F1	2110-0020	1	FUSE; .8A 250V SLO-BLO	71400	MDL-8/10
A15L1	9100-3139	1	COIL; 75 UH	28480	9100-3139
A15MP1	5040-0402	1	MOUNT; TRANSFORMER	28480	5040-0402
A15MP2	5040-0430	1	MOUNT; TRANSFORMER	28480	5040-0430
A15P1	1251-3319		CONNECTOR; 10-CONT, MALE, POST TYPE	27264	09-64-1101(A2402-10A)
A15R1	0757-0412		RESISTOR; FXD; 365 OHM 1% .125W F	24546	C4-1/8-T0-365R-F
A15R2	0757-0466		RESISTOR; FXD; 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A15R3	2100-3253		RESISTOR; VAR; TRMR, 50K OHM 10% C	32997	3389P-1-503
A15R4	0683-1825		RESISTOR; FXD; 1.8K 5% .25W CC TUBULAR	01121	CB1825
A15R5	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A15R6	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A15R7	0684-1011		RESISTOR; FXD; 100 OHM 10% .25W CC	01121	CB1011
A15R8	0684-1061		RESISTOR; FXD; 10M 10% .25W CC TUBULAR	01121	CB1061
A15R9	0684-1021		RESISTOR; FXD; 1K 10% .25W CC TUBULAR	01121	CB1021
A15R10	0698-8018	1	RESISTOR; FXD; 30M +1–19% 3W CP TUBULAR	03888	PVC175-3-T0-3004 F
A15R11	0698-6441	1	RESISTOR; FXD; 6.5MEG 5% 1.0W F	07716	0698-6441
A15R12	0698-4211	1	RESISTOR; FXD; 158K 1% .125W F TUBULAR	16299	C4-1/8-T0-1583-F
A15R13	0698-6442	1	RESISTOR; FXD; 13MEG 5% 1.0W F	07716	0698-6442
A15R14	0684-4731		RESISTOR 47K 10% .25W CC TUBULAR	01121	CB4731
A15T1	01720-61101	1	TRANSFORMER, HV	28480	01720-61101
A15W1	01720-61627		CABLE ASSY; HV OSCILLATOR	28480	01720-61627
A16	0960-0117	1	ASSY; H.V. MULTIPLIER (NOT REPAIRABLE)	28480	0960-0117
A17	01720-66528	1	BOARD ASSY, LVPS	28480	01720-66528
A17C1	0180-2172	1	CAPACITOR; FXD; 130UF +75–10% 200VDC AL	56289	39D137G200HL4
A17C2	0180-0089	2	CAPACITOR; FXD; 10UF +50–10% 150VDC AL	56289	30D106F150DD2
A17C3	0180-0489	1	CAPACITOR; FXD; 620UF +75–10% 100VDC AL	56289	39D627F100JP4
A17C4	0180-0089		CAPACITOR; FXD; 10UF +50–10% 150VDC AL	56289	30D106F150DD2
A17C5	0180-1938	1	CAPACITOR; FXD; 2600UF +75–10% 15VDC AL	56289	39D268G015JJ4
A17C6	0160-3448		CAPACITOR; FXD; .001UF ±10% 1000WVDC	28480	0160-3448
A17C7	0180-0341	1	CAPACITOR; FXD; 25UF +75–10% 12VDC AL	56289	30D256G012BB2
A17C8	0180-2371	1	CAPACITOR; FXD; 4700UF +75–10% 30VDC AL	28480	0180-2371
A17C9	0160-3448		CAPACITOR; FXD; .001UF ±10% 1000WVDC	28480	0160-3448
A17C10	0180-0045	2	CAPACITOR; FXD; 20UF +75–10% 25VDC AL	56289	30D206G025CB2

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

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A17C11	0180-2351	1	CAPACITOR; FXD; 2000UF +75-10% 50VDC AL	28480	0180-2351
A17C12	0160-3448		CAPACITOR; FXD; .001UF ±10% 1000WVDC	28480	0160-3448
A17C13	0180-0045		CAPACITOR; FXD; 20UF +75-10% 25VDC AL	56289	30D206G025CB2
A17C14	0180-2500	1	CAPACITOR; FXD; 1500UF +50-10% 16VDC AL	28480	0180-2500
A17C15	0180-1747		CAPACITOR; FXD; 150UF 20% 15WVDC	56289	150D157X0015
A17CR1	1906-0023	4	DIODE; MULT, FULL WAV BRIDGE RECTIFIER	04713	MDA922 4
A17CR2	1906-0023		DIODE; MULT, FULL WAV, BRIDGE RECTIFIER	04713	MDA922 4
A17CR3	1901 0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A17CR4	1901 0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A17CR5	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A17CR6	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A17CR7	1906-0023		DIODE; MULT; FULL WAVE BRIDGE RECTIFIER	04713	MDA922 4
A17CR8	1906-0023		DIODE; MULT; FULL WAVE BRIDGE RECTIFIER	04713	MDA922-4
A17CR9	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A17CR10	1901-0028		DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A17CR11	1901-0028		DIODE, PWR RECT; 400V MAX VRM 750MA	04713	SR1358 9
A17CR12	1901-0028	1	DIODE; PWR RECT; 400V MAX VRM 750MA	04713	SR1358-9
A17DS1	2140-0018	1	LAMP; GLOW, BULB T-2, 68V	06806	A9A (NE-2E1)
A17E1	2110-0269		FUSEHOLDER: CLIP TYPE	28480	2110-0269
A17P1	1251-3475	2	CONNECTOR; 10-CONT; MALE; POST TYPE	27264	09 60-1101
A17P2	1251-3475		CONNECTOR; 10-CONT; MALE; POST TYPE	27264	09 60-1101
A17P3	1251-3192	1	CONNECTOR; 3-CONT; MALE, POST TYPE	27264	09-60-1031(2403-03A)
A17Q1	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A17Q2	1854-0675	1	TRANSISTOR NPN SI PD=625MW FT=50MHZ	28480	1854-0675
A17Q3	1853-0317	1	TRANSISTOR PNP SI PD=625MW FT=100MHZ	28480	1853-0317
A17Q4	1854-0071		TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A17Q5	1854-0395	1	TRANSISTOR NPN SI TO-39 PD=10W FT=50 MHZ	28480	1854-0395
A17Q6	1853-0060	1	TRANSISTOR PNP SI PD=300MW FT=30MHZ	28480	1853 0060
A17R1	0684-1041		RESISTOR; FXD; 100K 10% .25W CC TUBULAR	01121	CB1041
A17R2	0683-0615	1	RESISTOR; FXD; 5.1 OHM 5% .25W CC	01121	CB61G5
A17R3	0687-1041	1	RESISTOR; FXD; 100K 10% .25W CC TUBULAR	01121	EB1041
A17R4	0683-1025	2	RESISTOR; FXD; 1K 5% .25W CC TUBULAR	01121	CB1025
A17R5	0684-2741	1	RESISTOR; FXD; 270K 10% .25W CC TUBULAR	01121	CB2741
A17R6	0757-0465		RESISTOR; FXD; 100K 1% .125W F TUBULAR	24546	C4-1/8-T0-1003-F
A17R7	0757-0446		RESISTOR; FXD; 15K 1% .125W F TUBULAR	24546	C4-1/8-T0-1502-F
A17R8	0698-3547	1	RESISTOR; FXD; 1 OHM 5% .5W CC TUBULAR	01121	EB10G5
A17R9	0687-6831	1	RESISTOR; FXD; 68K 10% .5W CC TUBULAR	01121	EB6831
A17R10	0683-1025		RESISTOR; FXD; 1K 5% .25W CC TUBULAR	01121	CB1025
A17R11	0684-6831	1	RESISTOR; FXD; 68K 10% .25W CC TUBULAR	01121	CB6831
A17R12	0757-0454	1	RESISTOR; FXD; 33.2K 1% .125W F TUBULAR	24546	C4-1/8-T0-3322-F
A17R13	0757-0445	1	RESISTOR; FXD; 13K 1% .125W F TUBULAR	24546	C4-1/8-T0-1302-F
A17R14	0811-1665	3	RESISTOR; FXD; .62 OHM 5% 2W PW TUBULAR	75042	BWH2 62/100-J
A17R15	0698-3329	3	RESISTOR; FXD; 10K .5% .125W F TUBULAR	03888	PME55-1/8-T0-1002 D
A17R16	0698-5579		RESISTOR; FXD; 5K .5% .125W F TUBULAR	24546	C4-1/8-T0-5001 D
A17R17	0757-0433		RESISTOR; FXD; 3.32K 1% .125W F TUBULAR	24546	C4-1/8-T0-3321 F
A17R18	0683-3355	1	RESISTOR; FXD; 3.3M 5% .25W CC TUBULAR	01121	CB3355
A17R19	0757-0443	1	RESISTOR; FXD; 6.2K 2% .125W F TUBULAR	24546	C4-1/8-T0-6201 G
A17R20	0757-0429		RESISTOR; FXD; 1.82K 1% .125W F TUBULAR	24546	C4-1/8-T0-1821-F
A17R21	0811-1553	2	RESISTOR .68 OHM 5% 2W PW TUBULAR	75042	BWH2-11/16-J
A17R22	0757-0437		RESISTOR 4.75K OHM 1% .125F TUBULAR	28480	0757-0437
A17R23	2100-3212		RESISTOR; VAR; TRMR, 200 OHM 10% C	73138	72PR200
A17R24	2100-3056		RESISTOR; VAR; TRMR, 5K OHM 10% C	73138	89PR5K
A17R25	0698-3329		RESISTOR; FXD; 10K .5% .125W F TUBULAR	03888	PME55-1/8-T0-1002 D
A17R26	0698-3329		RESISTOR; FXD; 10K .5% .125W F TUBULAR	03888	PME55-1/8-T0-1002 D
A17R27	0683-5125	1	RESISTOR, FXD; 5.1K 5% .25W CC TUBULAR	01121	CB5125
A17R28	0811-1553		RESISTOR .68 OHM 5% 2W PW TUBULAR	75042	BWH2-11/16-J
A17R29	0757-0280		RESISTOR 1K OHM 1% .125W F TUBULAR	28480	0757-0280
A17U1	1820-0196	3	IC; LIN; VOLTAGE REGULATOR	07263	723HC
A17U2	1820-0196		IC; LIN; VOLTAGE REGULATOR	07263	723HC
A17U3	1820-0196		IC; LIN; VOLTAGE REGULATOR	07263	723HC
A17VR1	1902-3036		DIODE; ZENER; 3.16V VZ; .4W MAX PD	04713	SZ-10939-38
A17VR2	1902-3149	1	DIODE; ZENER; 9.09V VZ; .4W MAX PD	04713	SZ-10939-170
A17VR3	1902-0680		DIODE; ZENER; 6.2V 5% .4V DO-7 PD=.25W	12954	1N827
A17VR4	1902-3323		DIODE ZNR 42.2V 5% DO-7 PD=.4W	04713	SZ-10939-361
A17XU1	1200-0493	3	SOCKET; I.C. FOR 10-PIN TO-5 CASE	4H713	133 99 92 064
A17XU2	1200-0493		SOCKET; I.C. FOR 10-PIN TO-5 CASE	4H713	133-99-92-064
A17XU3	1200-0493		SOCKET; I.C. FOR 10-PIN TO-5 CASE	4H713	133 99 92 064

See introduction to this section for ordering information

Table 6-2. Replaceable Parts (Option 001)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			PARTS LIST FOR OPTION 101		
A26	01710-66553	1	BD ASSY:STATE DISPLAY	28480	01710-66553
A26C1	0160-3461		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-3461
A26C2	0160-3461		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-3461
A26C3	0160-3446		CAPACITOR-FXD 220PF +-10% 1000WVDC CER	28480	0160-3446
A26C4	0160-3461		CAPACITOR-FXD .01UF +80-20% 100WVDC CER	28480	0160-3446
A26CR1	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1910-0047
A26CR2	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A26CR3	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A26CR4	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A26CR5	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A26CR6	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A26CR7	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A26CR8	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A26P1	1251-3973		CONNECTOR-MALE	28480	1251-3973
A26P2	1251-3973		CONNECTOR-MALE	28480	1251-3973
A26Q1	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A26Q2	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A26Q3	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A26Q4	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A26Q5	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A26Q6	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A26Q7	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A26Q8	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A26Q9	1853-0036		TRANSISTOR PNP SI CHIP PD=310MW	28480	1853-0036
A26Q10	1854-0215		TRANSISTOR NPN SI PD=310MW FT=300MHZ	04713	SPS3611
A26R1	0684-0271		RESISTOR 2.7 OHM 10% .25W CC TUBULAR	01121	CB27G1
A26R2	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A26R3	0698-3156		RESISTOR 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A26R4	0698-3156		RESISTOR 4.64K 1% .125W F TUBULAR	16299	C4-1/8-T0-4641-F
A26R5	0757-0283		RESISTOR 2K 1% .125W F TUBULAR	24546	C4-1/8-T0-2001-F
A26R6	0757-0284		RESISTOR 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A26R7	0757-0729		RESISTOR 681 OHM 1% .25W F TUBULAR	24546	C4-1/8-T0-681R-F
A26R8	0757-0284		RESISTOR 150 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-151-F
A26R9	0757-0427		RESISTOR 1.5K 1% .125W F TUBULAR	24546	C4-1/8-T0-1501-F
A26R10	0698-3152		RESISTOR 3.48K 1% .125W F TUBULAR	16299	C4-1/8-T0-3481-F
A26R11	0757-0288		RESISTOR 9.09K 1% .125W F TUBULAR	19701	MF4C-1/8-T0-9091-F
A26R12	0757-0280		RESISTOR 1K 1% .125W F TUBULAR	24546	C4-1/8-T0-1001-F
A26R13	0757-0410		RESISTOR 301 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-301R-F
A26R14	0757-0410		RESISTOR 301 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-301R-F
A26R15	0757-0421		RESISTOR 825 OHM 1% .125W F TUBULAR	24546	C4-1/8-T0-825R-F
A26R16	0698-0085		RESISTOR 2.61K 1% .125W F TUBULAR	16299	C4-1/8-T0-2611-F
A26R17	1810-0243		RESISTOR 6.8K (EIGHT SECTIONS)	28480	1810-0243
A26R18	0684-4711		RESISTOR 470 OHM 10% .5W CC TUBULAR	01121	EB4711
A26R19	0757-0932		RESISTOR 2.2K 2% .125W F TUBULAR	24546	C4-1/8-T0-2201-G
A26R20	0684-1001		RESISTOR 10 OHM 10% .25W CC TUBULAR	01121	CB1001
A26R21	0684-1021		RESISTOR 1K 10% .25W CC TUBULAR	01121	CB1021
A26S1	3101-0973		SWITCH: SL; DPDT .5A 125VAC/DC	79727	GF126-0018
A26VR1	1902-3094		DIODE-ZNR 5.11V 2% DO-7 PD=.4W	04713	SZ10939-99
A26VR2	1902-3149		DIODE-ZNR 9.09V 5% DO-7 PD=.4W	04713	SZ10939-170
A27	01710-66554		BD ASSY: DIODE INTERFACE	28480	01710-66554
A27CR1	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A27CR2	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A27CR3	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
A27CR4	1901-0047		DIODE-SWITCHING 10NS 20V 75MA	28480	1901-0047
MP42	01720-61403	1	KNOB ASSY/101 (INTENSITY CONTROL ONLY)	28480	01720-61403
R2	2100-3244	1	RESISTOR VAR 10K 10% 4PSW (INTENSITY)	28480	2100-3244
W8	01710-61635		CABLE-OPT 101 MAIN	28480	01710-61635
W9	01710-61636		CABLE-OPT 101 TWIN	28480	01710-61636
W10	01710-61637		CABLE-OPT 101 COAX	28480	01710-61637

Table 6-3. List of Manufacturers' Codes

MFR. NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
FR003	SOVCOR ELECTRONIQUE	LE VESINET FRANCE	
00000	U.S.A. COMMON		
01121	ALLEN BRADLEY CO	MILWAUKEE WI	53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS TX	75231
02114	FERROXCUBE CORP	SAUGERTIES NY	12477
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE NJ	08876
03888	PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX AZ	85008
06540	AIRCO SPEER ELECTRONICS DIV	NOGALES AZ	85621
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW CA	94040
07716	TRW INC BURLINGTON DIV	BURLINGTON IA	52601
08806	GE CO MINIATURE LAMP PROD DEPT	CLEVELAND OH	44112
12954	DICKSON ELECTRONICS CORP	SCOTTSDALE AZ	85252
13103	THERMALLOY CO	DALLAS TX	75247
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW CA	94040
16299	CORNING GLASS WK ELEC CMPNT DIV	RALEIGH NC	27604
16701	MEPCO/ELECTRA CORP (MF RES)	MINERAL WELLS TX	76067
24226	GOWANDA ELECTRONICS CORP	GOWANDA NY	14070
24546	CORNING GLASS WORKS (C STYLE RES)	BRADFORD PA	16701
24931	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS IN	46227
24995	ENVIRONMENTAL CNTNR SYS (CRATE-RITE)	PALO ALTO CA	94304
25403	AMPEREX SOLID STATE ACTIVE DVC DIV	SLATTERSVILLE RI	02876
27264	MOLEX PRODUCTS CO	DOWNERS GROVE IL	60515
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
30983	MEPCO/ELECTRA CORP (VAR RES)	SAN DIEGO CA	92121
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE CA	92507
4H713	CINCH MFG CO	SHELBYVILLE IN	46176
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
61637	UNION CARBIDE CORP	NEW YORK NY	10017
70903	BELDEN CORP	CHICAGO IL	60644
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS MO	63017
71590	CENTRALAB ELEK DIV GLOBE-UNION INC	MILWAUKEE WI	53201
71744	CHICAGO MINIATURE LAMP WORKS	CHICAGO IL	60640
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE IL	60007
72136	ELECTRO MOTIVE MFG CO INC	WILLIMANTIC CT	06226
72982	ERIE TECHNOLOGICAL PRODUCTS INC	ERIE PA	16512
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON CA	92634
73734	FEDERAL SCREW PRODUCTS INC	CHICAGO IL	60618
73899	J F D ELECTRONICS CORP	BROOKLYN NY	11219
74970	JOHNSON E F CO	WASECA MN	56093
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTLEFUSE INC	DES PLAINES IL	60016
78189	ILLINOIS TOOL WORKS INC	ELGIN IL	60126
79963	ZIERICK MFG CO	MT KISCO NY	10549
82142	NO M/F DESCRIPTION FOR THIS MFG NUMBER		
82389	SWITCHCRAFT INC	CHICAGO IL	60630
84411	TRW CAPACITOR DIV	OGALLALA NE	69153
91637	DALE ELECTRONICS INC	COLUMBUS NE	68601
96712	BENDIX CORP THE MICROWAVE DEVICES	FRANKLIN IN	46131

BACK DATING MANUAL CHANGES

SECTION VII

MANUAL CHANGES

7-1. INTRODUCTION.

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

7-3. MANUAL CHANGES.

7-4. This manual applies directly to the instrument having the same serial prefix shown on the manual title page. If the serial prefix of the instrument is not the same as the one on the title page, find your serial prefix in table 7-1 and make the changes to the manual that are listed for that serial prefix. Refer to paragraph 7-12 for changes. When making changes listed in table 7-1, make the change with the highest number first. Example: if backdating changes 1, 2, and 3 are required for your serial prefix, do change 3 first, then change 2, and finally change 1. If the serial prefix of the instrument is not listed either on the title page or in table 7-1, refer to the enclosed MANUAL CHANGES sheet for updating information. Also, if a MANUAL CHANGES sheet is supplied, make all indicated ERRATA corrections.

Table 7-1. Manual Changes

Serial Prefix	Make Changes
1420A	1, 2, 3, 4, 5, 6
1510A	2, 3, 4, 5, 6
1515A	3, 4, 5, 6
1524A	4, 5, 6
1545A	5, 6
1602A	6

7-5. OPTIONS.

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

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

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

7-9. STANDARD OPTIONS. Standard options are modifications installed on HP instruments at the factory and are available on request. The following paragraphs list additional information on standard options available for Model 1710B.

7-10. OPTION 003. This option supplies two rear-panel connectors for probe power. The option consists of the standard instrument and assembly A18 (HP Part No. 01720-66516). See figure 7-1 for option 003 schematic. Refer to table 7-2 for component part numbers.

Table 7-2. Option 003 Parts List

Ref Desig	HP Part No.	Description
C1	0180-0045	C:20 μF, 25 VDCW
CR1	1901-0028	CR:DIODE SI
J1, 2	5060-0467	CONN:MALE PROBE
MP1	1205-0095	HEAT SINK (FOR Q1)
Q1	1854-0039	TSTR:SI NPN
Q2	1853-0086	TSTR:SI PNP
R1	0698-3155	R:4.64K 1/8W
R2	0757-0451	R:24.3K 1/8W
R3	0683-1525	R:1.5K 1/4W

7-11. OPTION 101. Consists of Board Assembly A26, HP Part No. 01710-66553, and Board Assembly A27, HP Part No. 01710-66554. The board assemblies adapt the Model 1710B for use with HP Model 1607A Logic State Analyzer. When modified, the Model 1710B can be used normally or as a 16-channel logic state display. (See figures 7-2 through 7-4 for schematic and assembly component identification. Refer to the end of table 6-2 for Option 101 parts list.)

7-12. MANUAL CHANGES LISTING.

CHANGE 1

Table 6-2,
A12: Change HP Part No. and Mfr Part No. to HP Part No. 01720-66510; Description unchanged.
A12C2: Change to HP Part No. 0140-0149; CAPACITOR-FXD 470 PF +—5% 300 WVDC; Mfr Code 72136, Mfr Part No. DM15F471J0300WV1CR.
A12C3: Change to HP Part No. 0160-0300; CAPACITOR-FXD .0027 UF +—10% 200 WVDC; Mfr Code 56289, Mfr Part No. 292P27292.
A12C4: Change to HP Part No. 0160-0162; CAPACITOR-FXD .022 UF +—10% 200 WVDC; Mfr Code 56289, Mfr Part No. 292P22392.
A12C5: Change to HP Part No. 0170-0040; CAPACITOR-FXD .047 UF +—10% 200 WVDC; Mfr Code 56289, Mfr Part No. 292P47392.
A12C7: Change to HP Part No. 0180-0301; CAPACITOR-FXD 5 UF +75—10% 50 WVDC AL; Mfr Code 56289, Mfr Part No. 30D505G050BB2.
Scheamtic 13,
A12C2: Change value to 470 PF.
A12C3: Change value to 2700 PF.
A12C4: Change value to .022 UF.
A12C5: Change value to .047 UF.
A12C7: Change value to 5 UF.

CHANGE 2

Table 6-2,
A8: Change HP Part No. and Mfr Part No. to HP Part No. 01720-66519; Description unchanged.
A8C8: Change to HP Part No. 0160-3650; CAPACITOR-EXD .018 UF +—10% 50 WVDC; Mfr Code 28480, Mfr Part No. 0160-3650.
A8C11: Change to HP Part No. 0160-3448; CAPACITOR-FXD .001 UF +—10% 1000 WVDC; Mfr Code 28480, Mfr Part No. 0160-3448.
A8C26: Change to HP Part No. 0160-3650; CAPACITOR-FXD .018 UF +—10% 50 WVDC; Mfr Code 28480, Mfr Part No. 0160-3650.
A8C29: Change to HP Part No. 0160-3448; CAPACITOR-FXD .001 UF +—10% 1000 WVDC; Mfr Code 28480, Mfr Part No. 0160-3448.
Add: A8R2, HP Part No. 0757-0471; RESISTOR 182K 1% .125W F TUBULAR; Mfr Code 24546, Mfr Part No. C4-1/8-T0-1823-F.
A8R10: Change to HP Part No. 0698-3427; RESISTOR 13.3 OHM 1% .125W F TUBULAR; Mfr Code 03888, Mfr Part No. PME55-1/8-T0-13R3-F.
A8R11: Change to HP Part No. 0698-3451; RESISTOR 133K 1% .125W F TUBULAR; Mfr Code 16299, Mfr Part No. C4-1/8-T0-1333-F.
A8R12: Change to HP Part No. 0757-0471; RESISTOR 182K 1% .125W F TUBULAR; Mfr Code 24546, Mfr Part No. C4-1/8-T0-1823-F.
A8R13: Change to HP Part No. 0698-8198; RESISTOR 1.58M 1% .125W F TUBULAR; Mfr Code 30983, Mfr Part No. MF5C1/8-T0-1584-F.
A8R15: Change to HP Part No. 0684-3341; RESISTOR 330K 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB3341.
A8R18: Change to HP Part No. 0684-1011; RESISTOR 100 OHM 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB1011.
Add: A8R60, HP Part No. 0757-0471; RESISTOR 182K 1% .125W F TUBULAR; Mfr Code 24546, Mfr Part No. C4-1/8-T0-1823-F.
A8R63: Change to HP Part No. 0757-0471; RESISTOR 182K 1% .125W F TUBULAR; Mfr Code 24546, Mfr Part No. C4-1/8-T0-1823-F.
A8R69: Change to HP Part No. 0698-3427; RESISTOR 13.3 OHM 1% .125W F TUBULAR; Mfr Code 03888, Mfr Part No. PME55-1/8-T0-13R3-F.
A8R70: Change to HP Part No. 0698-3451; RESISTOR 133K 1% .125W F TUBULAR; Mfr Code 16299, Mfr Part No. C4-1/8-T0-1333-F.
A8R71: Change to HP Part No. 0698-8198; RESISTOR 1.58M 1% .125W F TUBULAR; Mfr Code 30983, Mfr Part No. MF5C1/8-T0-1584-F.
A8R73: Change to HP Part No. 0684-3341; RESISTOR 330K 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB3341.
A8R85: Change to HP Part No. 0684-1011; RESISTOR 100 OHM 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB1011.
A8R170: Change to HP Part No. 0757-0464; RESISTOR 90.9K 1% .125W F TUBULAR; Mfr Code 24546, Mfr Part No. C4-1/8-T0-9092-F.
A8R171: Change to HP Part No. 0757-0464; RESISTOR 90.9K 1% .125W F TUBULAR; Mfr Code 24546, Mfr Part No. C4-1/8-T0-9092-F.
Schematic 9,
A8C8: Change value to .018 UF.
A8C11: Change value to 1000 PF.
Add: A8R2 between right, center contact A8S1N and ground. Value is 182K.
A8R10: Change value to 13.3.
A8R11: Change value to 133K.
A8R12: Change value to 182K.
A8R13: Change value to 1.58M.
A8R15: Change value to 330K.
A8R18: Change value to 100.
A8R171: Change value to 90.9K.
Schematic 11,
A8C26: Change value to .018 UF.
A8C29: Change value to 1000 PF.
Add: A8R60 between right, center contact A8S1D and ground. Value is 182K.
A8R63: Change value to 182K.
A8R69: Change value to 13.3.
A8R70: Change value to 133K.
A8R71: Change value to 1.58M.
A8R73: Change value to 330K.
A8R85: Change value to 100.
A8R170: Change value to 90.9K.

CHANGE 3

Table 6-2,
A14: Change HP Part No. and Mfr Part No. to 01720-66513; Description unchanged.
A15: Change HP Part No. and Mfr Part No. to 01720-66512; Description unchanged.
Add: DS2 and DS3; HP Part No. 2140-0008; LAMP, GLOW, BULB T-2, 59 V; Mfr Code 71744, Mfr Part No. A1A(NE-2).
W5: Change HP Part No. and Mfr Part No. to 01720-61604; Description unchanged.
Delete: A14C32.
Delete: A14CR13 and A14CR14.
Delete: A14Q18 and A14Q19.
Delete: A14R5.
A14R6: Change to HP Part No. 0684-1021; RESISTOR 1K OHM 10% .25W CC TUBULAR; Mfr Code 01121, Mfr Part No. CB1021.
Delete: A14R80 and A14R81.
Delete: A14VR5.
Delete: A15DS1 and A15DS2.
Delete: A5R14.
Figure 8-19,
Replace with figure 7-5.
Schematic 17,
Replace with figure 7-6.
Figure 8-20,
Replace with figure 7-7.
Schematic 18,
Repalce with figure 7-8.

CHANGE 4

Table 6-2,
A5: Change HP Part No. and Mfr Part No. to 01720-66525; Description unchanged.
Delete: A5CR3 and A5CR4.
A6: Change HP Part No. and Mfr Part No. to 01720-6650 , Description unchanged.
A7: Change HP Part No. and Mfr Part No. to 01720-66502; Description unchanged.
A10: Change HP Part No. and Mfr Part No. to 01720-66518; Description unchanged.
A13: Change HP Part No. and Mfr Part No. to 01720-66523; Description unchanged.
Delete: A13CR3 and A13CR4.
Page 7-1,
Delete: Paragraph 7-11.
Figure 8-8,
Delete: A5CR3 and A5CR4.
Schematic 6,
Delete: A5CR3 and A5CR4.
Figure 8-18,
Delete: A13CR3 and A13CR4.
Schematic 16,
Delete: A13CR3 and A13CR4.

CHANGE 5

Table 6-2,
A9: Change HP Part No. and Mfr Part No. to 01720-66522; Description unchanged.
A11: Change HP Part No. and Mfr Part No. to 01720-66521; Description unchanged.
A9C2: Change to HP Part No. 0121-0456; Description unchanged; Mfr Code 74970, Mfr Part No. 187-0109-105.
A9C10: Change to HP Part No. 0121-0456; Description unchanged; Mfr Code 74970, Mfr Part No. 187-0109-105.
A9C12: Change to HP Part No. 0121-0456; Description unchanged; Mfr Code 74970, Mfr Part No. 187-0109-105.
A11C4: Change to HP Part No. 0121-0456; Description unchanged; Mfr Code 74970. 187-0109-105.
A11C12: Change to HP Part No 0121-0456; Description unchanged; Mfr Code 74970, Mfr Part No. 187-0109-105.
A11C14: Change to HP Part No. 0121-0456; Description unchanged; Mfr Code 74970, Mfr Part No. 187-0109-105.

CHANGE 6

Table 6-2,
A1: Change HP Part No. and Mfr Part No. to 01710-63407; Description unchanged.
A2: Change HP Part No. and Mfr Part No. to 01710-63408; Description unchanged.
A1A1: Change HP Part No. and Mfr Part No. to 01720-66505; Description unchanged.
A2A1: Change HP Part No. and Mfr Part No. to 01720-66506; Description unchanged.

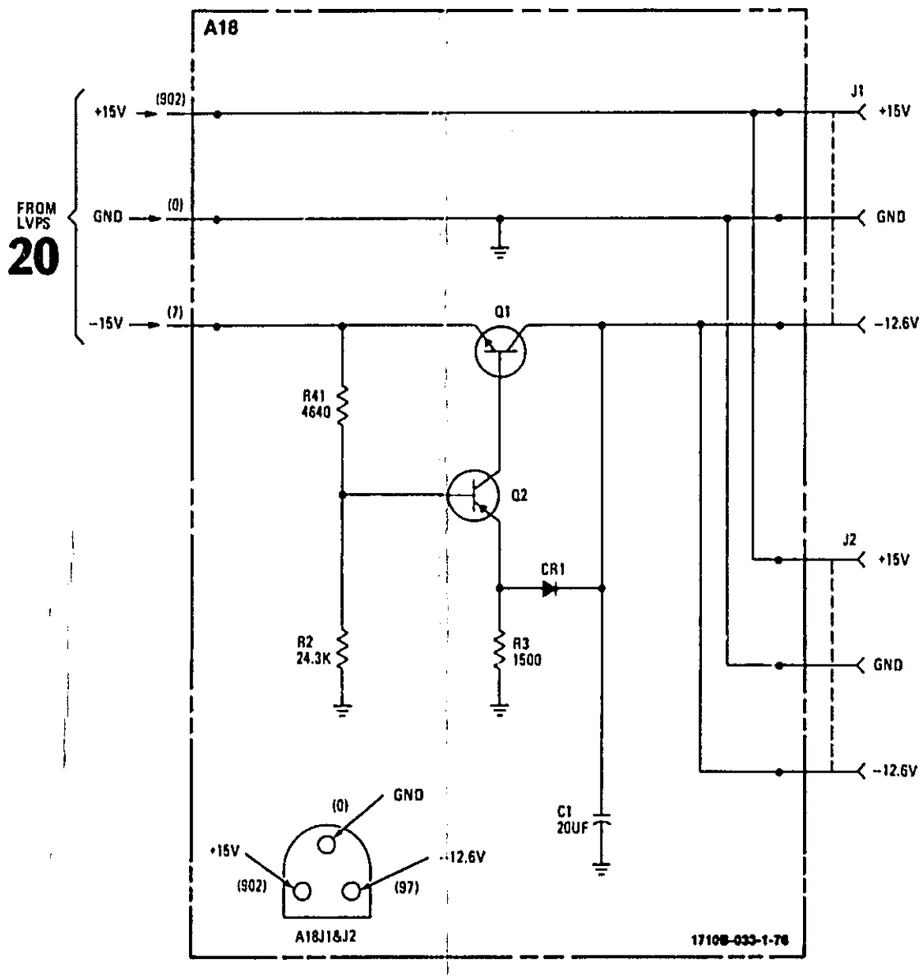


Figure 7-1.
Option 003 Probe Power Schematic

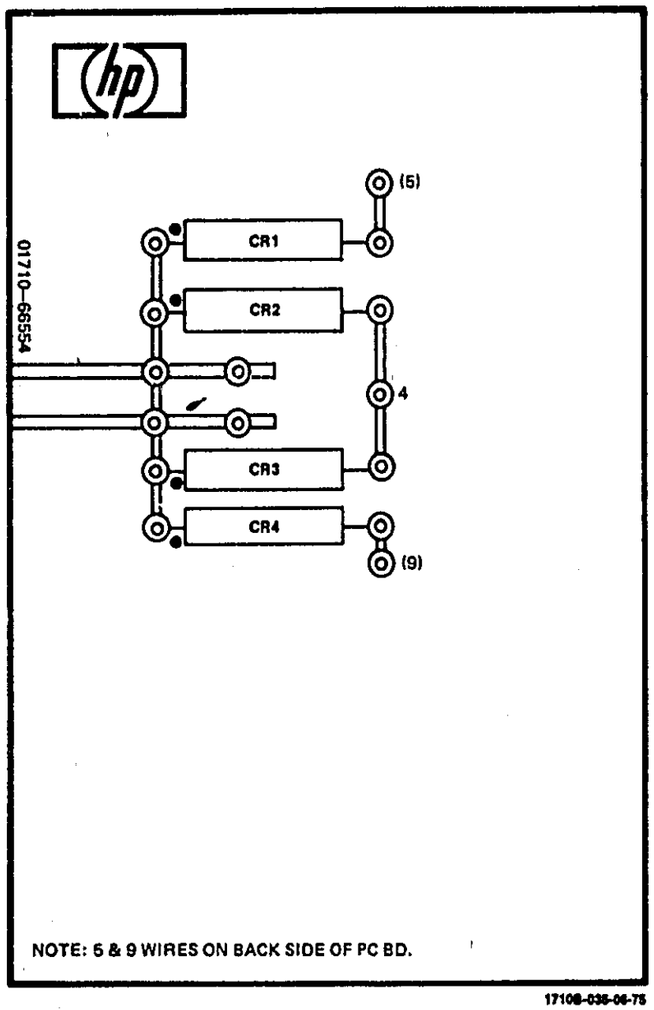
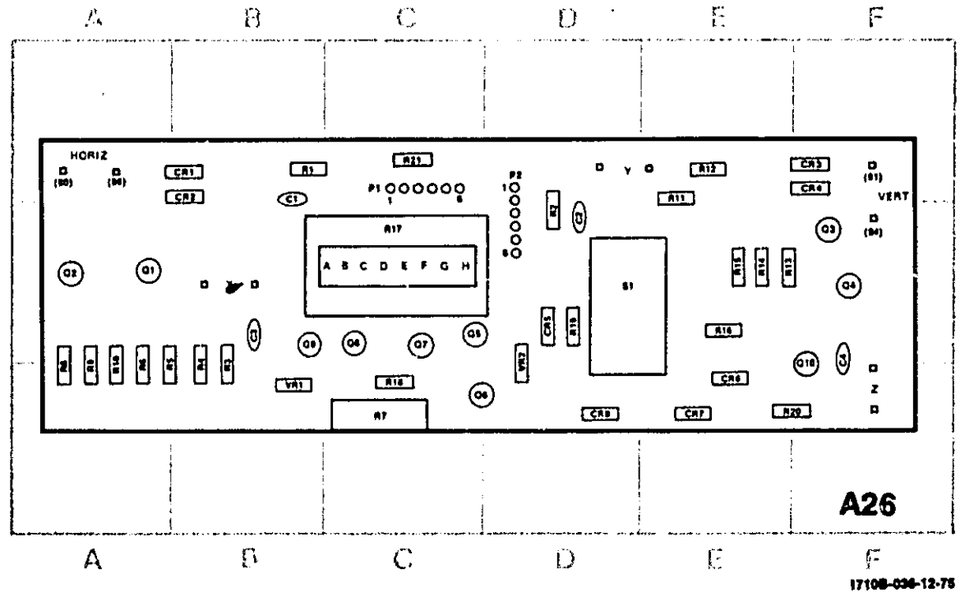


Figure 7-2. Assembly A27 Component Identification



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-1	CR5	D-2	Q3	F-2	R1	B-1	R9	A-3	R17	C-2
C2	D-2	CR6	E-3	Q4	F-2	R2	D-2	R10	A-3	R18	C-2
C3	B-2	CR7	E-3	Q5	C-2	R3	B-3	R11	E-1	R19	D-2
C4	F-2	CR8	D-3	Q6	C-3	R4	B-3	R12	E-1	R20	F-3
CR1	B-1	P1	C-1	Q7	C-2	R5	B-3	R13	E-2	R21	C-1
CR2	B-2	P2	D-1	Q8	C-2	R6	A-3	R14	E-2	VR1	B-3
CR3	F-1	Q1	A-2	Q9	B-2	R7	C-3	R15	E-2	VR2	D-3
CR4	F-1	Q2	A-2	Q10	F-3	R8	A-3	R16	E-2		

Figure 7-3. Assembly A26 Component Identification

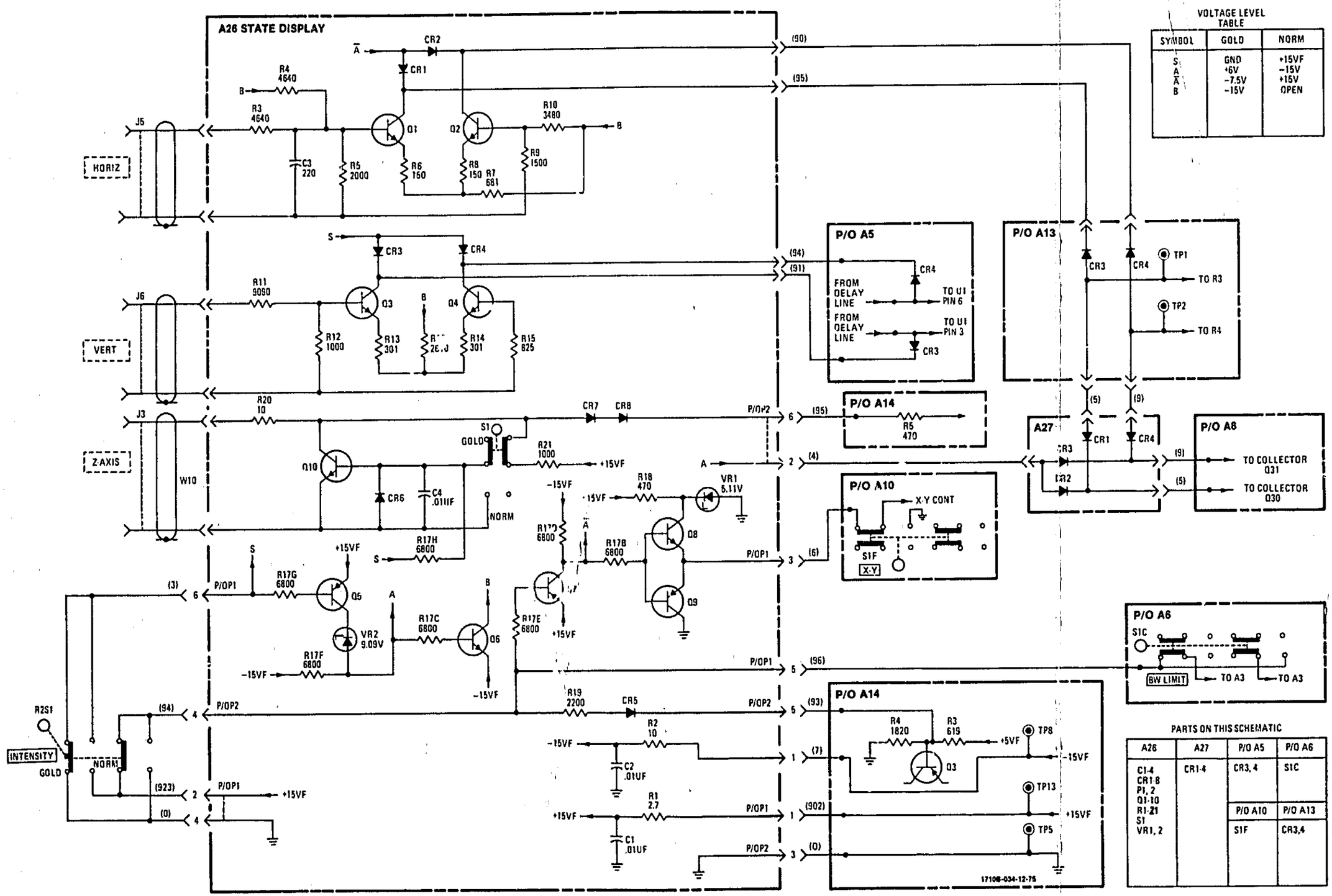
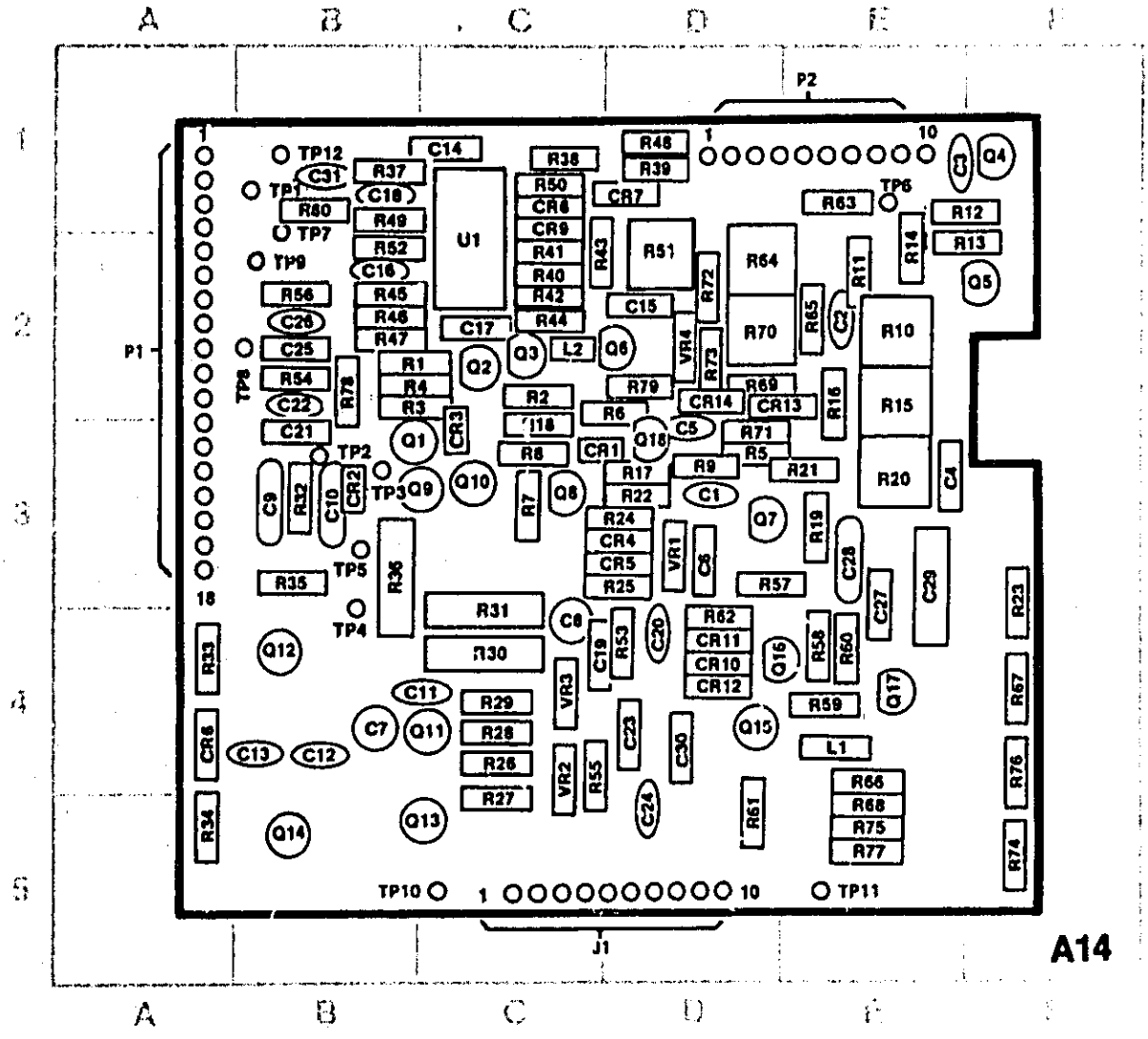


Figure 7-4.
Option 101 Schematic



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	D-3	C29	E-3	Q8	C-3	R18	C-2	R46	B-2	R73	D-2
C2	E-2	C30	D-4	Q9	B-3	R19	E-3	R47	B-2	R74	F-5
C3	E-1	C31	B-1	Q10	C-3	R20	E-3	R48	D-1	R75	E-5
C4	E-3	CR1	D-3	Q11	C-4	R21	D-3	R49	B-1	R76	F-4
C5	D-3	CR2	B-3	Q12	B-4	R22	D-3	R50	C-1	R77	E-5
C6	D-3	CR3	C-3	Q13	C-5	R23	F-3	R51	D-2	R78	B-2
C7	B-4	CR4	D-3	Q14	B-5	R24	D-3	R52	B-2	R79	D-2
C8	C-4	CR5	D-3	Q15	D-4	R25	D-3	R53	D-4	R80	B-1
C9	B-3	CR6	A-4	Q16	D-4	R26	C-4	R54	B-2	TP1	B-1
C10	B-3	CR7	D-1	Q17	E-4	R27	C-5	R55	C-4	TP2	B-3
C11	B-4	CR8	C-1	Q18	D-3	R28	C-4	R56	B-2	TP3	B-3
C12	B-4	CR9	C-1	R1	B-2	R29	C-4	R57	D-3	TP4	B-4
C13	B-4	CR10	D-4	R2	C-2	R30	C-4	R58	E-4	TP5	B-3
C14	C-1	CR11	D-4	R3	B-2	R31	C-4	R59	E-4	TP6	E-1
C15	D-2	CR12	D-4	R4	B-2	R32	B-3	R60	E-4	TP7	B-1
C16	B-2	CR13	D-2	R5	D-3	R33	A-4	R61	D-5	TP8	B-2
C17	C-2	CR14	D-2	R6	D-2	R34	A-5	R62	D-4	TP9	B-2
C18	B-1	L1	E-4	R7	C-3	R35	B-3	R63	E-1	TP10	C-5
C19	D-4	L2	C-2	R8	C-3	R36	B-3	R64	D-2	TP11	E-5
C20	D-4	P1	A-2	R9	D-3	R37	B-1	R65	E-2	TP12	B-1
C21	B-3	P2	E-1	R10	E-2	R38	C-1	R66	E-4	U1	C-2
C22	B-2	Q1	B-3	R11	E-2	R39	D-1	R67	F-4	VR1	D-3
C23	D-4	Q2	C-2	R12	E-1	R40	C-2	R68	E-5	VR2	C-5
C24	D-5	Q3	C-2	R13	E-2	R41	C-2	R69	D-2	VR3	C-4
C25	B-2	Q4	F-1	R14	E-2	R42	C-2	R70	D-2	VR4	D-2
C26	B-2	Q5	F-2	R15	E-2	R43	C-2	R71	D-3	J1	C-5
C27	E-4	Q6	D-2	R16	E-2	R44	C-2	R72	D-2		
C28	E-3	Q7	D-3	R17	D-3	R45	B-2				

17108-837-1-76

Figure 7-5. Replacement for P/O Figure 6-19

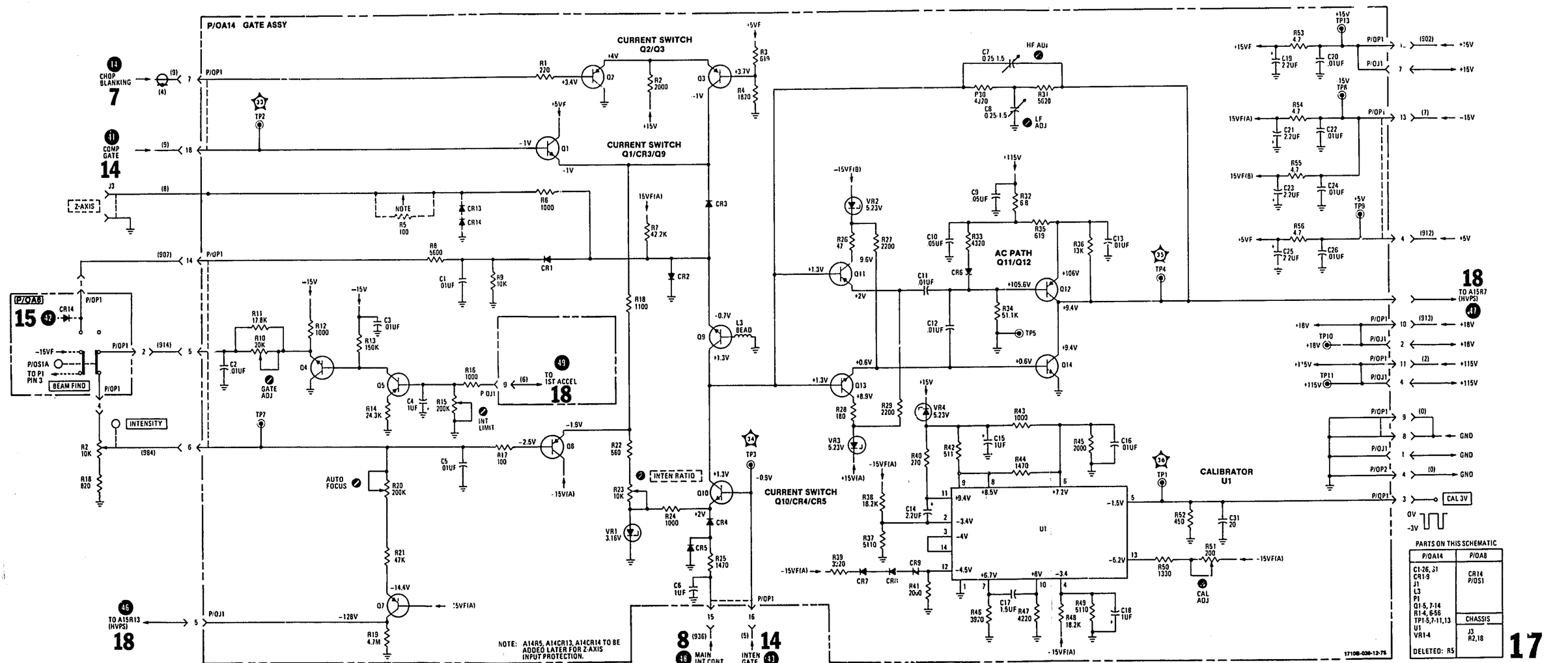
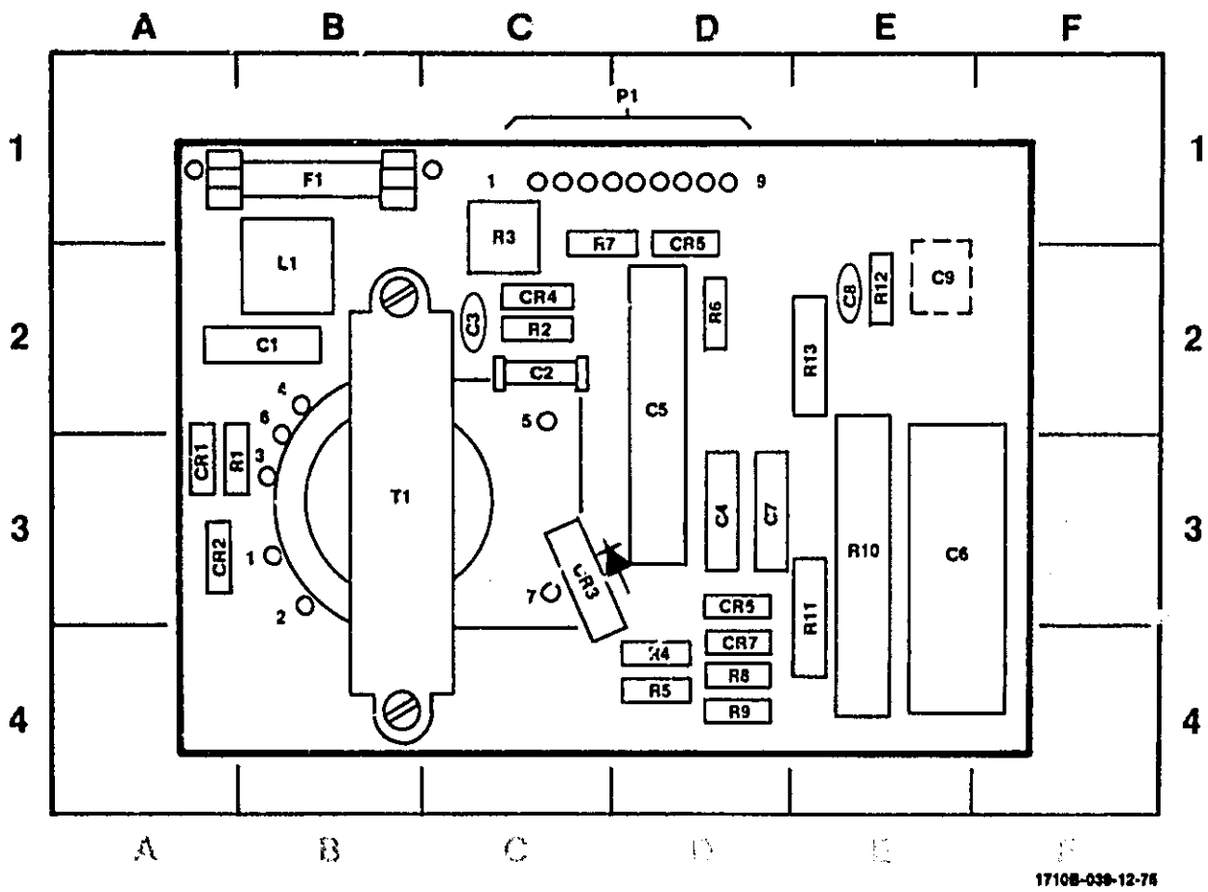


Figure 7-6.
Replacement for Schematic 17



A15

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-2	C8	E-2	CR6	D-3	R1	A-3	R8	D-4
C2	C-2	C9	E-2	CR7	D-4	R2	C-2	R9	D-4
C3	C-2	CR1	A-3	E1	A-1	R3	C-1	R10	E-3
C4	D-3	CR2	A-3	E2	C-1	R4	D-4	R11	E-3
C5	D-2	CR3	C-3	F1	B-1	R5	D-4	R12	E-2
C6	E-3	CR4	C-2	L1	B-2	R6	D-2	R13	E-2
C7	D-3	CR5	D-2	P1	D-1	R7	C-2	T1	B-3

Figure 7-7. Replacement for P/O Figure 8-20

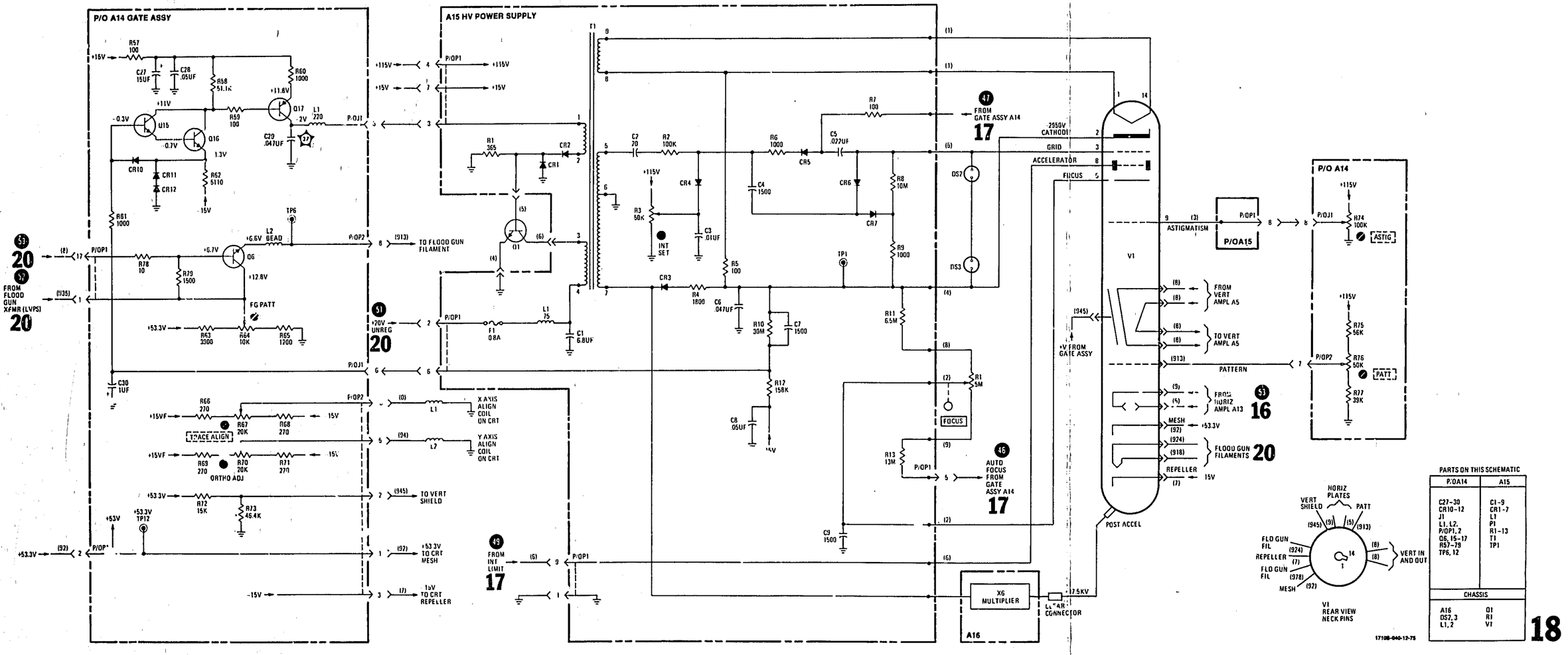


Figure 7-8.
Replacement for Schematic 18

SCHEMATIC DIAGRAMS

SECTION VIII

SCHEMATICS AND TROUBLESHOOTING

8-1. INTRODUCTION.

8-2. This section contains schematics, repair and replacement information, component-identification illustrations, waveforms, and test conditions. A disassembly procedure for removing the CRT and instrument modules for repair and replacement is also contained in this section.

8-3. SCHEMATICS.

8-4. Schematics are printed on foldout pages. The schematics are drawn to show the electronic function of the circuits. Any one schematic may include all or part of several different physical assemblies. Non-MIL-standard symbols and conventions used in the schematics are defined in table 8-1.

8-5. The schematics are numbered in sequence with a bold number at the lower right-hand corner of each page. These numbers are used to cross reference signal connections between the schematics. At each circuit breaking point, a number in a circle is shown, followed by another number in bold type. The circled number indicates the signal or circuit and the bold number indicates the associated schematic that contains the source or destination of the signal. Circled number indicators are used only when the referenced schematic has a large number of signals assigned. When a referenced schematic has few assigned signals, only the schematic designator is given. To find the source or destination of the signal, turn to the indicated schematic and find the circled number (if assigned).

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

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

8-8. REFERENCE DESIGNATIONS.

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

8-10. Each electrical component is assigned a class letter and a number. This letter-number combination is the basic reference designation. Components which are part of an assembly have, in addition to the basic designation, a prefix designation indicating the assembly of which the component is a part. For instance, resistor R23 on assembly A1 is called A1R23.

8-11. Assemblies are numbered consecutively. If an assembly reference designation is assigned and later deleted, that number is not reused.

8-12. COMPONENT LOCATIONS.

8-13. Locations of components on etched circuit boards are illustrated on line drawings adjacent to the schematics. Since the schematics are drawn to show function, portions of a particular assembly may appear on several different schematics.

8-14. PREVENTIVE MAINTENANCE.

8-15. Preventive maintenance consists of periodic performance checks, calibration, mechanical inspection, lubrication, and other services designed to prevent breakdown and failure. Performance checks and calibration are covered in Section V of this manual. The other preventive maintenance services are covered in the following paragraphs.

8-16. MECHANICAL INSPECTION. Periodically inspect the instrument for damaged components, excess grease, dirt, and corrosion. Look for loose and misaligned assemblies. Ensure that all screws and fasteners are tight and serviceable.

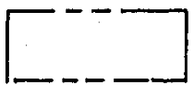
8-17. Refer to the paragraphs in this section on repair and replacement for instructions on replacing damaged components.

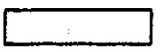
8-18. Painted surfaces can be cleaned with a commercial, spray-type window cleaner or with a mild soap and water solution. Excess grease can be removed with a degreaser such as M-180 FREON TF DEGREASER produced by Miller-Stevenson Company.

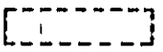
8-19. Corroded spots are best removed with soap and water. Stubborn residues can be removed with a fine abrasive. When using abrasives, be careful that fine particles do not fall into instrument. Such areas

Table 8-1. Schematic Notes

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


ETCHED CIRCUIT BOARD


FRONT-PANEL MARKING

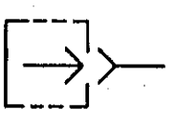

REAR-PANEL MARKING

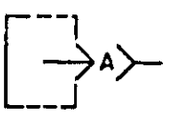

FRONT-PANEL CONTROL


SCREWDRIVER ADJUSTMENT

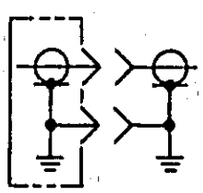
ELECTRICAL TEST POINT TP (WITH NUMBER)

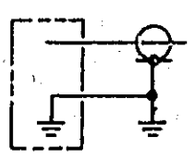
WAVEFORM TEST POINT (WIT I NUMBER)


SINGLE-PIN CONNECTOR ON BOARD



PIN OF A PLUG-IN BOARD (WITH LETTER OR NUMBER)


COAXIAL CABLE CONNECTED TO SNAP-ON JACK


COAXIAL CABLE CONNECTED DIREC 'LY TO BOARD

MAIN SIGNAL PATH

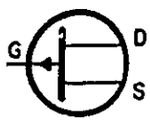
PRIMARY FEEDBACK PATH

SECONDARY FEEDBACK PATH

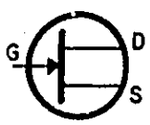
P/O PART OF

NC NO CONNECTION

CW CLOCKWISE END OF VARIABLE RESISTOR



FIELD-EFFECT TRANSISTOR (P-TYPE BASE)

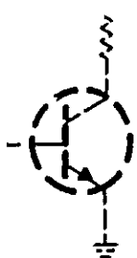


FIELD-EFFECT TRANSISTOR (N-TYPE BASE)


BREAKDOWN DIODE (VOLTAGE REGULATOR)


TUNNEL DIODE


STEP-RECOVERY DIODE


CIRCUITS OR COMPONENTS DRAWN WITH DASHED LINES (PHANTOM) SHOW FUNCTION ONLY AND ARE NOT INTENDED TO BE COMPLETE. THE CIRCUIT OR COMPONENT IS SHOWN IN DETAIL ON ANOTHER SCHEMATIC.

SIGNAL REFERENCE

SCHEMATIC REFERENCE

(925) WIRE COLORS ARE GIVEN BY NUMBERS IN PARENTHESIS USING THE RESISTOR COLOR CODE

[(925) IS WHT-RED-GRN]

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

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

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

should be protected from further corrosion by an application of a silicone resin such as GE DRI-FILM 88.

8-20. SWITCH MAINTENANCE. The pushbutton switches used in this instrument have been designed for long, trouble-free service. In the event that one of these switches becomes defective, replacement rather than repair is recommended.

8-21. The rotary switches in this instrument can easily be serviced after removal of the assembly on which the switch is mounted. In the case of the TIME/DIV switch, the TIME/DIV switch shaft must be removed. Refer to the paragraphs on repair and replacement in this section for instructions on disassembly of the modules in the instrument.

8-22. Conventional rotary switches are serviced by cleaning the contacts with a degreaser such as M-180 FREON TF DEGREASER. The contact surfaces are then lubricated with a lubricant comparable to LUBRIPLATE FML produced by the Fiske Brothers Refining Company. LUBRIPLATE FML is available from the Hewlett-Packard Company (HP Part No. 6040-0305).

CAUTION

Do not attempt to clean attenuator switches with any cleaning agent. Attenuator switches have self-cleaning contacts.

8-23. The rotary switches on assemblies A9 and A11 can be serviced as follows:

a. Remove TIME/DIV knob and shaft (refer to paragraph 8-31).

b. Remove plug-in assembly (A9 or A11) from assembly A8.

c. Observe orientation of slot in rotor section of switch.

d. Remove metal retainer ring uniting male and female sections of rotor switch.

e. Separate two rotor sections.

f. Check contacts on both rotor sections. If contacts show excessive wear, replace rotor section.

g. Check contact area on etched circuit board. If contact area shows excessive wear, replace etched circuit board.

h. Clean and lubricate contacts on etched circuit board and rotors as described in paragraph 8-22.

i. Place rotor sections on etched circuit board and reinstall retainer ring.

j. Position slotted portion of open rotor section as noted in step c.

k. Reinstall assembly in instrument.

l. Reinstall TIME/DIV shaft and knob assembly.

8-24. REMOVAL AND REPLACEMENT.

8-25. The following paragraphs provide procedures for removal and replacement of assemblies, subassemblies, and components. Special servicing instructions for etched circuit boards are provided in paragraph 8-41. Section VI provides a detailed parts list for use in ordering replacement parts.

8-26. CRT REMOVAL AND REPLACEMENT. To remove and replace the CRT, see figure 6-1 and proceed as follows:

WARNING

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

a. Remove top and bottom covers from instrument.

b. Remove rear-panel CRT socket cover MP21.

c. Remove front-panel CRT bezel (MP16) by squeezing at midpoint on bottom and rotating outward and upward.

d. Remove CRT filter (if in use).

e. Remove four VERT IN wires (gray) from side of CRT neck.

f. Disconnect horizontal input cable W4 (wires (9) and (5)) from CRT neck pins.

g. Disconnect CRT cable connector from gate assembly at A14P2.

h. Disconnect floodgun filament wire (924) from CRT neck pin.

i. Carefully disconnect CRT socket (XV1).

j. Remove two CRT shield mounting screws from rear panel of instrument (at MP44 and MP48).

k. Slide CRT shield toward rear of instrument until shield is clear of instrument front panel.

WARNING

Failure to discharge high voltage can result in severe electrical shock to personnel and damage to the instrument. Do not attempt to remove lead from CRT glass.

l. Disconnect white plastic post-accelerator connector and immediately discharge lead to ground.

m. Carefully remove CRT and shield from instrument.

n. Disconnect remaining wires from CRT neck pins.

o. Loosen CRT clamp (MP51).

CAUTION

When removing CRT from shield, care should be taken to avoid damage to CRT neck pins and align/ortho coils.

p. Remove CRT from shield.

q. To reinstall CRT, reverse removal procedure.

8-27. ATTENUATOR REMOVAL AND REPLACEMENT. To remove the attenuator assemblies, A1 and A2, from the instrument, proceed as follows:

a. Remove screw holding channel A attenuator shield to vertical preamplifier assembly, A3.

b. Remove screw holding channel B attenuator shield to assembly A3 and ground lug attached to top of attenuator cover.

c. Unsolder three lead-in wires to assembly A3 from channel A attenuator, A1.

d. Unsolder three lead-in wires to assembly A3 from channel B attenuator, A2.

e. Remove two retaining screws holding vertical preamplifier to main deck of instrument.

f. Disconnect sync cable (W2) from square pin connections on horizontal display switch assembly A10.

g. Pull vertical preamplifier toward rear of instrument until A3P1 and A3P2 clear attenuator connectors.

NOTE

Assemblies A6 and A7 are connected to the underside of vertical preamplifier A3. They will also move to the rear. When reinstalling, ensure that push-button switches are aligned with front-panel holes.

h. Remove vernier, volt/div, and coupling lever from channel attenuator being removed.

i. Remove retaining hardware from INPUT BNC connector of channel attenuator being removed.

j. Pull attenuator toward rear of instrument until attenuator assembly clears front panel of instrument.

NOTE

Step j clears the attenuator for required maintenance. If complete removal of the attenuator is desired continue with step k.

k. Remove two screws holding vernier bracket to attenuator.

l. Slide attenuator from vernier shaft.

m. Remove vernier shaft from vernier.

n. To reinstall attenuators, reverse removal procedure.

8-28. VERTICAL PREAMPLIFIER REMOVAL AND REPLACEMENT. To remove vertical preamplifier assembly, A3, from the instrument, proceed as follows:

a. Remove channel A and B attenuators from preamplifier assembly in accordance with paragraph 8-27, steps a through g.

b. Disconnect plastic connector at A3P5.

c. Remove gate and blanking coaxial cables from A7 (square-pin connectors).

d. Remove two screws securing delay line cable to vertical preamplifier assembly.

e. Unsolder delay line cable wires at vertical preamplifier assembly.

f. Note orientation of delay line. Red marked side of delay line goes to dot on board assembly.

g. Remove assemblies A3, A6, and A7 from instrument.

h. Disconnect ASW (9) and BSW (0) wires from square-pin connectors on assembly A7.

i. Simultaneously pull assemblies A6 and A7 from male connectors mounted on assembly A3.

j. To reinstall vertical preamplifier assembly, reverse removal procedure.

8-29. DELAY LINE REMOVAL AND REPLACEMENT. To remove delay line assembly, A4, from the instrument, proceed as follows:

a. Remove two screws holding delay line cable to vertical preamplifier assembly, A3.

b. Unsolder two wires from end of delay line cable to assembly, A3.

c. Note orientation of delay line. Red marked side of delay line goes to dot on board assembly.

d. Remove two screws holding delay line cable to vertical output amplifier, A5.

e. Unsolder two wires from end of delay line cable to vertical output assembly, A5.

f. Note orientation of delay line. Red marked side of delay line goes to dot on board assembly.

g. Remove two retaining screws holding delay line bracket (MP8) to main deck.

h. Remove delay line assembly from instrument.

i. To install delay line assembly, reverse removal procedure.

8-30. REMOVAL AND REPLACEMENT OF ASSEMBLIES IN HORIZONTAL SECTION. The following paragraphs provide information required to remove and replace various assemblies in the horizontal section of the instrument.

8-31. TIME/DIV Switch Removal and Replacement. To remove the TIME/DIV switches, proceed as follows:

a. Set TIME/DIV controls as follows:

TIME/DIV (main) ..... .1 mSEC
TIME/DIV (delayed) ..... OFF

b. Remove retaining ring (MP68) from TIME/DIV shaft (inside front panel of instrument).

c. Pull TIME/DIV shaft out.

d. To reinstall TIME/DIV shaft, reverse removal procedure.

8-32. Main Horizontal Sweep Switch Assembly and Holdoff-Comparator Assembly Removal and Replacement. To remove horizontal sweep switch assembly A11, proceed as follows:

a. Remove TIME/DIV shaft (paragraph 8-31).

b. Gently rock main horizontal sweep switch assembly, A11, and holdoff-comparator assembly, A12, while pulling upward to remove from sockets on horizontal sweep assembly, A8.

c. Separate assembly A11 from assembly A12 by removing two retaining screws and soldered wire.

d. To reinstall assemblies, reverse removal procedure.

8-33. Delayed Horizontal Sweep Switch Assembly Removal and Replacement. To remove delayed horizontal sweep switch assembly, A9, proceed as follows:

a. Remove TIME/DIV shaft (paragraph 8-31).

b. Gently rock assembly A9, while pulling upward to remove from socket on horizontal sweep assembly, A8.

c. To reinstall assembly A9, reverse removal procedure.

8-34. Horizontal Sweep Assembly Removal and Replacement. To remove horizontal sweep assembly, A8, proceed as follows:

a. Accomplish paragraphs 8-31 through 8-33.

b. Unsolder R16 from main EXT + 10 switch A8S1P.

c. Unsolder R17 from delayed EXT + 10 switch A8S1B.

d. Unsolder two ground straps from A8 to chassis ground.

e. Disconnect reset lamp coaxial cable (5) from A8 (square-pin connections).

f. Disconnect line sync wire (6) from A8

g. Disconnect main trig level wire (903) from A8.

h. Disconnect delay trig level wire (97) from A8.

i. Disconnect start after delay wire (916) from A8.

j. Disconnect plastic connectors at A8P1 and A8P5.

k. Remove two retaining screws at rear edge of assembly A8.

NOTE

Horizontal display switch assembly A10 is mounted on the rear of assembly A8. It must also clear the front panel during the next step.

l. Move assembly A8 toward right rear of instrument until pushbutton controls clear front panel.

m. Disconnect sync cable W2 from assembly A10 (square-pin connections).

n. Disconnect plastic connector at A8P4.

o. Disconnect at A10 (square-pin connections), the coaxial cable leading from VERTICAL OUTPUT connector J4.

p. Disconnect horizontal input cable W3 at horizontal output assembly A13 (square-pin connections).

q. Remove assemblies A8 and A10 from instrument.

r. To reinstall A8 and A10, reverse removal procedure.

8-35. Horizontal Display Switch Assembly Removal and Replacement. To remove horizontal display switch assembly, A10, proceed as follows:

a. Accomplish paragraph 8-34 steps a through q.

b. Unsolder R9 and R10 (connected between A8 and A10) at A1C terminals.

c. Remove three retaining screws holding A8 and A10 together.

d. To reinstall horizontal display switch assembly, reverse removal procedure.

8-36. REPAIR OF ASSEMBLIES.

8-37. GENERAL. The board assemblies used in this instrument are etched circuit type and have plated through component holes to facilitate replacement of components. Before repairing any board assembly refer to paragraph 8-41 for information covering circuit board repair and recommended soldering equipment.

8-38. The only assemblies not recommended for repair are the attenuator assemblies. The attenuator components are closely mounted and their interrelationship is critical. The only components recommended for replacement are R1, R2, Q1, Q2, and Q3. These items are socket mounted and easily replaced. If other components fail, replacement of the board assembly is recommended.

8-39. REPLACEMENT OF ATTENUATOR TERMINATION RESISTORS.

CAUTION

Do not attempt to clean attenuator assemblies with any cleaning agent. Always wear protective cotton gloves (such as HP Part Number 8650-0030) while handling the attenuator board assemblies. The board assemblies are extremely susceptible to conduction paths caused by fingerprints.

8-40. To replace attenuator termination resistors A1A1R1/R2 and A2A1R1/R2, proceed as follows:

a. Remove two screws holding top cover of attenuator.

b. Slide attenuator cover from attenuator.

c. Remove resistors R1/R2 from attenuator board assembly using long-nosed pliers.

d. Replace resistors R1/R2 reversing above procedure.

CAUTION

If new resistors are to be installed, replace with flame-proof type only (HP Part No. 0698-6433). Recompensate attenuator assembly when new resistors are installed.

8-41. CIRCUIT BOARDS.

8-42. The following paragraphs provide information regarding servicing procedures for etched circuit boards, use of heat sinks, and special soldering considerations.

8-43. BOARD CONNECTIONS. Square-pin connectors are identified on circuit boards by the color code of the connecting wire or by the signal name. Connector pins on plugs and jacks are identified by either a numeral or a letter. The letters G, I, O, and Q have been omitted. Table 8-1 shows the types of board connections used in the instrument.

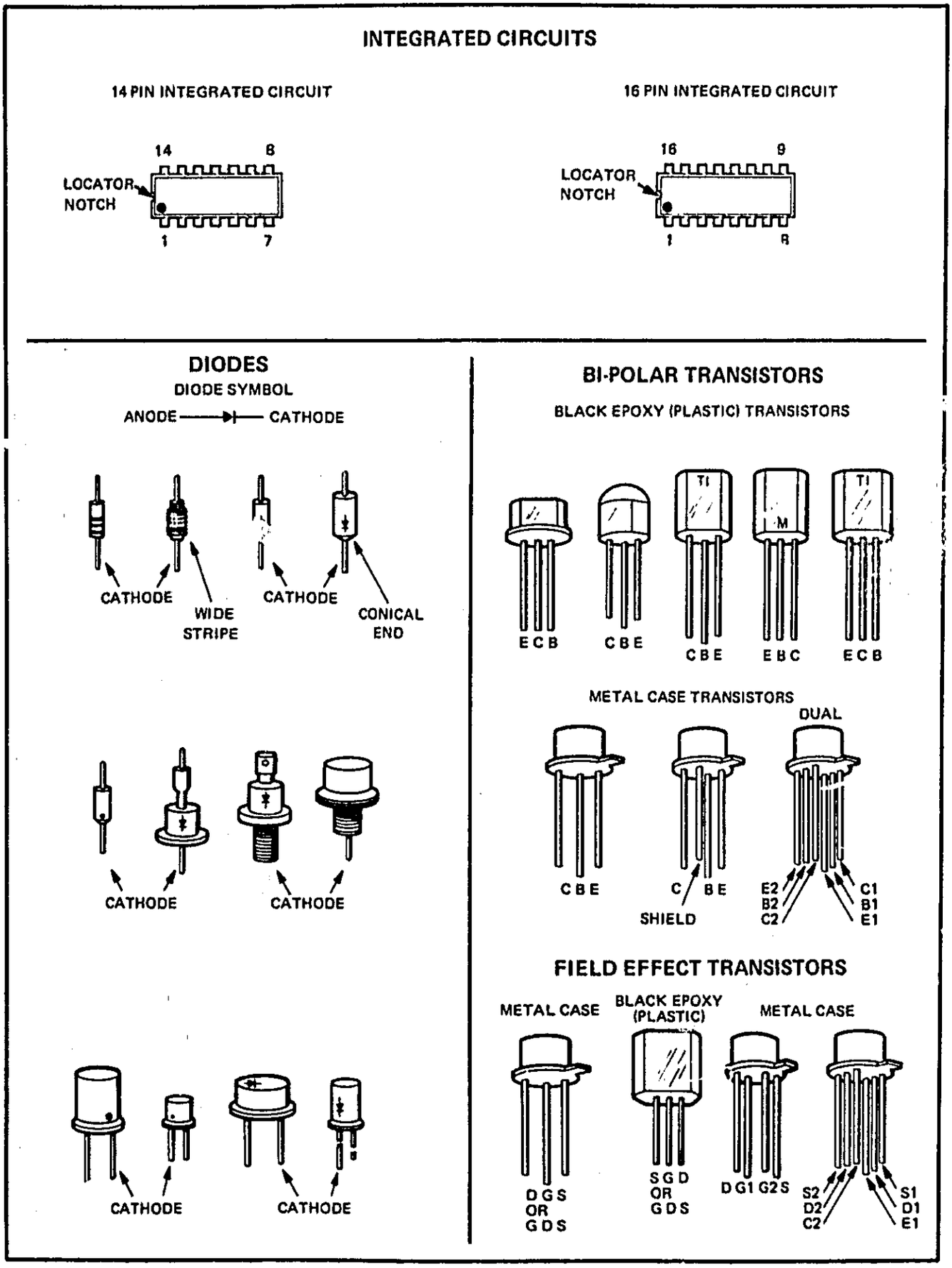


Figure 8-1. Semiconductor Terminal Identification

8-44. SERVICING ETCHED CIRCUIT BOARDS. The etched circuit boards have plated-through component holes. This allows components to be remove or replaced by unsoldering or soldering from either side of the board. When removing large components, such as potentiometers, rotate the soldering iron tip from lead to lead while applying pressure to the part to lift it from the board. HP Service Note M-20E contains additional information for repair of etched circuit boards.

8-45. SEMICONDUCTOR REMOVAL AND REPLACEMENT. Figure 8-1 is included to help identify the leads on the common shapes and sizes of semiconductor devices. When removing a semiconductor, use long-nosed pliers as a heat sink between the device and the soldering iron. When replacing a semiconductor, ensure sufficient lead length to dissipate the soldering heat by using the same length of exposed lead as used for the original part.

8-46. INTEGRATED CIRCUIT REMOVAL AND REPLACEMENT. The integrated circuits in this instrument are plug-in types. Remove a plug-in integrated circuit with a straight pull away from the board. When replacing an integrated circuit, note the mark or notch used for orientation. The component-identification photographs and the integrated circuit pin-location diagrams in this manual show the correct orientation.

CAUTION

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

8-47. ASSEMBLY A5 INTEGRATED CIRCUIT REPLACEMENT. Use the following procedure when replacing integrated circuits (ICs) in the vertical output assembly A5:

a. Remove A5 assembly mounting bracket by removing two screws in rear panel and two screws in main deck.

b. Disconnect four gray wires from CRT neck pins (two wires from assembly A5 and two wires from assembly A5A1).

c. Remove A5 and mounting bracket from instrument.

NOTE

The delay line cable remains attached to assembly A5.

d. Disconnect power supply connector J8 from A5P1.

e. Unsolder wire (92) from termination assembly A5A1 at A5 assembly.

NOTE

Read next two steps before accomplishing them.

f. Remove four screws attaching A5 to mounting bracket.

g. Separate A5 from mounting bracket. Do not lose yellow plastic insulator (HP Part No. 5080-9670) held captive between gain cell A5U1 (gold colored IC) and mounting bracket.

h. Remove A5U1 from its mounting socket.

i. To remove output amplifier A5U2, remove four screws holding it to circuit board. (Go to step l.)

j. Replace gain cell A5U1 by matching mark on gain cell leg (solid line) with polarity dot on circuit board.

CAUTION

Do not use lettering on gain cell A5U1 and number "1" marking on socket as a reference.

k. Insert gain cell in socket, but do not push it all the way in to final position. (When circuit board is remounted on mounting bracket, the mounting screws will seat IC to required depth.)

l. Replace output amplifier A5U2 by matching contacts on circuit board with gold pads on IC.

m. Secure A5U2 by replacing four mounting screws and lock washers.

n. Using Thermalloy Compound (HP Part No. 6040-0239), coat surfaces of both ICs (A5U1 and A5U2) that will come in contact with mounting bracket.

o. Attach yellow plastic insulator to rear of gain cell A5U1.

p. Coat exposed side of yellow plastic insulator with Thermalloy Compound.

q. Carefully feed two gray wires through hole in mounting bracket.

r. Position assembly A5 and mounting bracket so that yellow plastic insulator is properly positioned between A5U1 and mounting bracket.

s. Using four screws, attach assembly A5 to mounting bracket.

NOTE

Ensure that yellow plastic insulator is properly positioned and IC is flat against bracket.

t. Resolder wire (92) from termination assembly A5A1 to assembly A5.

u. Connect power supply connector J8 to A5P1.

v. Insert mounting bracket with A5 assembly into instrument.

w. Start two screws through rear panel to mounting bracket.

x. Start two screws through mounting bracket to main deck of instrument.

y. Tighten lower screw through rear panel and rear screw through mounting bracket to main deck.

z. Tighten two remaining screws.

NOTE

Steps y and z should be followed carefully to ensure that mounting bracket is positioned correctly for lowest possible IC operating temperature.

aa. Reconnect four gray wires to CRT neck pins.

ab. Verify mounting bracket ground clip is making contact with ground shield.

8-48. TROUBLESHOOTING.

8-49. Two important prerequisites for successful troubleshooting are: (1) understanding how the instrument is designed to operate and (2) knowing the correct use of front-panel controls. Improper control settings or circuit connections can cause apparent malfunctions. Read Section III (Operating Procedure) for an explanation of controls, connectors, and general operating considerations. Read Section IV for explanations of circuit theory.

8-50. If trouble is suspected, visually inspect the instrument. Look for loose or burned components that might suggest a source of trouble. Check to see that all circuit board connections are making good contact and are not shorting to an adjacent circuit. If no obvious trouble is found, check the power supply voltages in the instrument. Prior to any extensive troubleshooting, also check the external power sources.

8-51. DC VOLTAGES. On some of the schematics, dc voltages are indicated for active components (transistors, etc). Conditions for making these voltage measurements are listed adjacent to the schematics. Since conditions for making measurements may differ from one circuit to another, always check the specific conditions listed adjacent to the schematic.

8-52. INITIAL TROUBLESHOOTING PROCEDURE. Before troubleshooting the Model 1710B in detail, try to perform the adjustment procedures listed in Section V of this manual. Some apparent malfunctions can be corrected by these adjustments; also, the inability to obtain a correct adjustment will often reveal the source of trouble.

8-53. If possible, perform adjustment procedures in listed sequence since the power supplies should be checked first for any malfunction.

8-54. TROUBLE DIAGNOSIS. By use of front-panel controls, note as many symptoms of the malfunction as possible. From the symptoms, it can usually be determined which section (vertical, horizontal, or power supplies) is malfunctioning. Normally, the vertical and horizontal sections will not malfunction simultaneously, although symptoms may indicate this to be the case.

8-55. VERTICAL SECTION TROUBLESHOOTING. Although a sweep may not be generated on the CRT, vertical deflection of an input signal on the CRT will normally indicate that the vertical section is functioning properly.

8-56. The sync pulse required for internal triggering is developed in the vertical preamplifier and sync amplifier located on horizontal display switch assembly A10. If the instrument does not trigger internally, but triggers properly when an external trigger is applied, the vertical preamplifier section should be checked.

8-57. Due to the low levels of the signal in the preamplifier, signal tracing becomes difficult. When troubleshooting the preamplifier, check dc bias voltages for best result.

8-58. HORIZONTAL SECTION TROUBLESHOOTING. The horizontal section of the instrument consists of the trigger assembly, gate assembly, holdoff-

comparator assembly, main and delayed sweep assembly, horizontal preamplifier, and horizontal output assembly. From symptoms derived in paragraph 8-54, check the input and output signals of the suspected assembly(s) until the problem is isolated to a particular circuit. Refer to table 8-2 for troubleshooting hints on the horizontal section.

NOTE

Table 8-2 is to be used as a guide only. Slight variations in voltage readings may occur.

8-59. LOW-VOLTAGE POWER SUPPLY TROUBLESHOOTING. The Model 1710B contains seven low-voltage power supplies, two of which are unregulated. The nominally +20V unregulated is used in the HV power supply oscillator circuit. The nominally +15-volt regulated supply furnishes the reference voltage for the other regulated supplies. A check at the output of each regulated supply will indicate a malfunction. A convenient test point is located on each supply. All supplies are regulated to better than ±2%. If a malfunction occurs in the low-voltage supplies, always check the +15-volt supply.

Table 8-2. Troubleshooting Guide - Horizontal Section

The following table is a troubleshooting guide to help analyze the problem under no sweep condition in AUTO mode of operation. Once the sweep is running, individual circuits can be analyzed using schematics and associated waveforms.

STEP	CIRCUIT	TEST POINT	TEST POINT MEASUREMENT	ACTION
1	Output of Integrators (main-delayed)	Main - A11TP2	1 volt	Go to Step 2.
		Delayed - A9TP2	14 volts	Go to Step 3.
			other	Go to Step 4.
2	Measure Gate	Main - A8TP5	2 volts	Problem in Integrator - troubleshoot.
		Delayed - A8TP9	0 volt	Go to Step 5.
3	Measure Gate	Main -A8TP5	2 volts	Go to Step 5.
		Delayed - A8TP9	0 volt	Problem in Integrator - troubleshoot.
4	Measure Gate	Main - A8TP5	0 volt or 2 volts	Problem in Integrator - troubleshoot.
		Delayed - A8TP9	other	Problem in sweep control circuit - troubleshoot.

Table 8-2. Troubleshooting Guide - Horizontal Section (Cont'd)

STEP	CIRCUIT	TEST POINT	TEST POINT MEASUREMENT	ACTION
5	Measure Reset input to trigger circuit.	Main - A8TP2	4.3 volts	Go to Step 6.
		Delayed - A8TP7	4.9 volts	Go to Step 9.
			other	Problem in holdoff (main only) or sweep length circuits, rarely in trigger circuits - troubleshoot.
6		Main - A8TP4	+5 volts	Go to Step 7.
			+4 volts	Problem in sweep control circuit - troubleshoot.
		Delayed - A8TP8	+14 volts	Problem in sweep control circuit - troubleshoot.
			+15 volts	Go to Step 8.
7		A8U2 - pin 6	+4.3 volts	Auto problem - check A8U3 and associated circuits.
			+4.9 volts	Problem in A7U2.
8		A8U5 - pin 6	+4.3 volts	Auto problem - check A8U6 and associated circuits.
			+4.9 volts	Problem in A8U5.
9		Main - A8TP4	+4 volts	Go to Step 10.
			+5 volts	Problem in sweep control circuit - troubleshoot.
		Delayed - A8TP8	+15 volts	Problem in sweep control circuit - troubleshoot.
			+14 volts	Go to Step 11.
10		A8U2 - pin 6	+4.3 volts	Problem in A8U2.
			+4.9 volts	Auto problem - check A8U3 and associated circuits.
11		A8U5 - pin 6	+4.3 volts	Problem in A8U5.
			+4.9 volts	Auto problem - check A8U6 and associated circuits.

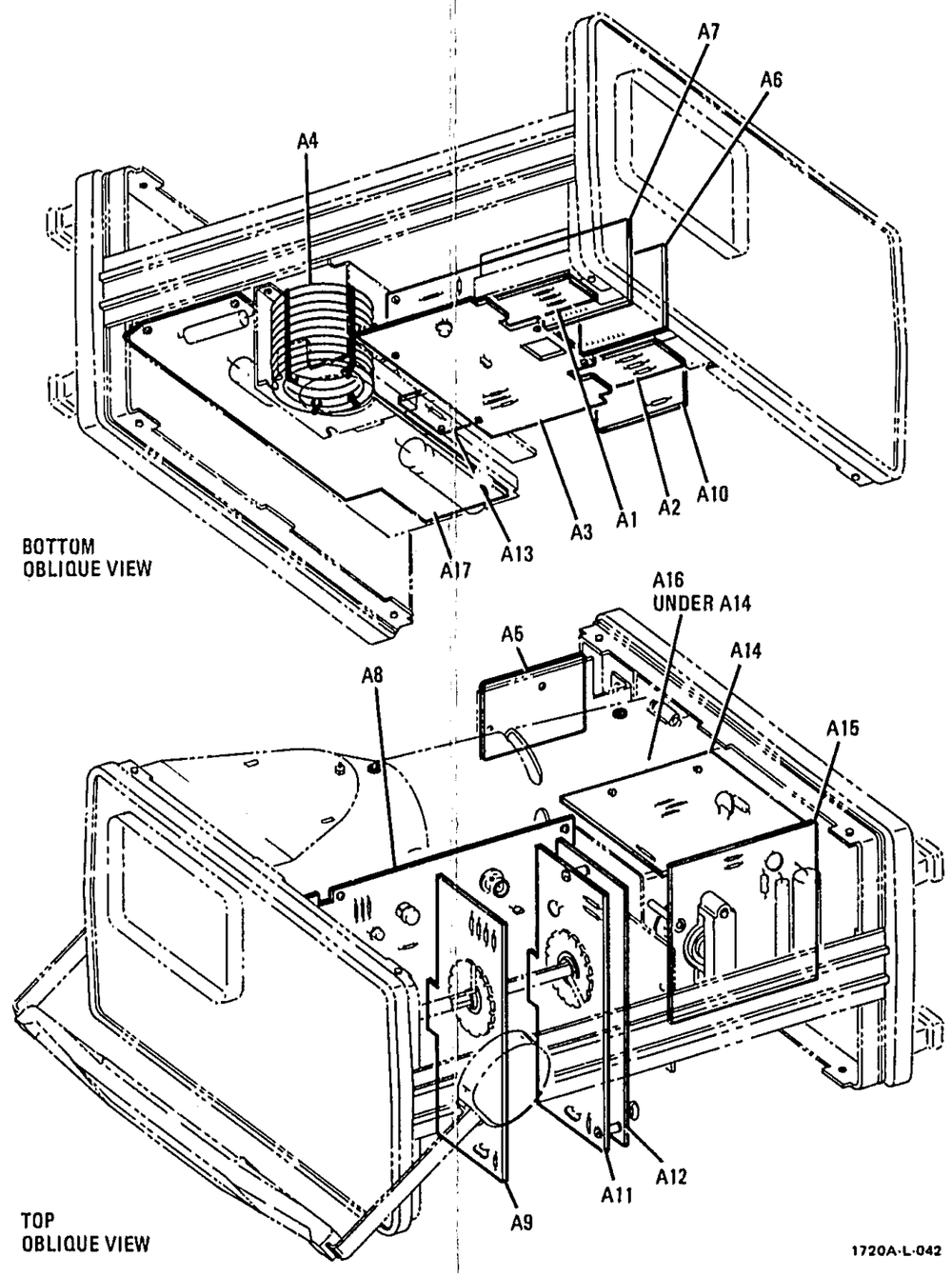


Figure 8-2.
Board Assembly Identification

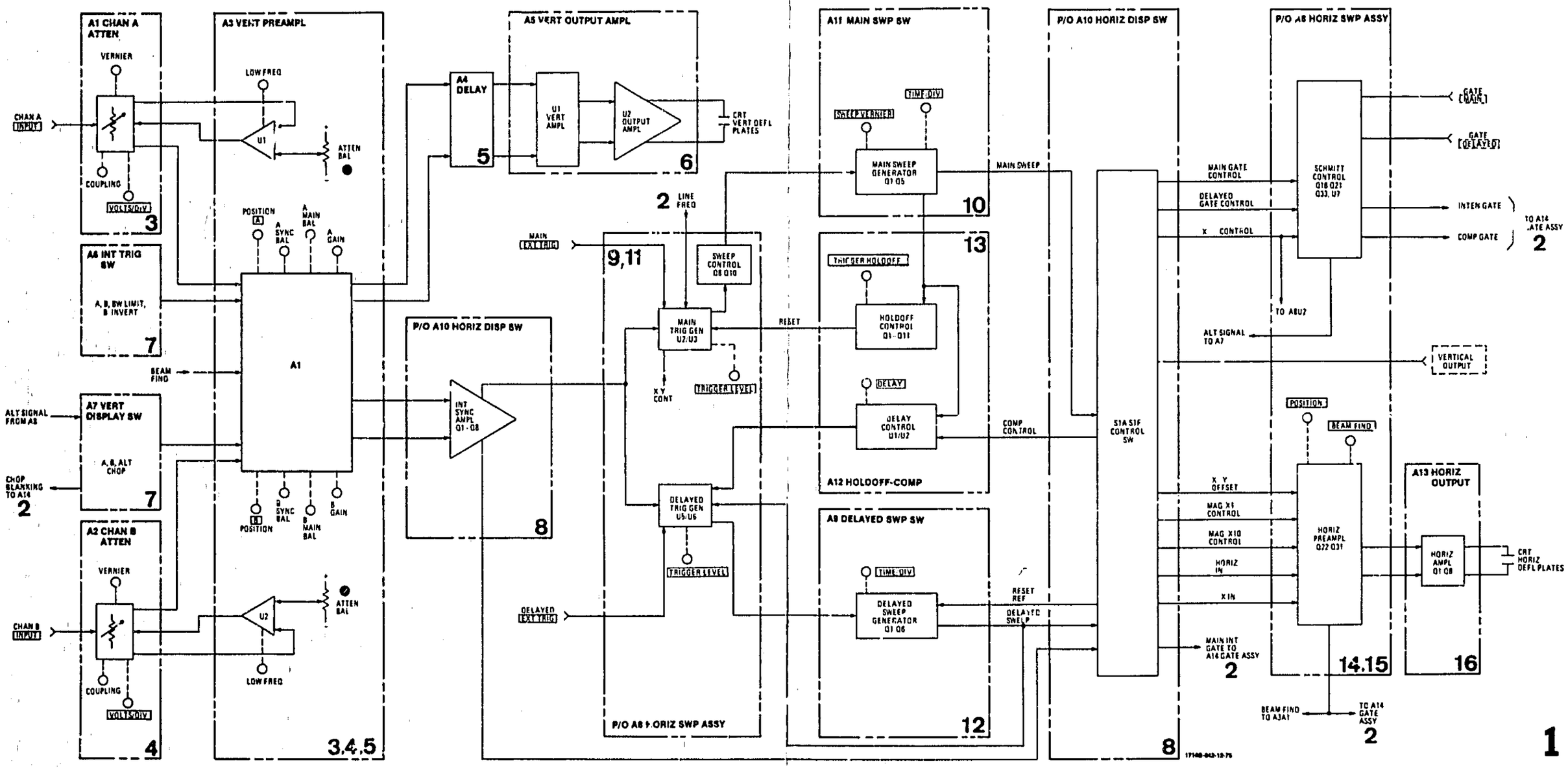


Figure 8-3. Overall Block Diagram, Schematic 1

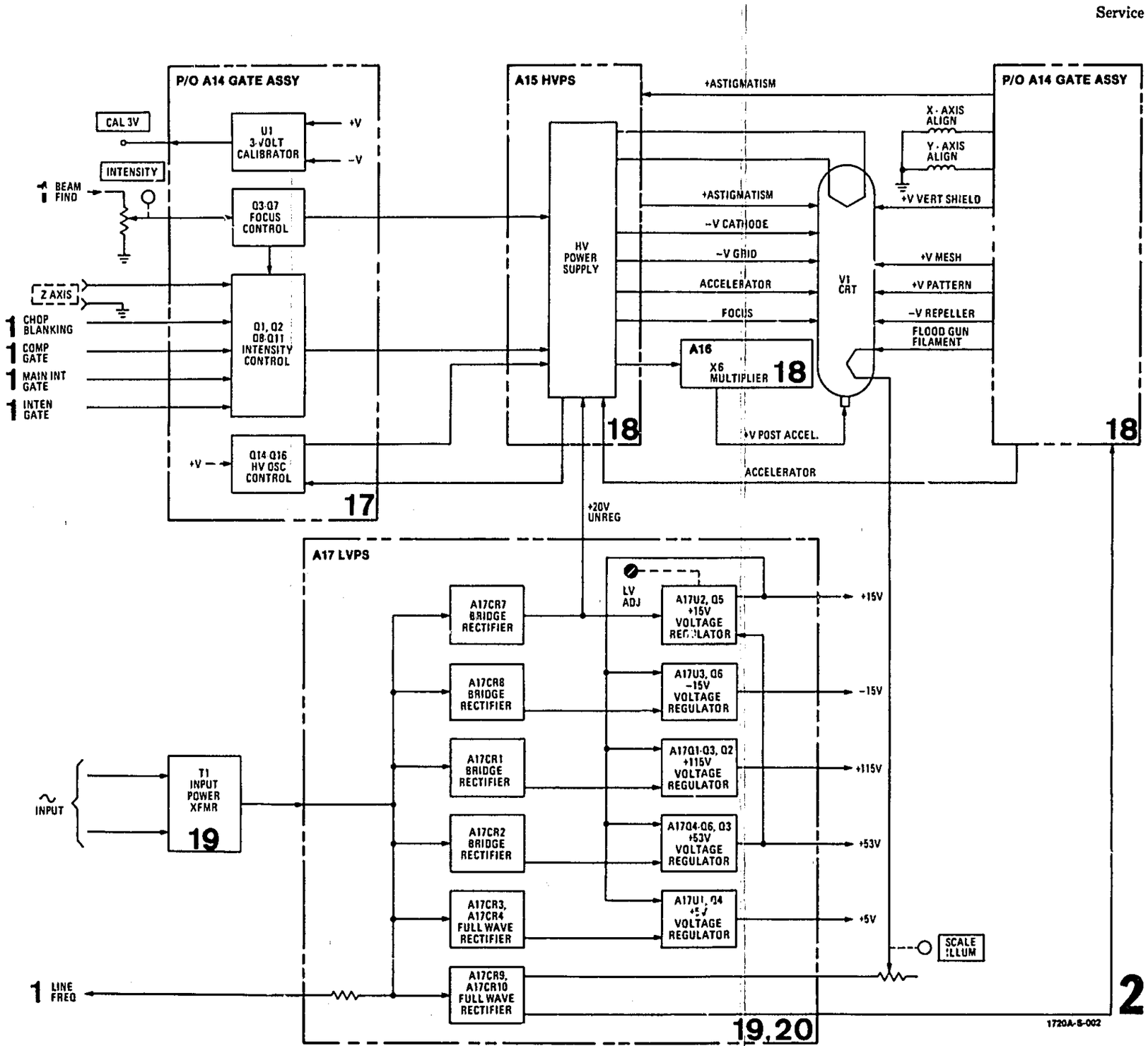
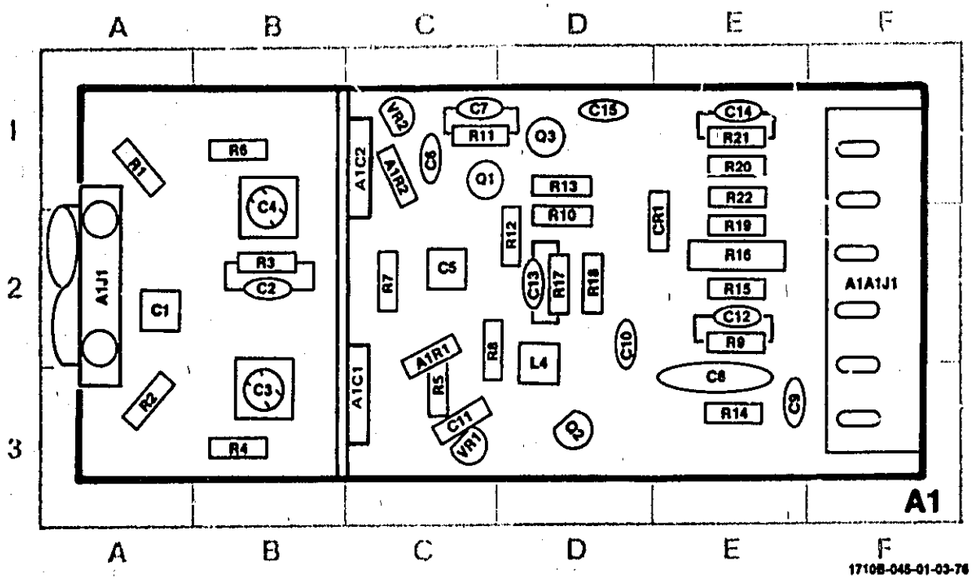


Figure 8-4.
Overall Block Diagram, Schematic 2



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
A1C1	C-3	C8	E-3	Q3	D-1	R11	C-1
A1C2	C-1	C9	E-3	R1	A-1	R12	D-2
A1R1	C-3	C10	D-2	R2	A-3	R13	D-1
A1R2	C-1	C11	C-3	R3	B-2	R14	E-3
C1	A-2	C12	E-2	R4	B-3	R15	E-2
C2	B-2	C13	D-2	R5	C-3	R16	E-2
C3	B-3	C14	E-1	R6	B-1	R17	D-2
C4	B-2	C15	D-1	R7	C-2	R18	D-2
C5	C-2	CR1	D-2	R8	C-2	R19	E-2
C6	C-1	L4	D-2	R9	E-2	R20	E-1
C7	C-1	Q1	C-1	R10	D-2	R21	E-1
		Q2	D-3			VR1	C-3
						VR2	C-1

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 3

1. Set front-panel controls in accordance with paragraph 5-13, Section V.
2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 3

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TIME/DIV (delayed)	10 uSEC
DELAY	5.00
HORIZ DISPLAY	MIXED
TRIGGER LEVEL (main)	stable display

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).
3. Connect pulse generator 50-ohm output to Model 1710B channel A INPUT connector.
4. Adjust pulse generator output for four divisions of signal amplitude (.4 V).

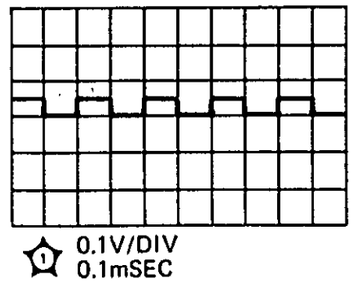
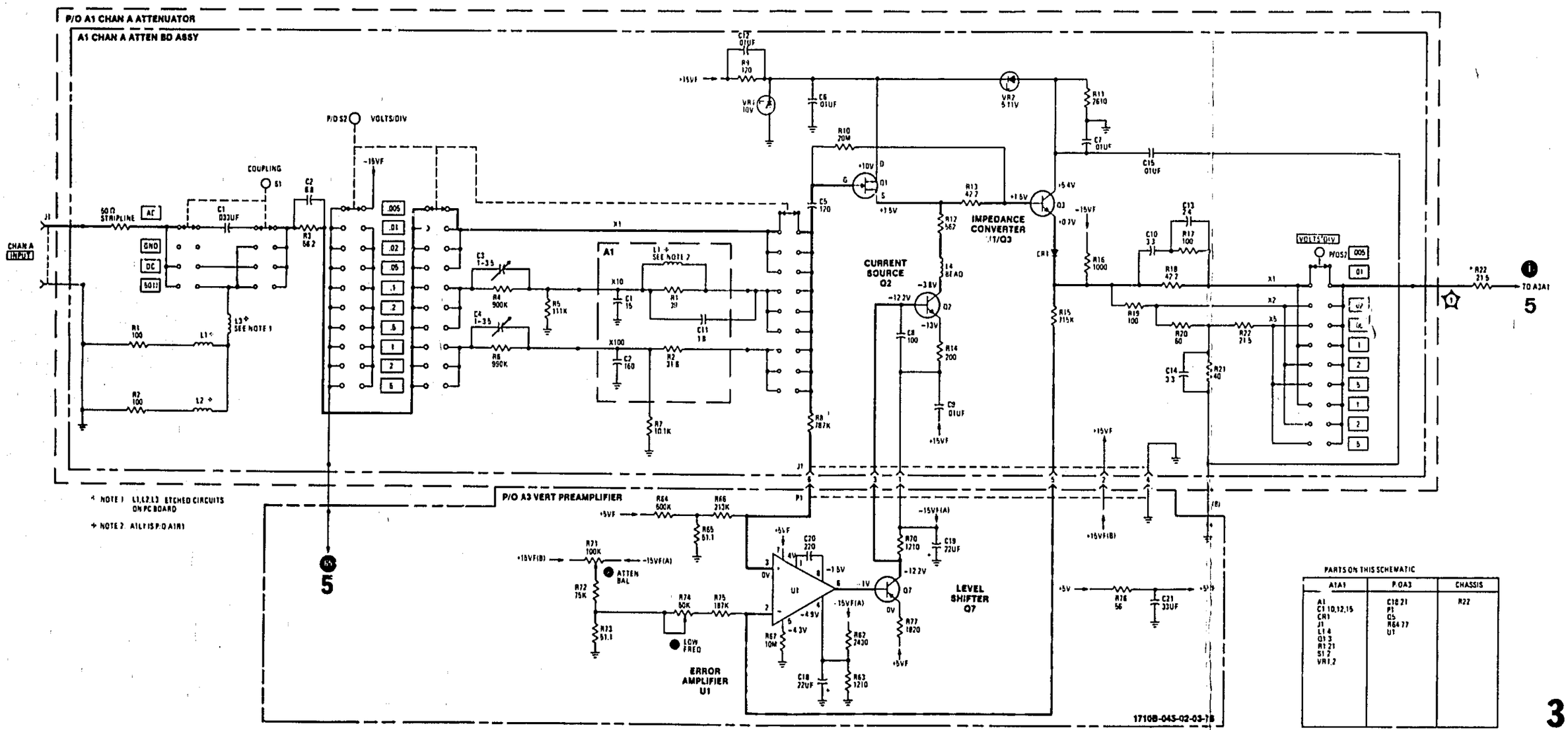


Figure 8-5. Service Information, Channel A Attenuator, Assembly A1 (Sheet 1 of 2)

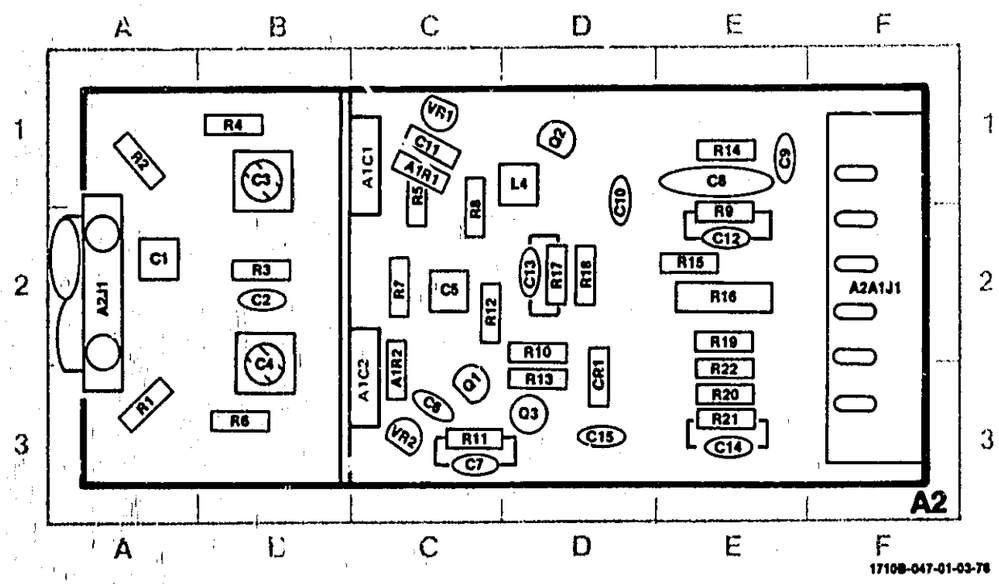


PARTS ON THIS SCHEMATIC

A1A1	P/O A3	CHASSIS
A1 C1,10,12,15 CR1 J1 L1,4 Q1,3 R1,21 S1,7 VR1,2	C18,21 P1 Q5 R64,77 U1	R22

3

Figure 8-5.
Service Information, Channel A Attenuator, Assembly A1 (Sheet 2 of 2)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
A1C1	C-1	C9	E-1	R1	A-3	R13	D-3
A1C2	C-3	C10	D-1	R2	A-1	R14	E-1
A1R1	C-1	C11	C-1	R3	B-2	R15	E-2
A1R2	C-3	C12	E-2	R4	B-1	R16	E-2
C1	A-2	C13	D-2	R5	C-1	R17	D-2
C2	B-2	C14	E-3	R6	B-3	R18	D-2
C3	B-1	C15	D-3	R7	C-2	R19	E-2
C4	B-2	CR1	D-3	R8	C-2	R20	E-3
C5	C-2	L4	D-1	R9	E-2	R21	E-3
C6	C-3	Q1	C-3	R10	D-2	R22	E-3
C7	C-3	Q2	D-1	R11	C-3	VR1	C-1
C8	E-1	Q3	D-3	R12	C-2	VR2	C-3

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 4

1. Set front-panel controls in accordance with paragraph 5-13, Section V.
2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 4

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

   Coupling (channel A) 50Ω
   TRIGGER LEVEL (main) ..... stable display

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).
3. Connect pulse generator output to Model 1710B channel A INPUT connector.
4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.

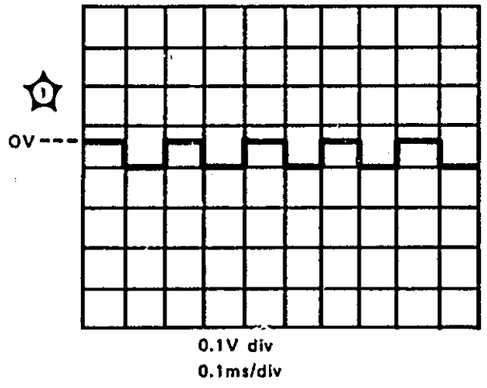


Figure 8-6. Service Information, Channel B Attenuator, Assembly A2 (Sheet 1 of 2)

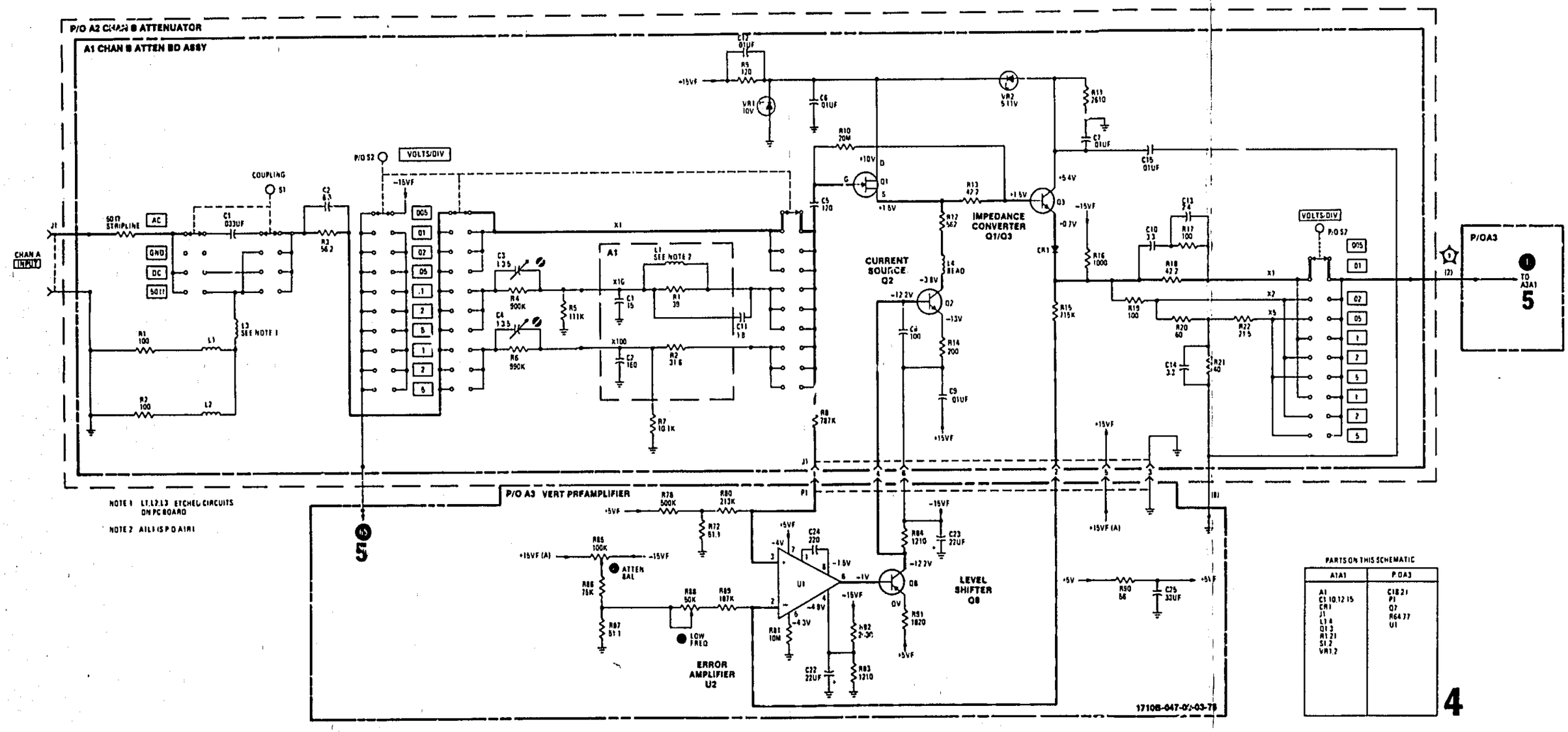
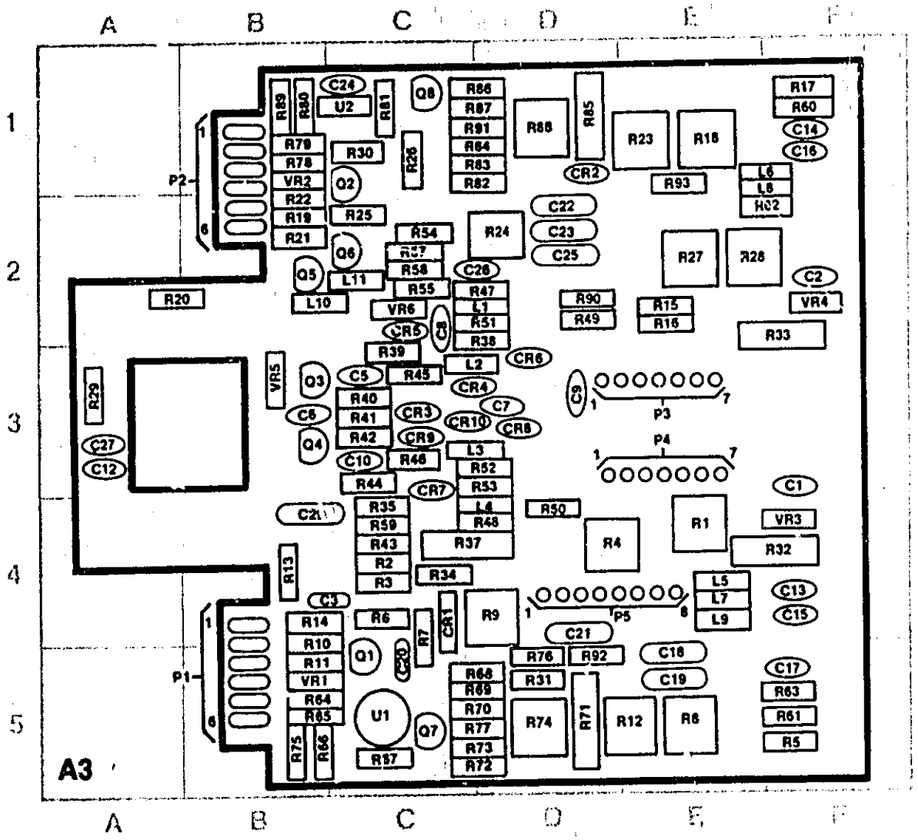


Figure 8-6.
Service Information, Channel B Attenuator, A2 (Sheet 2 of 2)

SCHEMATIC DIAGRAMS CON'T



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REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	F-3	C25	D-2	L10	B-2	R9	D-4	R32	F-4	R57	C-2	R80	B-1
C2	F-2	C26	D-2	L11	C-2	R10	B-4	R33	F-2	R58	C-2	R81	C-1
C3	B-4	C27	A-3	P1	B-5	R11	B-5	R34	C-4	R59	C-4	R82	D-1
C5	C-3	C29	B-4	P2	B-1	R12	E-5	R35	C-4	R60	F-1	R83	D-1
C6	B-3	CR1	C-4	P3	E-3	R13	B-4	R37	C-4	R61	F-5	R84	D-1
C7	D-3	CR2	D-1	P4	E-3	R14	B-4	R38	D-2	R62	F-2	R85	D-1
C8	C-2	CR3	C-3	P5	D-4	R15	E-2	R39	C-3	R63	F-5	R86	D-1
C9	D-3	CR4	C-3	Q1	C-5	R16	E-2	R40	C-3	R64	B-5	R87	D-1
C10	C-3	CR5	C-2	Q2	C-1	R17	F-1	R41	C-3	R65	B-5	R88	D-1
C12	A-3	CR6	D-3	Q3	B-3	R18	E-1	R42	C-3	R66	B-5	R89	B-1
C13	F-4	CR7	C-3	Q4	B-3	R19	B-2	R43	C-4	R67	C-5	R90	D-2
C14	F-1	CR8	D-3	Q5	B-2	R20	A-2	R44	C-3	R68	C-5	R91	D-1
C15	F-4	CR9	C-3	Q6	C-2	R21	B-2	R45	C-3	R69	C-5	R92	D-5
C16	F-1	CR10	C-3	Q7	C-5	R22	B-2	R46	C-3	R70	C-5	R93	E-1
C17	F-5	L1	D-2	Q8	C-1	R23	E-1	R47	D-2	R71	D-5	U1	C-5
C18	E-5	L2	C-3	R1	E-4	R24	D-2	R48	D-4	R72	C-5	U2	C-1
C19	E-5	L3	C-3	R2	C-4	R25	C-2	R49	D-2	R73	C-5	VR1	B-5
C20	C-5	L4	D-4	R3	C-4	R26	C-1	R50	D-4	R74	D-5	VR2	B-1
C21	D-4	L5	E-4	R4	D-4	R27	E-2	R51	D-2	R75	B-5	VR3	F-4
C22	D-2	L6	F-1	R5	F-5	R28	E-2	R52	D-3	R76	D-5	VR4	F-2
C23	D-2	L7	E-4	R6	C-4	R29	A-3	R53	D-3	R77	C-5	VR5	B-3
C24	C-1	L8	F-1	R7	C-4	R30	C-1	R54	C-2	R78	B-1	VR6	C-2
		L9	E-4	R8	E-5	R31	D-5	R55	C-2	R79	B-1		

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 5

1. Set front-panel controls in accordance with paragraph 5-13, Section V.

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 5

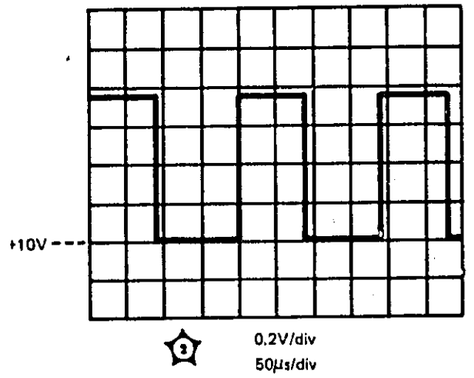
1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

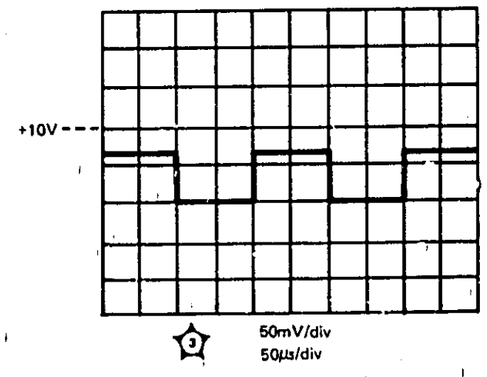
   Coupling (channel A) 50Ω
   TRIGGER LEVEL (main) ..... stable display

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator Squarewave Generator 50-ohm output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5kHz.





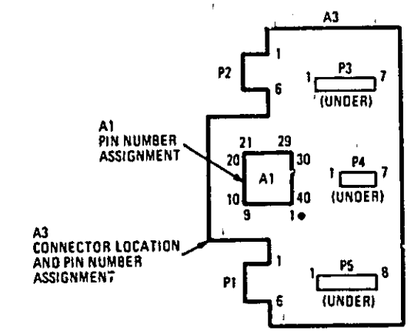
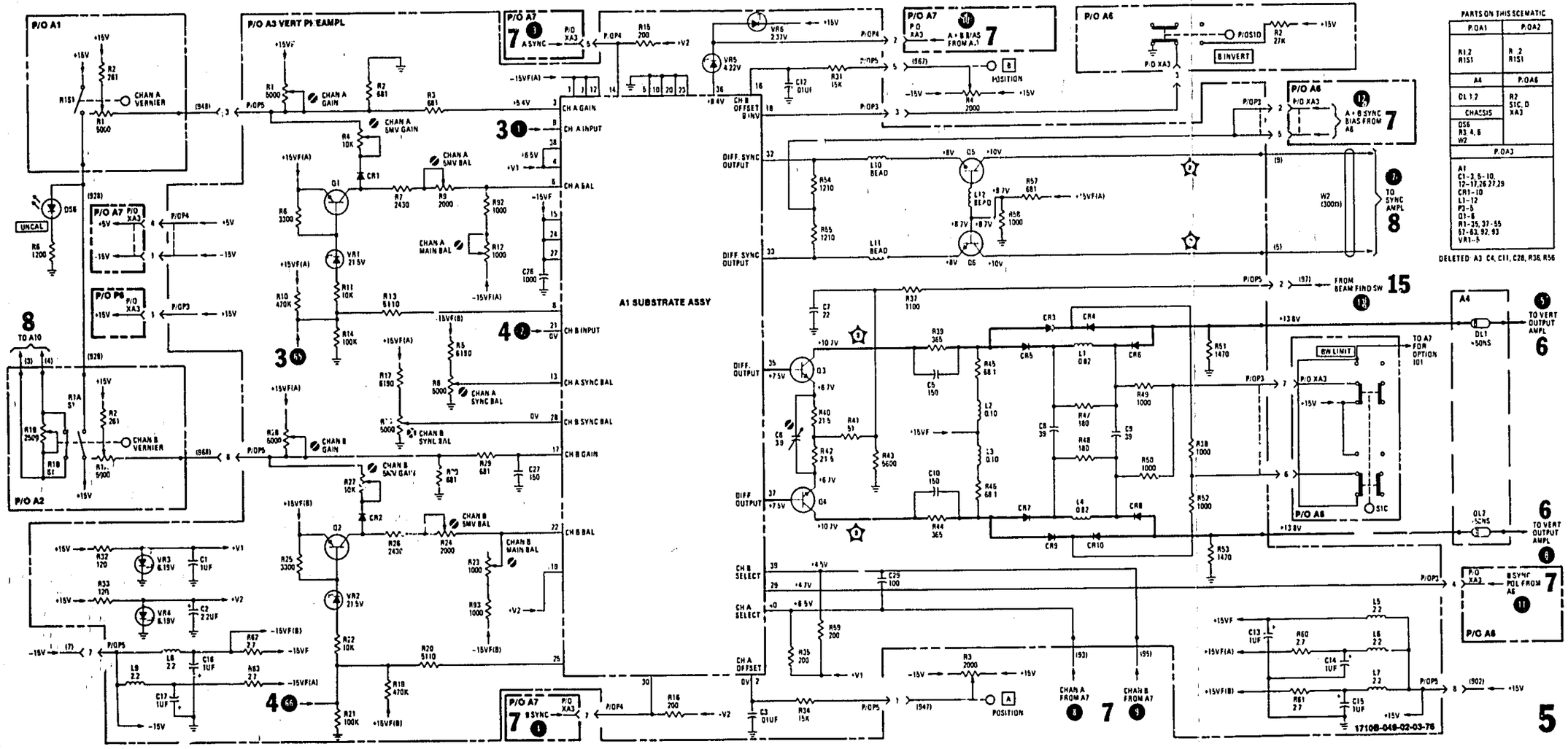


Figure 8-7. Service Information, Vertical Preamplifier, Assembly A3, (Sheet 1 of 2)

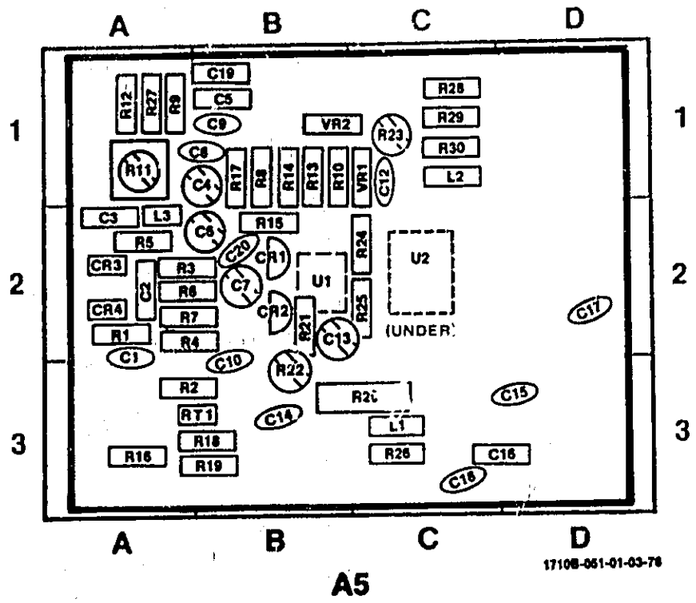


PARTS ON THIS SCEMATIC

P/O A1	P/O A2
R1,2 R151	R 2 R151
A4	P/O A6
DL 1,2	R2 S1C, D XA3
CHASSIS	
DS6 R3, 4, 6 W2	
P/O A3	
A1 C1-3, 5-10, 12-17, 26 27, 29 CR1-10 L1-12 P3-5 Q1-6 R1-35, 37-55 57-63, 92, 93 VR1-5	

DELETED: A3 C4, C11, C28, R36, R56

Figure 8-7.
Service Information, Vertical Preamplifier, Assembly A3, (Sheet 2 of 2)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	A-2	CR2	B-2	R16	A-3
C2	A-2	CR3	A-2	R17	B-1
C3	A-2	CR4	A-2	R18	B-3
C4	B-1	L1	C-3	R19	B-3
C5	B-1	L2	C-1	R20	C-3
C6	B-2	L3	A-2	R21	B-2
C7	B-2	R1	A-2	R22	B-3
C8	B-1	R2	A-3	R23	C-1
C9	B-1	R3	A-2	R24	C-2
C10	B-3	R4	A-2	R25	C-2
C12	C-1	R5	A-2	R26	C-3
C13	B-2	R6	A-2	R27	A-1
C14	B-3	R7	A-2	R28	C-1
C15	D-3	R8	B-1	R29	C-1
C16	C-3	R9	A-1	R30	C-1
C17	D-2	R10	B-1	RT1	B-3
C18	C-3	R11	A-1	U1	B-2
C19	B-1	R12	A-1	U2	C-2
C20	B-2	R13	B-1	VR1	C-1
CR1	B-2	R14	B-1	VR2	B-1
		R15	B-2		

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 6

1. Set front-panel controls in accordance with paragraph 5-13, Section V.
2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 6

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

   Coupling (channel A) 50Ω
   TRIGGER LEVEL (main) ..... stable display

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).
3. Connect pulse generator output to Model 1710B channel A INPUT connector.
4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.

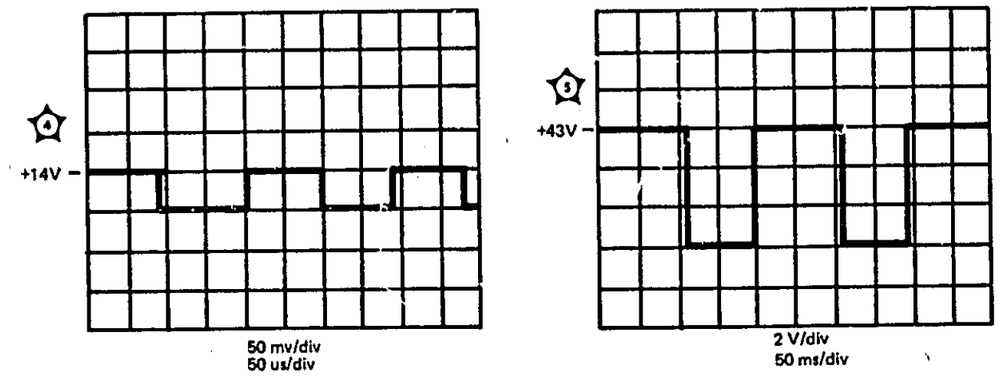
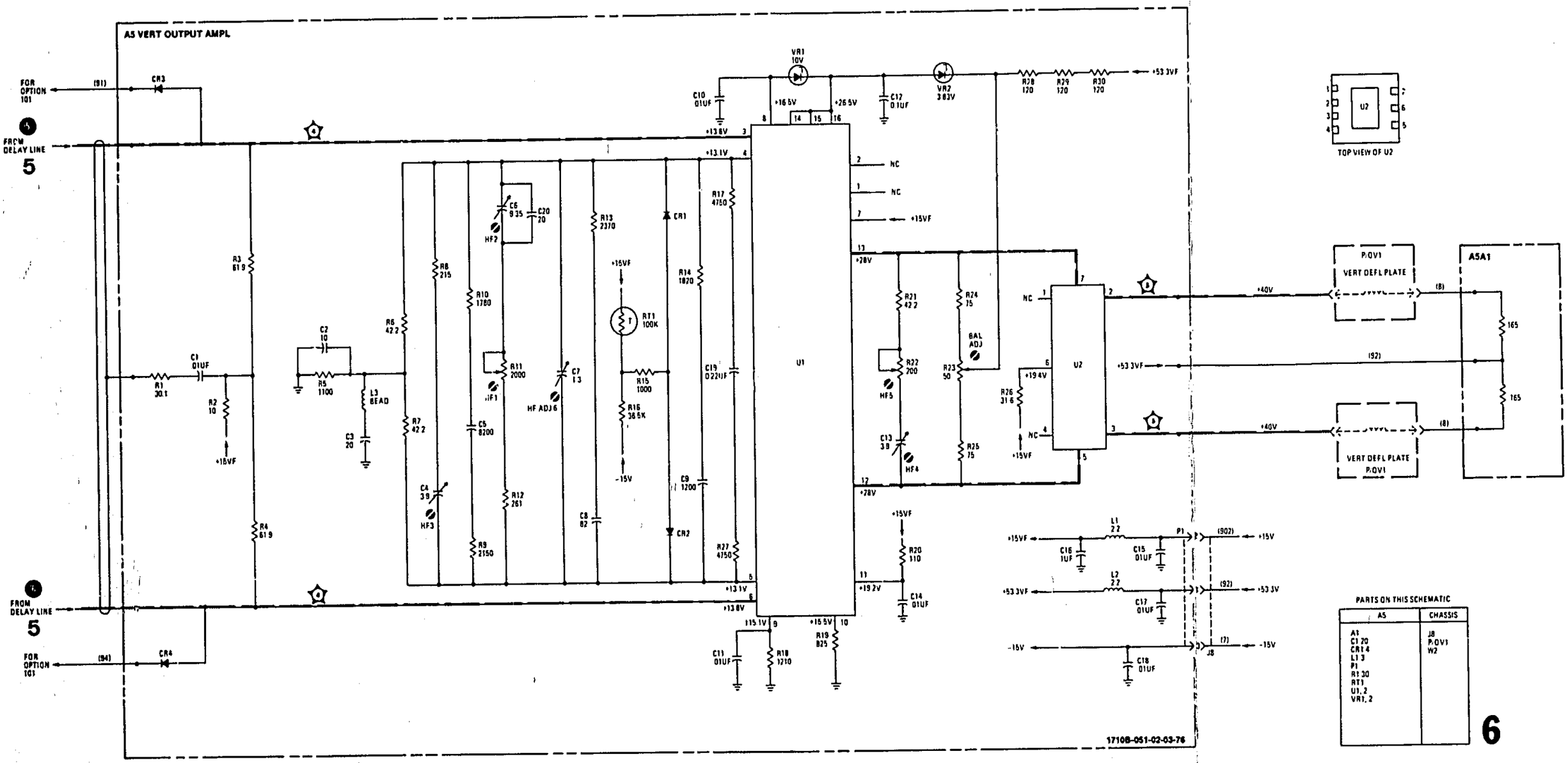


Figure 8-8. Service Information, Vertical Amplifier, Assembly A5 (Sheet 1 of 2)



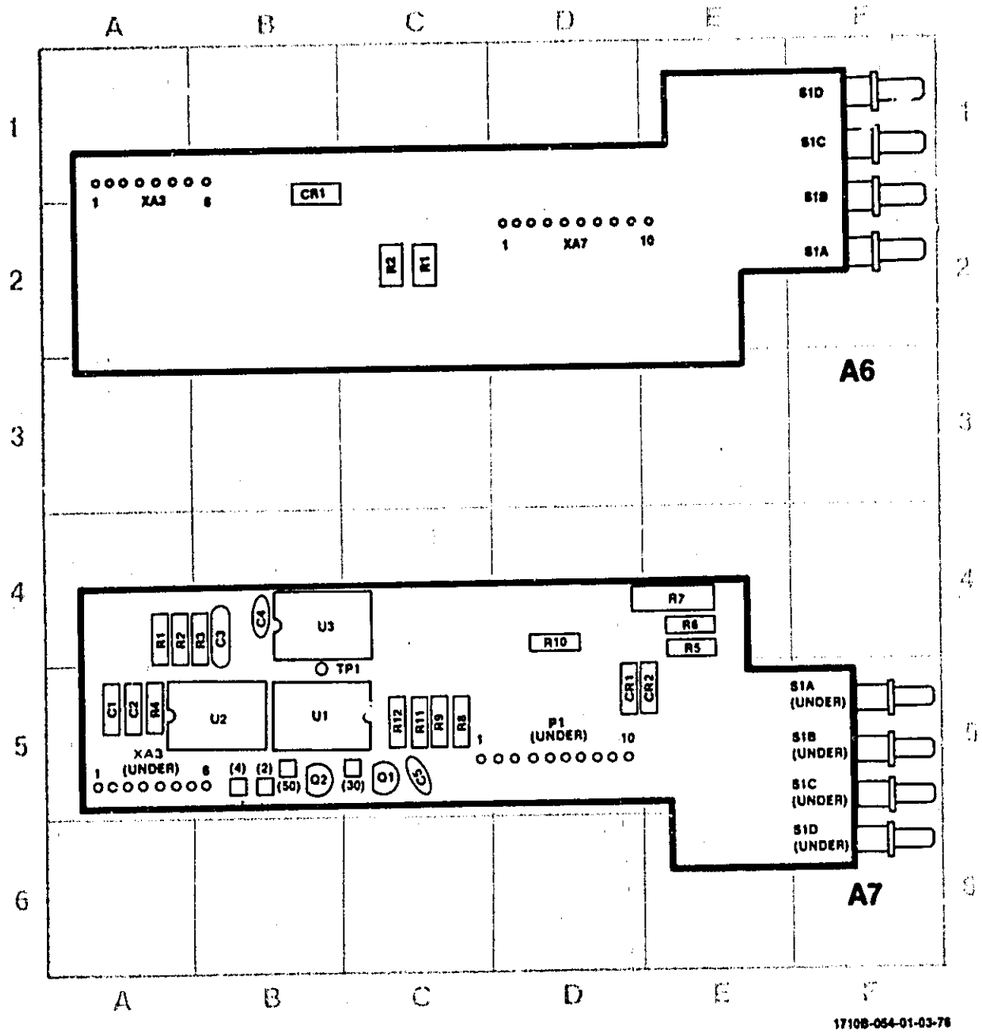
TOP VIEW OF U2

PARTS ON THIS SCHEMATIC

A5	CHASSIS
A1 C1 20 CR1 4 L1 3 P1 R1 30 RT1 U1, 2 VR1, 2	J8 P/OV1 W2

6

Figure 8-8.
Service Information, Vertical Amplifier, Assembly A5 (Sheet 2 of 2)



REF DESIG	GRID LOC
CR1	B-2
R1	C-2
R2	C-2
S1A	F-2
S1B	F-2
S1C	F-2
S1D	F-1
XA3	A-2

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	A-5	R1	A-4	R11	C-5
C2	A-5	R2	A-4	R12	C-5
C3	B-4	R3	B-4	S1A	F-5
C4	B-4	R4	A-5	S1B	F-5
C5	C-5	R5	E-4	S1C	F-5
CR1	D-5	R6	E-4	S1D	F-6
CR2	E-5	R7	E-4	U1	B-5
P1	D-5	R8	C-5	U2	B-5
Q1	C-5	R9	C-5	U3	B-4
Q2	B-5	R10	D-4	XA3	A-5

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 7

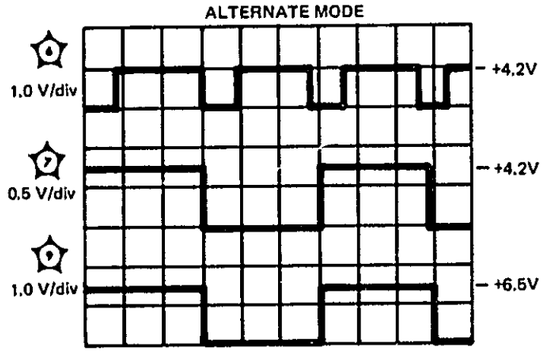
1. Set front-panel controls in accordance with paragraph 5-13, Section V.
2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 7

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
VOLTS/DIV	see waveforms

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).
3. Connect pulse generator output to Model 1710B channel A INPUT connector.
4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.



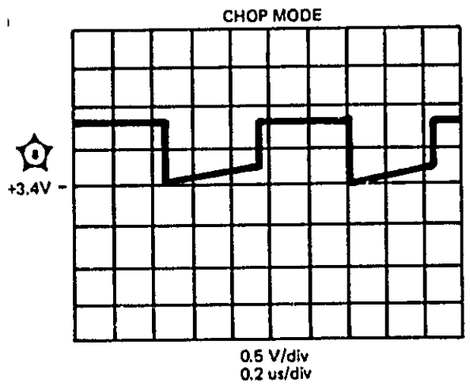


Figure 8-9. Service Information, Display/Trigger Switches, Assembly A6 and A7 (Sheet 1 of 2)

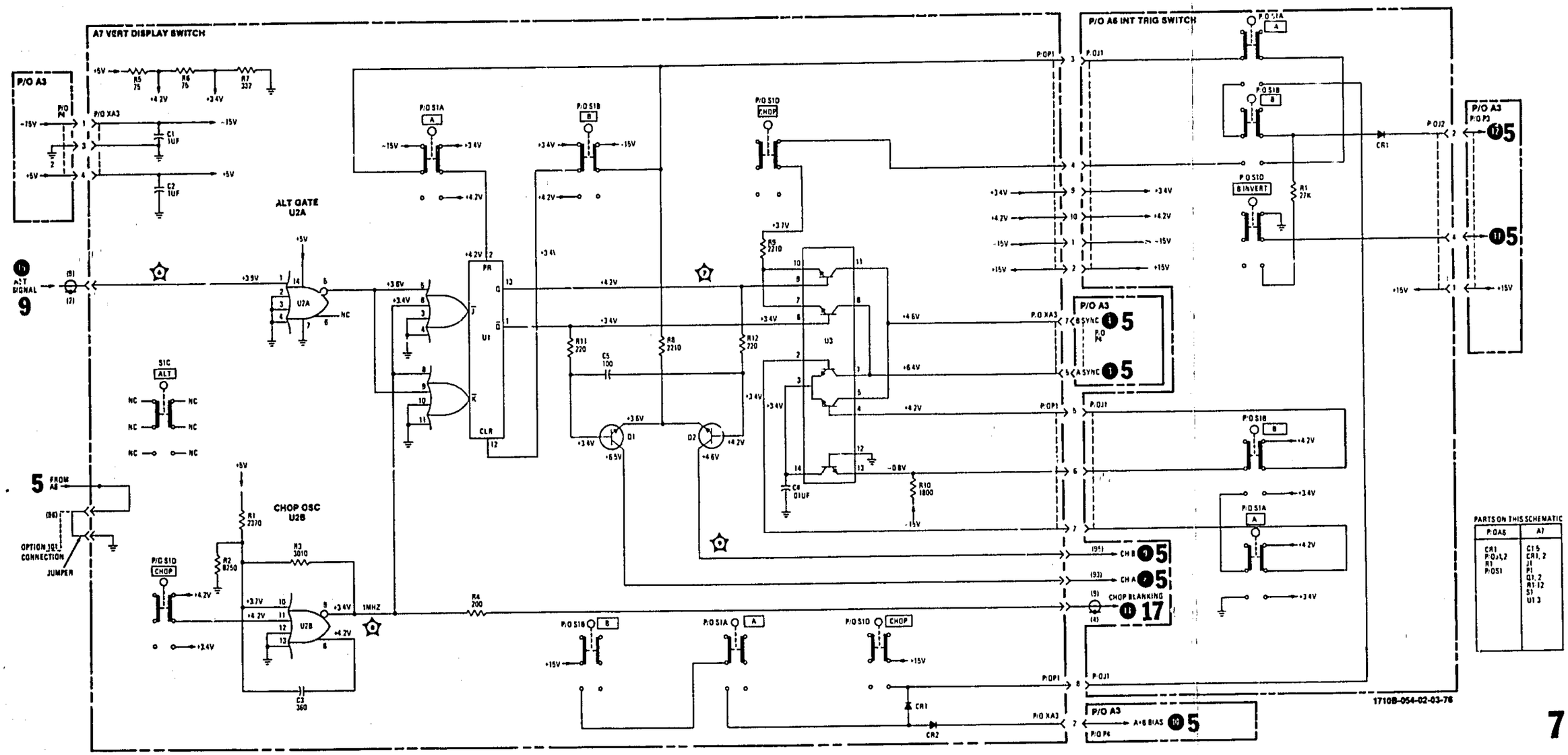
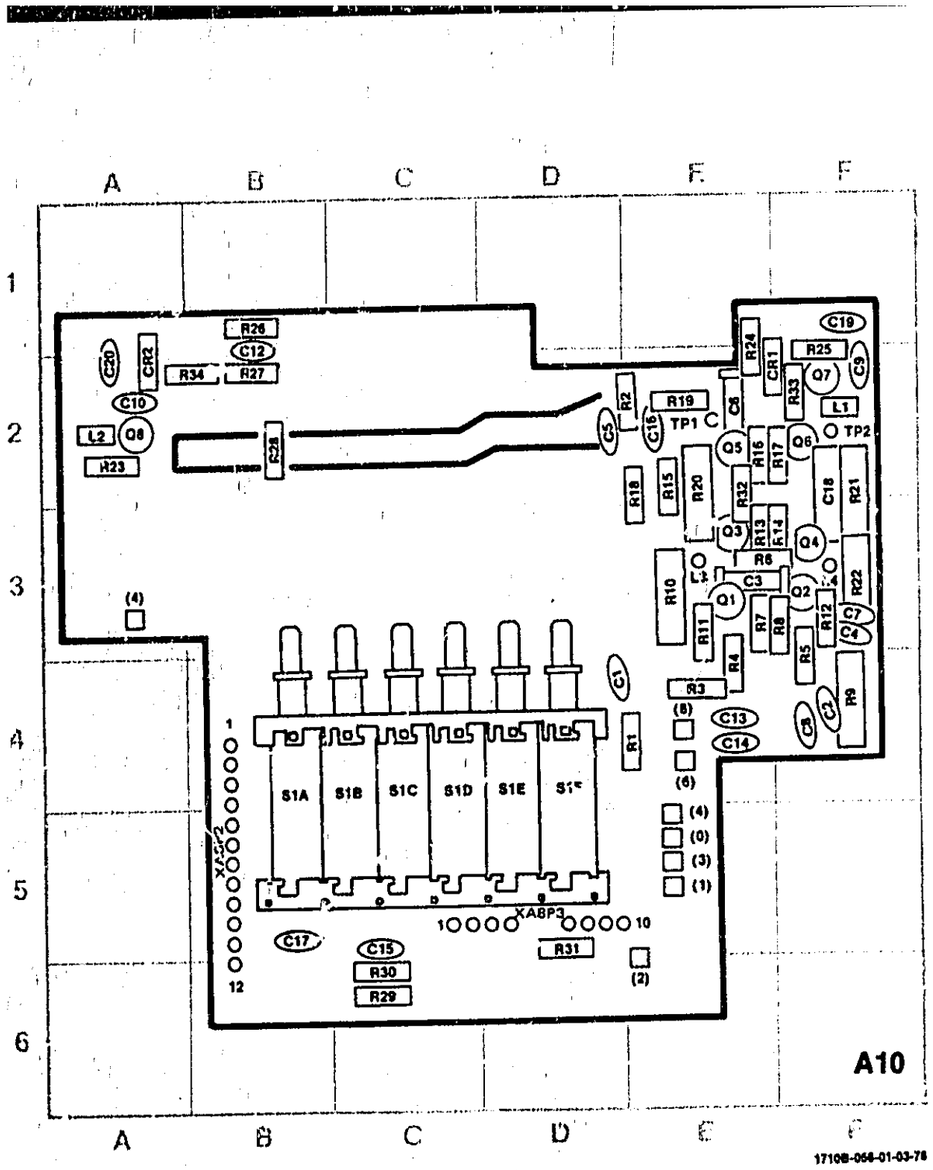


Figure 8-9.
Service Information, Display/Trigger Switches, Assembly A6 and A7 (Sheet 2 of 2)



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REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	D-4	C18	D-2	Q7	F-2	R14	F-3	R29	C-6
C2	F-4	C19	F-1	Q8	A-2	R15	E-2	R30	C-6
C3	E-3	C20	A-2	R1	E-4	R16	E-2	R31	D-5
C4	F-3	CR1	F-2	R2	E-2	R17	F-2	R32	E-2
C5	D-2	CR2	A-2	R3	E-4	R18	E-2	R33	F-2
C6	E-2	L1	F-2	R4	E-4	R19	E-2	R34	B-2
C7	F-3	L2	A-2	R5	F-4	R20	E-2	S1A	B-4
C8	F-4	L3	E-3	R6	E-3	R21	F-3	S1B	C-4
C9	F-2	L4	F-3	R7	E-3	R22	F-3	S1C	C-4
C10	A-2	Q1	E-3	R8	F-3	R23	A-2	S1D	C-4
C12	B-1	Q2	F-3	R9	F-4	R24	E-2	S1E	D-4
C13	E-4	Q3	E-3	R10	E-3	R25	F-2	S1F	D-4
C14	E-4	Q4	F-3	R11	E-3	R26	B-1	TP1	E-2
C15	C-5	Q5	E-2	R12	F-3	R27	B-2	TP2	F-2
C16	E-2	Q6	F-2	R13	E-3	R28	B-2	XA8P2	B-5
C17	B-5							XA8P3	D-5

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 8

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

VERTICAL DISPLAY	X-Y
HORIZ DISPLAY	X-Y
POSITION (horizontal)	centered

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 8

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
VERTICAL DISPLAY	X-Y
HORIZONTAL MODE	X-Y

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.

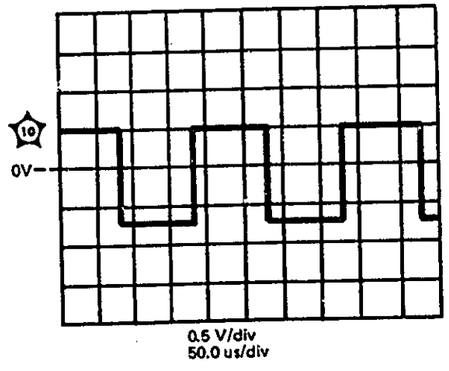


Figure 8-10. Service Information, Horizontal Display Switch Assembly A10 (Sheet 1 of 2)

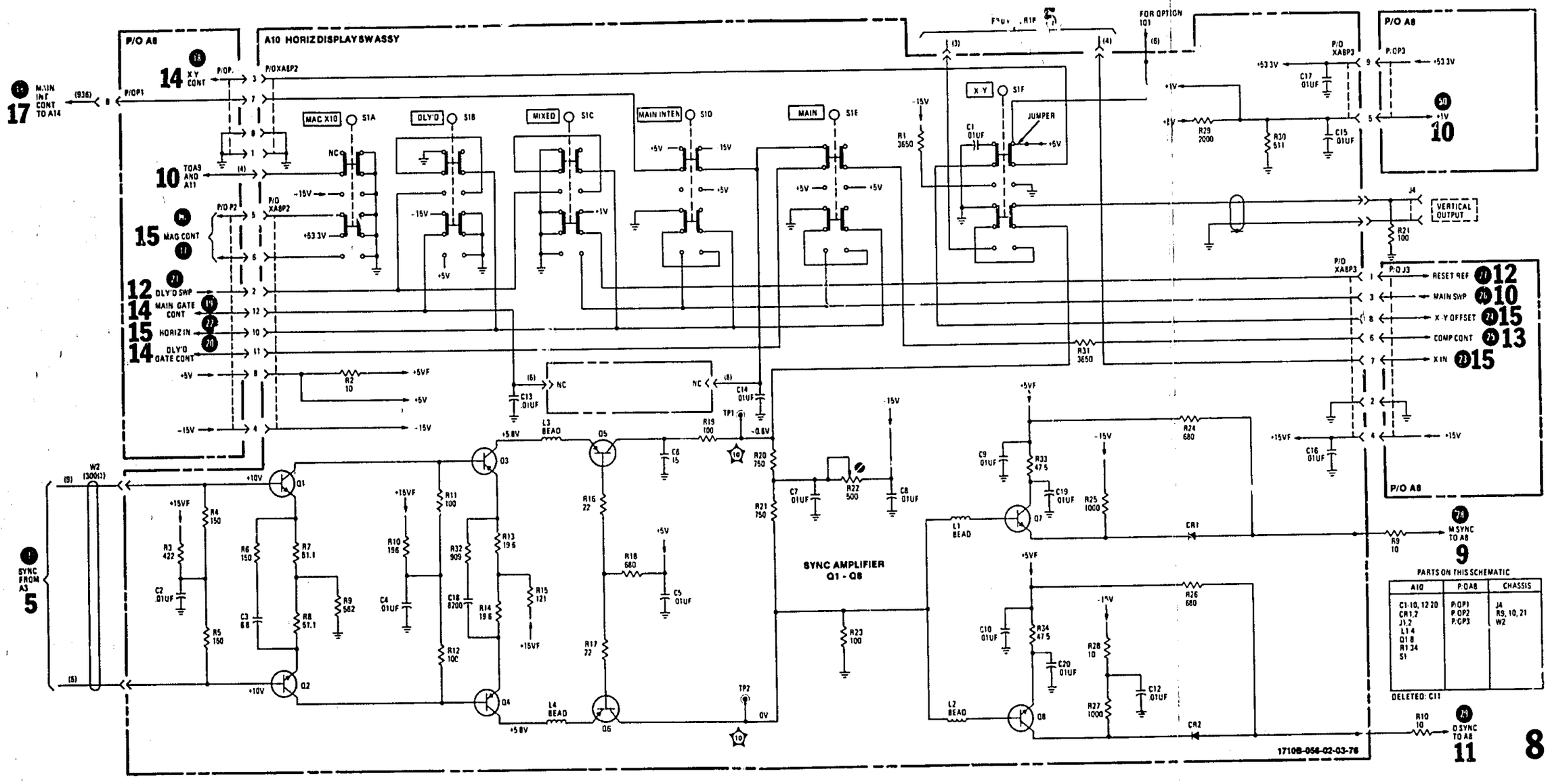
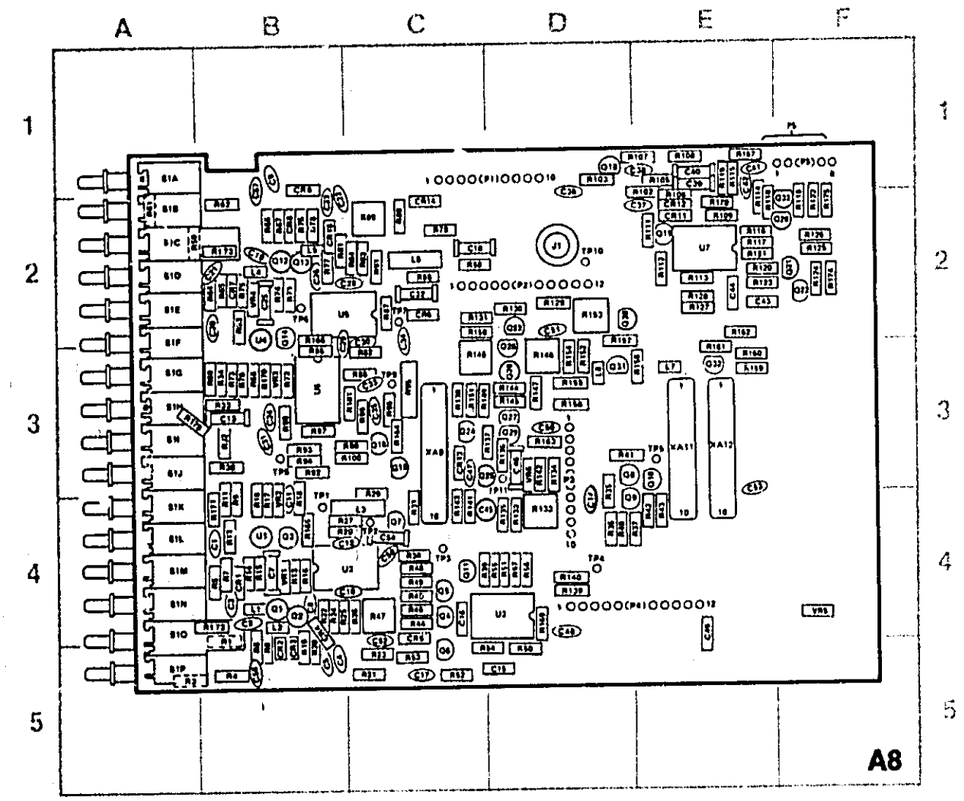


Figure 8-10.
Service Information, Horizontal Display Switch Assembly A10 (Sheet 2 of 2)



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REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-4	C35	C-3	CR11	E-2	Q16	C-3	R18	B-4	R51	D-4	R85	B-4	R119	E-1	R162	D-3	S1J	A-3
C2	B-4	C36	D-1	CR12	E-2	Q18	D-1	R19	B-5	R52	C-5	R86	C-2	R120	E-2	R163	D-2	S1K	A-4
C3	B-4	C37	E-2	CR13	C-3	Q19	E-2	R20	B-5	R53	C-5	R87	C-2	R121	E-2	R164	D-3	S1L	A-4
C4	B-5	C38	E-1	CR14	C-2	Q20	F-2	R21	C-5	R54	C-5	R88	C-3	R122	F-2	R165	D-3	S1M	A-4
C5	B-5	C39	E-1	J1	D-2	Q21	F-2	R22	B-4	R55	D-4	R89	C-2	R123	-	R166	D-3	S1N	A-4
C6	B-4	C40	E-1	L1	B-4	Q22	F-2	R23	C-5	R56	D-4	R90	B-3	R124	F-2	R167	D-2	S1O	A-4
C7	B-4	C41	E-1	L2	B-4	Q23	D-2	R24	B-4	R57	D-4	R91	C-2	R125	F-2	R168	E-3	S1P	A-5
C8	B-4	C42	E-1	L3	C-4	Q24	C-3	R25	B-4	R58	C-2	R92	B-3	R126	F-2	R169	E-3	TP1	B-4
C9	B-1	C43	E-2	L4	B-2	Q25	C-3	R26	C-4	R59	A-2	R93	B-2	R127	E-2	R160	E-3	TP2	C-4
C10	C-4	C44	E-2	L5	B-2	Q26	D-3	R27	C-4	R61	A-2	R94	B-3	R128	E-2	R161	E-3	TP3	C-4
C11	B-4	C45	C-4	L6	C-2	Q27	D-3	R28	C-4	R62	B-2	R95	C-3	R129	D-2	R162	E-2	TP4	D-4
C12	C-4	C46	D-3	L7	E-3	Q28	D-3	R29	C-3	R63	B-2	R96	C-3	R130	D-2	R163	D-3	TP5	E-3
C13	B-3	C47	C-3	L8	D-3	Q29	D-3	R30	B-3	R64	B-2	R97	B-3	R131	C-2	R164	C-3	TP6	B-2
C14	D-4	C48	D-4	P1	D-1	Q30	D-2	R31	C-4	R65	B-2	R98	C-3	R132	D-4	R165	B-4	TP7	C-2
C15	D-5	C49	E-4	P2	D-2	Q31	D-3	R32	B-3	R66	B-2	R99	C-3	R133	D-4	R166	B-2	TP8	B-3
C16	C-4	C50	D-3	P3	D-3	Q32	E-3	R33	B-3	R67	B-2	R100	C-3	R134	D-3	R167	E-1	TP9	C-3
C17	C-5	C51	D-2	P4	E-4	Q33	F-2	R34	B-3	R68	B-4	R101	C-3	R135	D-4	R169	D-4	TP10	D-2
C18	C-2	C52	C-4	P5	F-1	R1	B-4	R35	D-3	R69	B-3	R102	E-1	R136	D-3	R170	B-4	TP11	D-3
C19	B-2	C53	E-3	Q1	B-4	R3	A-5	R36	D-4	R70	B-4	R103	D-1	R137	C-3	R171	B-4	U1	B-4
C20	B-2	C54	C-3	Q2	B-4	R4	B-5	R37	E-4	R71	B-2	R105	E-1	R138	C-3	R172	B-4	U2	C-4
C21	B-2	C56	A-5	Q3	B-4	R5	B-4	R38	C-4	R72	B-4	R106	E-2	R139	D-4	R173	B-2	U3	D-4
C22	B-2	C57	B-1	Q4	C-4	R6	B-5	R39	C-4	R73	B-4	R107	E-1	R140	D-4	R174	F-2	U4	B-2
C23	B-2	C58	C-4	Q5	C-4	R7	B-4	R40	D-4	R74	B-2	R108	E-1	R141	C-4	R175	F-2	U5	B-2
C24	B-4	CR1	B-4	Q6	C-5	R8	B-5	R41	D-3	R75	B-2	R109	E-2	R142	D-3	R178	A-3	U6	B-4
C25	B-2	CR2	B-5	Q7	C-4	R9	B-4	R42	E-4	R76	B-2	R110	E-2	R143	C-4	R179	E-2	U7	E-2
C26	B-2	CR3	B-5	Q8	D-3	R10	B-4	R43	E-4	R77	B-2	R111	E-2	R144	D-3	S1A	A-1	VR1	B-4
C28	B-2	CR4	B-4	Q9	D-4	R11	B-4	R44	C-4	R78	B-2	R112	E-2	R145	D-3	S1B	A-2	VR2	B-4
C29	B-2	CR5	C-4	Q10	E-3	R12	B-4	R45	C-4	R79	C-2	R113	E-2	R146	D-3	S1C	A-2	VR3	B-4
C30	C-2	CR6	C-2	Q11	C-4	R13	B-4	R46	C-4	R80	C-2	R114	E-2	R147	D-3	S1D	A-2	VR4	B-2
C31	B-2	CR7	B-2	Q12	B-2	R14	B-4	R47	C-4	R81	B-2	R115	E-1	R148	C-3	S1E	A-2	VR5	F-4
C32	C-2	CR8	B-2	Q13	B-2	R15	B-4	R48	C-4	R82	C-3	R116	E-2	R149	C-3	S1F	A-2	VR6	D-3
C33	C-3	CR9	B-1	Q14	B-2	R16	B-4	R49	C-4	R83	C-2	R117	E-2	R150	C-2	S1G	A-3	XA9	C-3
C34	C-2	CR10	B-1	Q15	C-3	R17	B-4	R50	D-5	R84	C-2	R118	F-2	R151	C-3	S1H	A-3	XA11	E-3
																S1I	A-3	XA12	E-3

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 9

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Sweep Mode	SINGLE
AUTO/NORM	NORM
RESET	armed
TRIGGER LEVEL (main)	cw

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 9

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
TIME/DIV (main)	20 µs/div

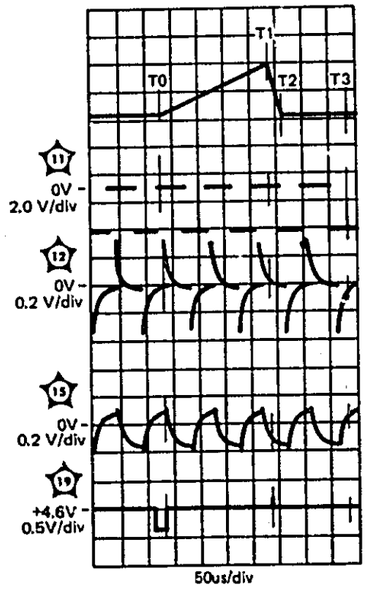
2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 10 kHz.

5. Waveform timing conditions:

T_0 - Sweep start; position trigger occurs at A8U2 pin 11.
T_1 - Sweep ends; holdoff starts.
T_2 - Holdoff ends; armed starts.
T_3 - Armed ends.



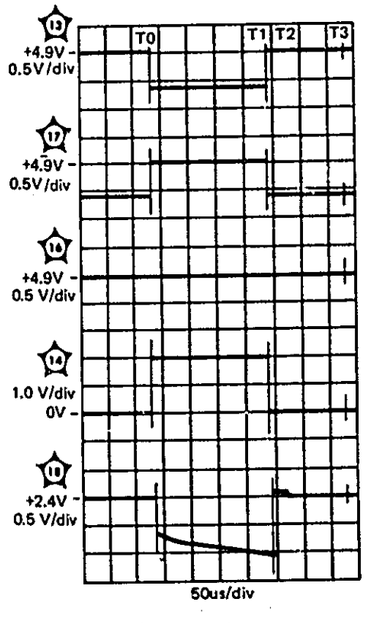


Figure 8-11. Service Information, Main Sweep Trigger, Assembly A8 (Sheet 1 of 2)

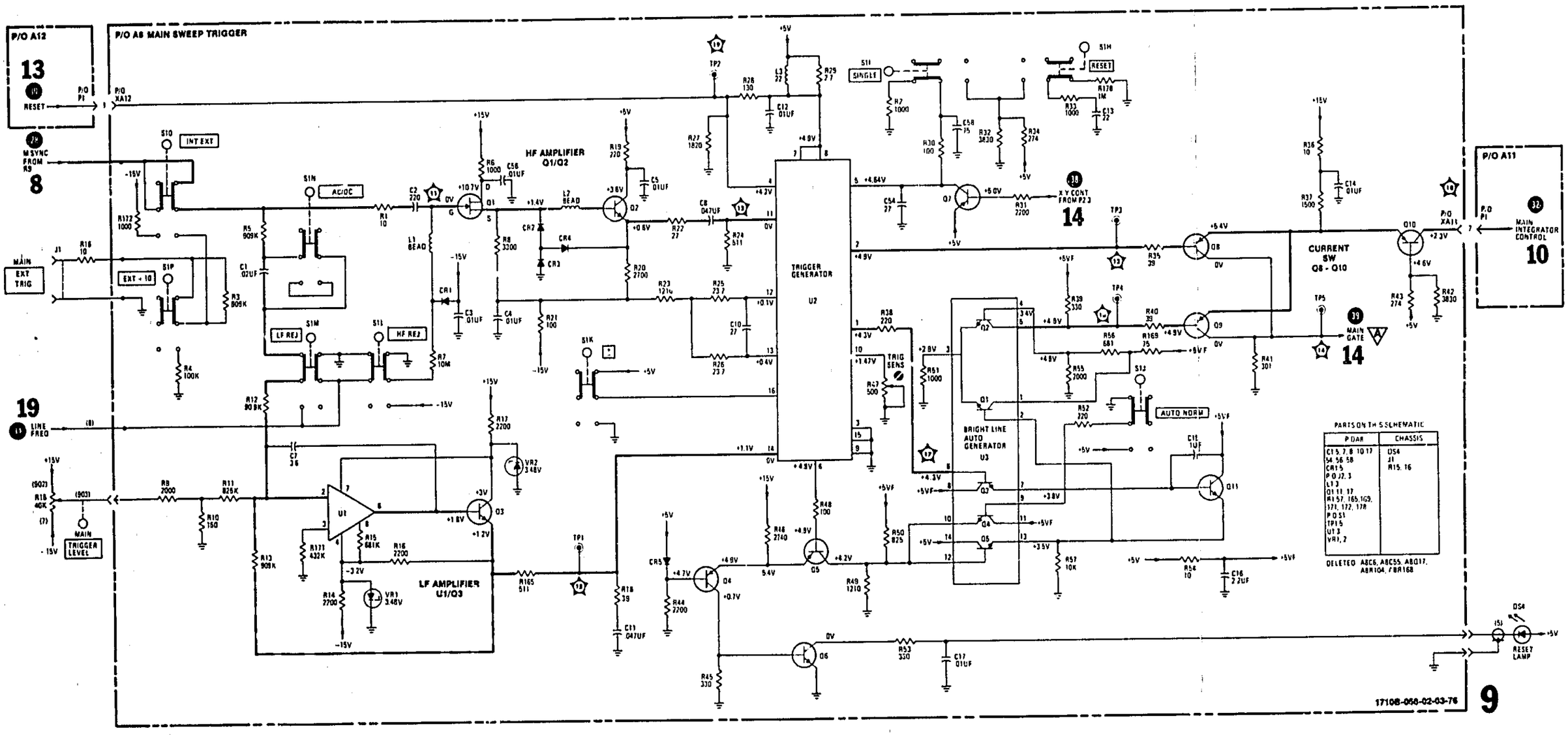
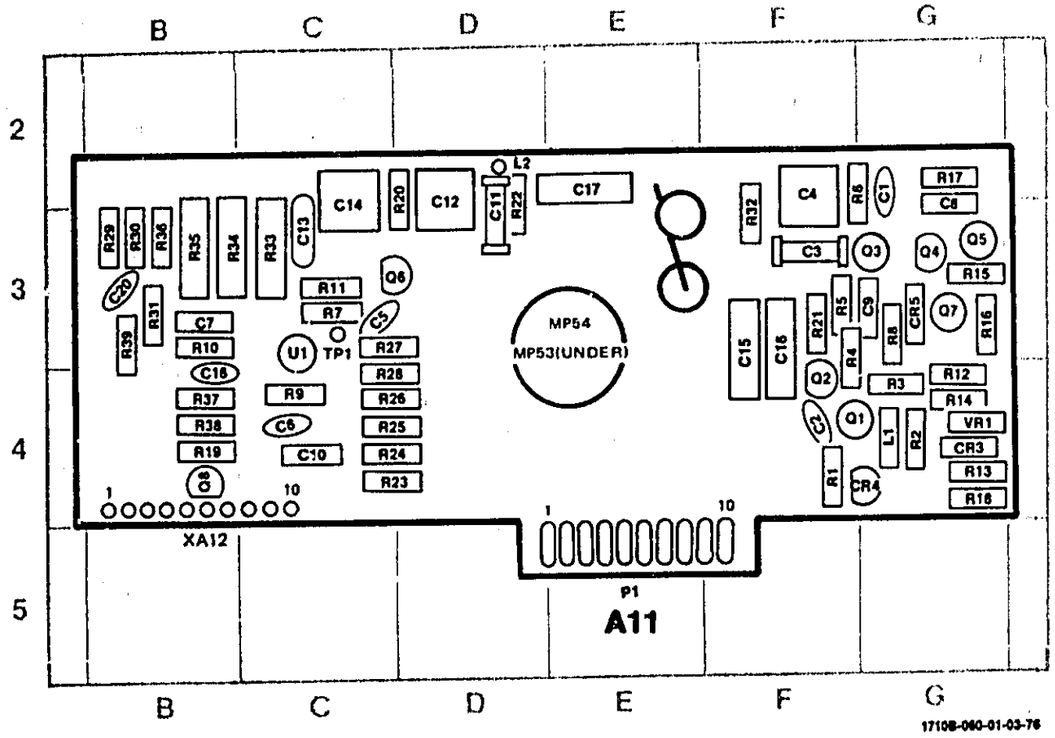


Figure 8-11.
Service Information, Main Sweep Trigger, Assembly A8 (Sheet 2 of 2)



17108-060-01-03-76

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	G-3	C12	D-3	CR5	G-3	Q6	C-3	R9	C-4	R20	D-3	R32	F-3
C2	F-4	C13	C-3	L1	G-4	Q7	G-3	R10	B-3	R21	F-3	R33	C-3
C3	F-3	C14	C-3	L2	D-2	Q8	B-4	R11	C-3	R22	D-3	R34	B-3
C4	F-2	C15	F-3	MP53	D-3	R1	F-4	R12	G-4	R23	C-4	R35	B-3
C5	C-3	C16	F-3	MP54	E-3	R2	G-4	R13	G-4	R24	C-4	R36	B-3
C6	C-4	C17	E-2	P1	E-5	R3	G-4	R14	G-4	R25	C-4	R37	B-4
C7	B-3	C18	B-4	Q1	F-4	R4	F-3	R15	G-3	R26	C-4	R38	B-4
C8	G-3	C20	B-3	Q2	F-4	R5	F-3	R16	G-3	R27	C-3	R39	B-3
C9	G-3	CR3	G-4	Q3	G-3	R6	F-3	R17	G-2	R28	C-4	TP1	C-3
C10	C-4	CR4	G-4	Q4	G-3	R7	C-3	R18	G-4	R29	B-3	U1	C-3
C11	D-3			Q5	G-3	R8	G-3	R19	B-4	R30	B-3	VR1	G-4
										R31	B-3	XA12	B-5

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 10

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Sweep Mode	SINGLE
AUTO/NORM	NORM
RESET	armed
TRIGGER LEVEL (main)	cw

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 10

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
TIME/DIV (main)	20 µs/div

2. Set monitor oscilloscope TIME/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 10 kHz.

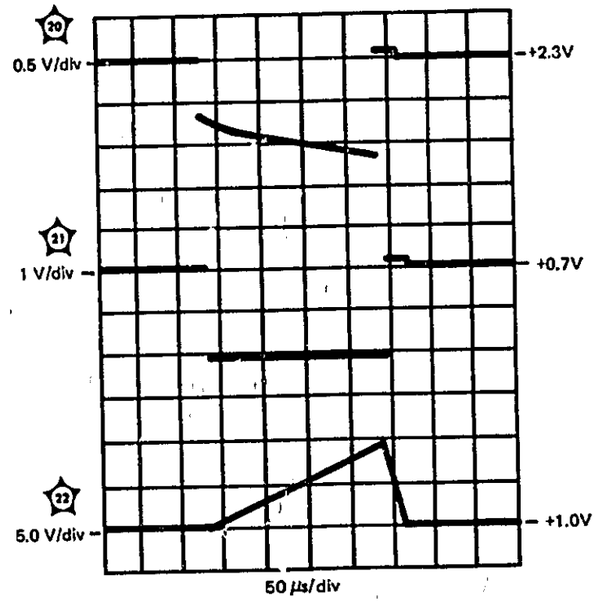


Figure 8 12. Service Information, Main Sweep Integrator, Assembly A11 (Sheet 1 of 2)

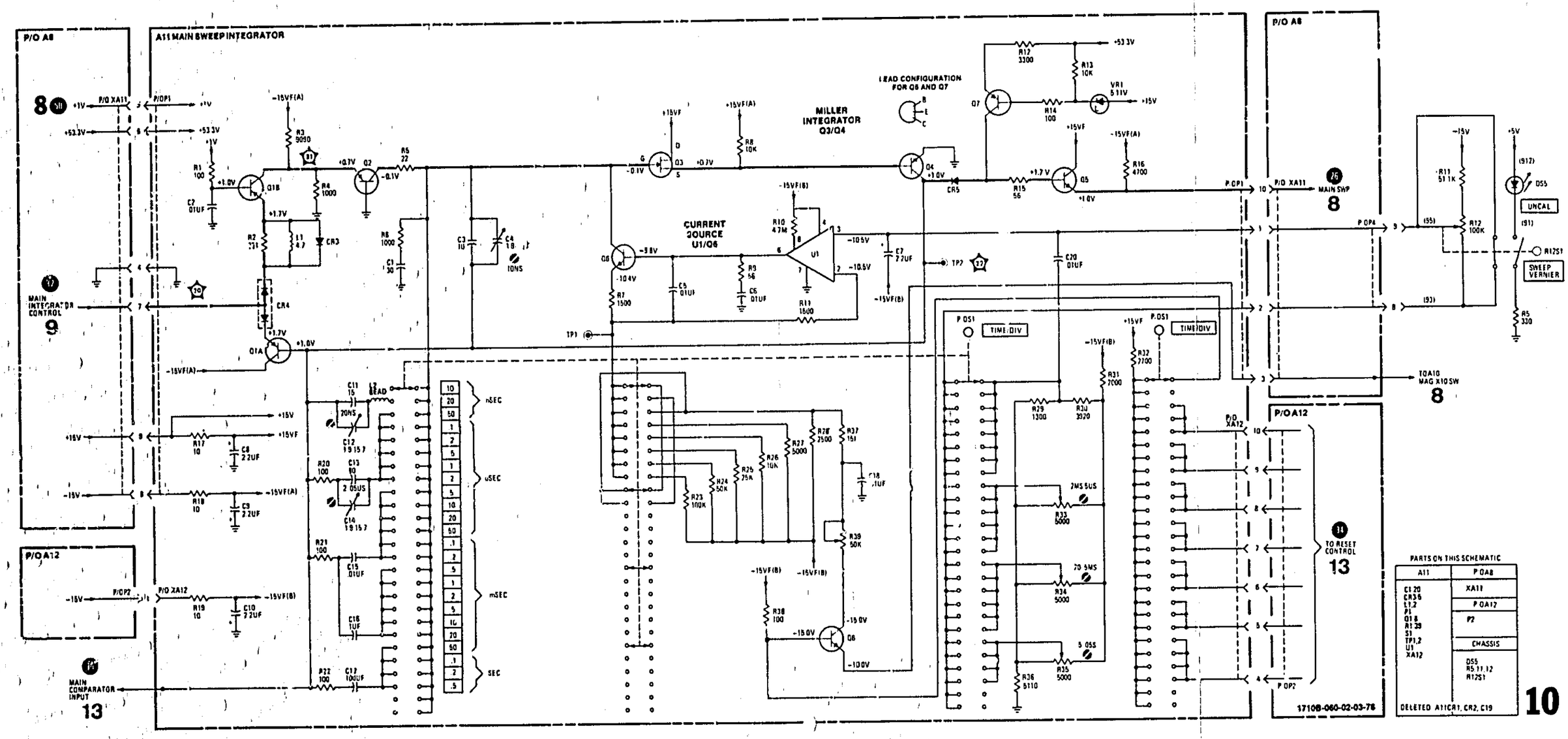


Figure 8-12.
Service Information, Main Sweep Integrator, Assembly A11 (Sheet 2 of 2)

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 11

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

HORIZ DISPLAY	DLY'D
Sweep Mode	SINGLE
AUTO/NORM	NORM
RESET	armed
TRIGGER LEVEL (main and delayed)	cw

2. All voltages are referenced to chassis ground. All indications are normal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 11

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
TIME/DIV (main)	0.1 ms/div
TIME/DIV (delayed)	50 µs/div
HORIZ DISPLAY	DLY'D

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 10 kHz.

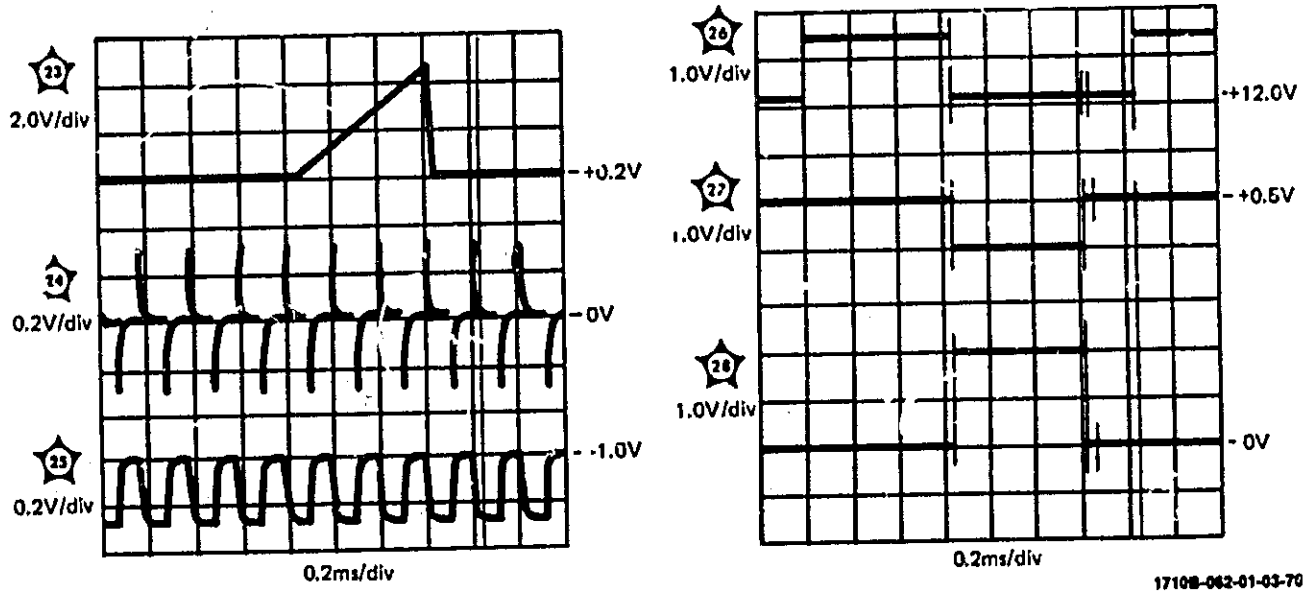
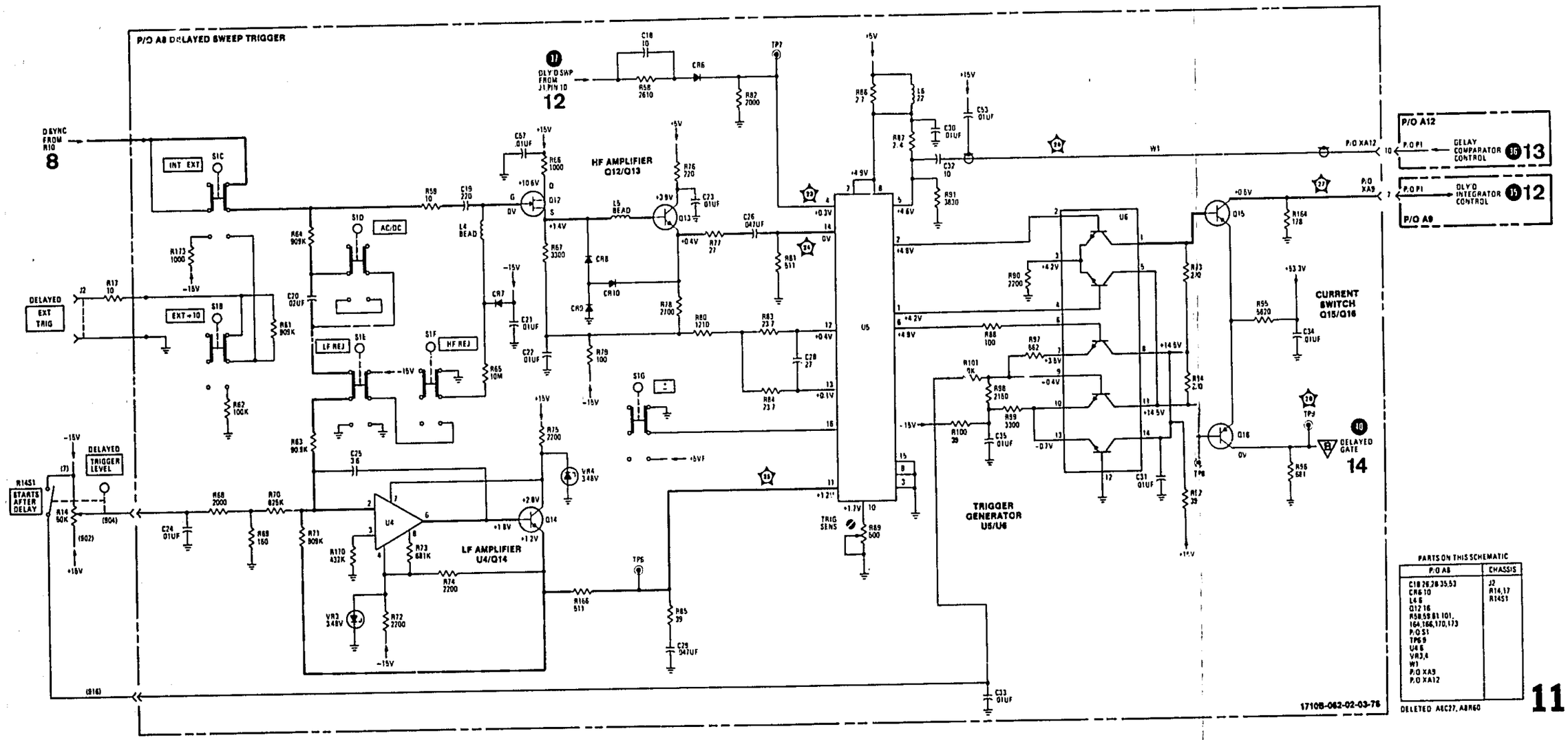


Figure 8-13. Service Information, Dly'd Sweep Trigger, Assembly A8 (Sheet 1 of 2)



PARTS ON THIS SCHEMATIC

P/O A8	CHASSIS
C18,26,28,35,53 CR6,10 L4,6 Q12,16 R58,59,81,101, 164,166,170,173 P/O S1 TP6,9 U4,6 VR3,4 W1 P/O XA9 P/O XA12	J2 R14,17 R14S1

DELETED A8C27, A8R60

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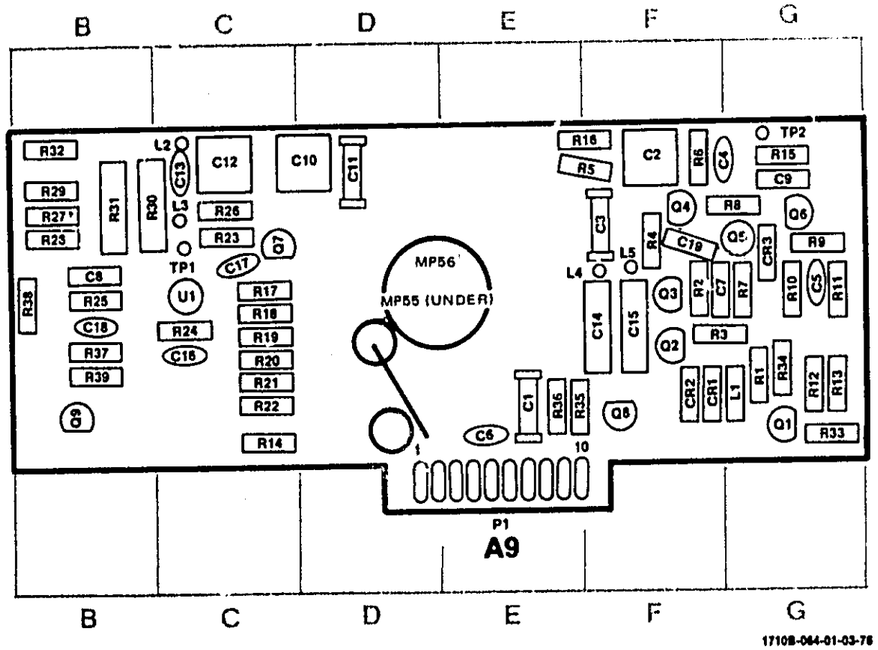
Figure 8-13.
Service Information, Dly'd Sweep Trigger, Assembly A8 (Sheet 2 of 2)



17108-064-01-03-76

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	E-4	C12	C-2	L1	G-4	Q5	G-3	R8	G-3	R20	C-4	R32	B-2
C2	F-2	C13	C-3	L2	C-2	Q6	G-3	R9	G-3	R21	C-4	R33	G-4
C3	F-3	C14	F-4	L3	C-3	Q7	C-3	R10	G-3	R22	C-4	R34	G-4
C4	F-2	C15	F-4	L4	F-3	Q8	F-4	R11	G-3	R23	C-3	R35	E-4
C5	G-3	C16	C-4	L5	F-3	Q9	B-4	R12	G-4	R24	C-4	R36	E-4
C6	E-4	C17	C-3	MP55	D-3	R1	G-4	R13	G-4	R25	B-3	R37	B-4
C7	F-3	C18	B-3	MP56	D-3	R2	F-3	R14	C-4	R26	C-3	R38	B-3
C8	B-3	C19	F-3	P1	E-5	R3	G-4	R15	G-2	R27	B-3	R39	B-4
C9	G-3	CR1	F-4	Q1	G-2	R4	F-3	R16	E-2	R28	B-3	TP1	C-3
C10	D-2	CR2	F-4	Q2	F-4	R5	F-2	R17	C-3	R29	B-3	TP2	G-2
C11	D-3	CR3	G-3	Q3	F-3	R6	F-2	R18	C-3	R30	B-2	U1	C-3
				Q4	F-3	R7	G-3	R19	C-4	R31	B-3		

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 12

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

HORIZ DISPLAY	DLY'D
Sweep Mode	SINGLE
TIME/DIV (delayed)	1 µs
AUTO/NORM	NORM
RESET	armed
TRIGGER LEVEL (main and delayed)	cw

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 12

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
TIME/DIV (main)	0.1 ms/div
TIME/DIV (delayed)	50 µs/div
HORIZ DISPLAY	DLY'D

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.

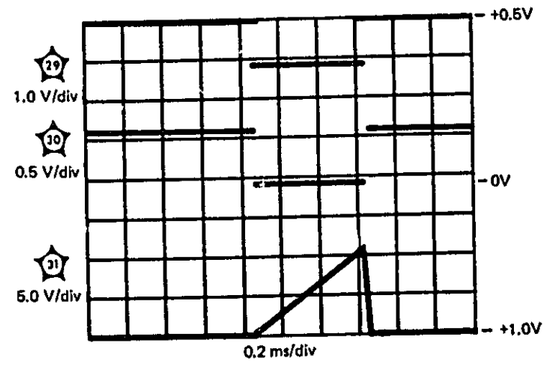


Figure 8-14. Service Information, Dly'd Sweep Integrator, Assembly A9 (Sheet 1 of 2)

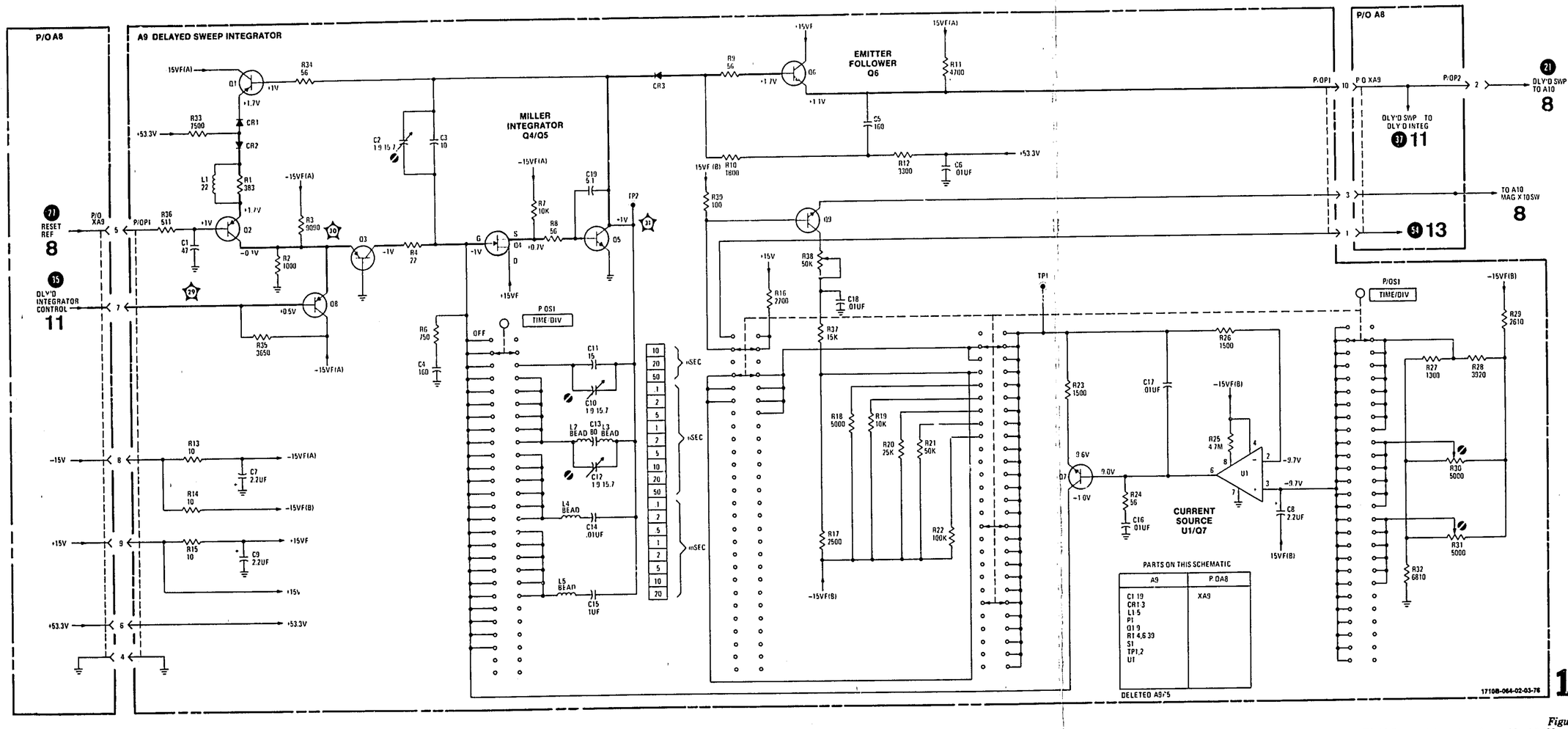
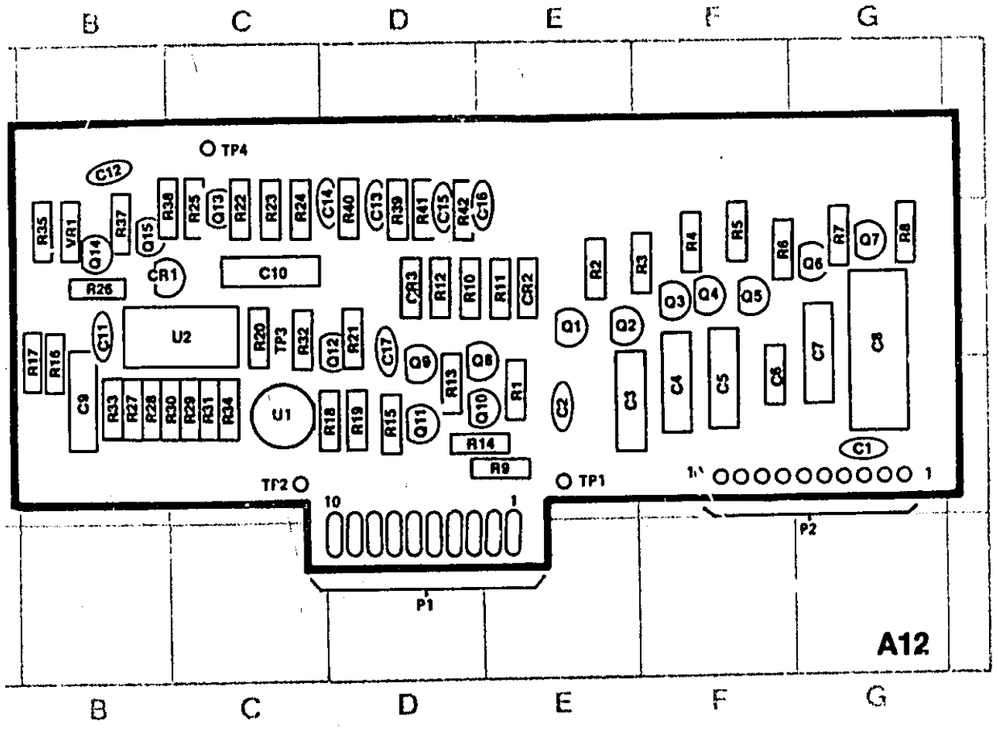


Figure 8-14.
Service Information, Dly'd Sweep Integrator, Assembly A9 (Sheet 2 of 2)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	G-3	Q1	E-2	R7	G-2	R28	B-3
C2	E-3	Q2	E-2	R8	G-2	R29	C-3
C3	E-3	Q3	F-2	R9	E-3	R30	B-3
C4	F-3	Q4	F-2	R10	D-2	R31	C-3
C5	F-3	Q5	F-2	R11	E-2	R32	C-2
C6	F-3	Q6	G-2	R12	D-2	R33	B-3
C7	G-2	Q7	G-2	R13	D-3	R34	C-3
C8	G-2	Q8	D-2	R14	D-3	R35	B-2
C9	B-3	Q9	D-2	R15	D-3	R37	B-2
C10	C-2	Q10	D-3	R16	B-3	R38	C-2
C11	B-2	Q11	D-3	R17	B-3	R39	D-2
C12	B-1	Q12	D-2	R18	D-3	R40	D-2
C13	D-2	Q13	C-2	R19	D-3	R41	D-2
C14	D-2	Q14	B-2	R20	C-2	R42	D-2
C15	D-2	Q15	B-2	R21	D-2	TP1	E-3
C16	D-2	R1	E-3	R22	C-2	TP2	C-3
C17	D-2	R2	E-2	R23	C-2	TP3	C-2
CR1	C-2	R3	F-2	R24	C-2	TP4	C-1
CR2	E-2	R4	F-2	R25	C-2	U1	C-3
CR3	D-2	R5	F-2	R26	B-2	U2	C-2
P1	D-4	R6	F-2	R27	B-3	VR1	B-2
P2	G-4						

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 13

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Sweep Mode	SINGLE
AUTO/NORM	NORM
RESET	armed
TRIGGER LEVEL (main)	cw

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 13

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
TIME/DIV (main)	0.1 ms/div
TIME/DIV (delayed)	50 µs/div
HORIZ DISPLAY	DLY'D

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.

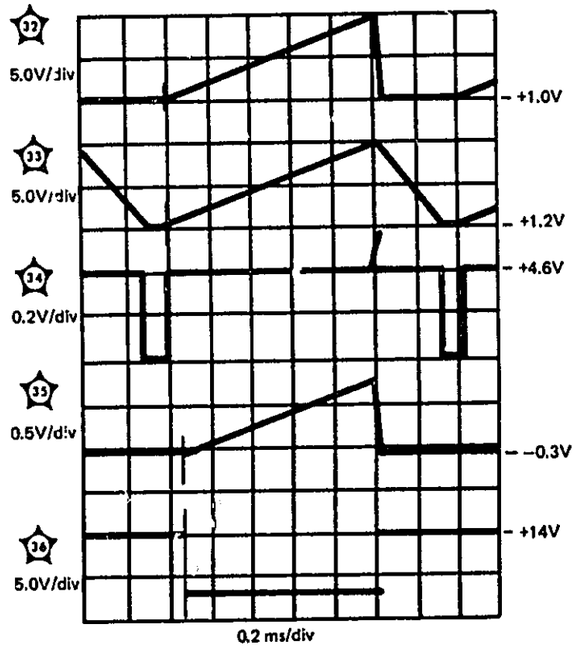


Figure 8-15. Service Information, Holdoff-comparator, Assembly A12 (Sheet 1 of 2)

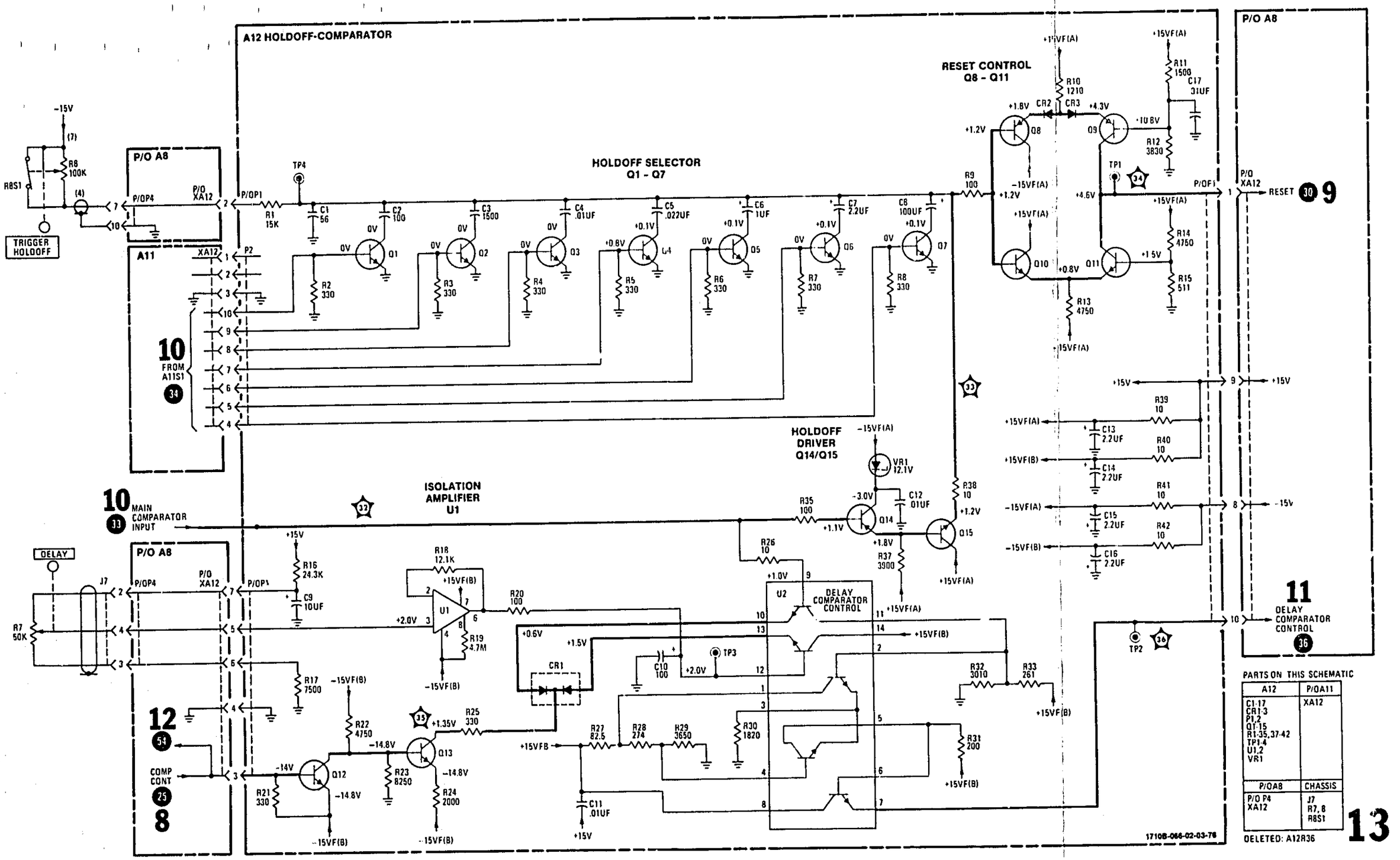


Figure 8-15.
Service Information, Holdoff-comparator, Assembly A12 (Sheet 2 of 2)

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 14

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Sweep Mode	SINGLE
AUTO/NORM	NORM
RESET	armed
TRIGGER LEVEL (main)	cw

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 14

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
TIME/DIV (delayed)	50 µs/div
DELAY	5.00
HORIZ DISPLAY	MIXED

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.

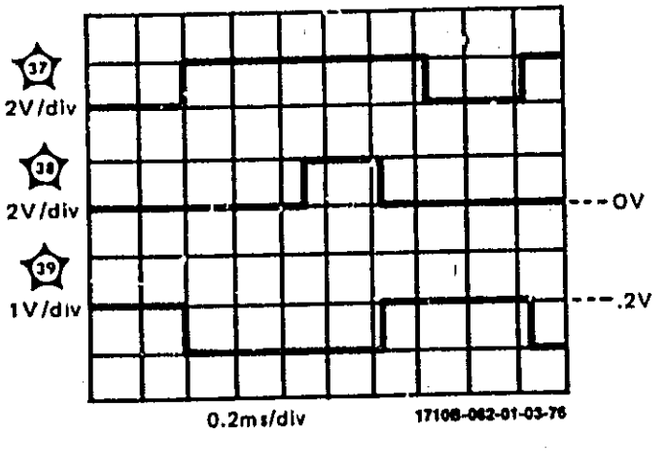


Figure 8-16. Service Information, Schmitt Control, Assembly A8 (Sheet 1 of 2)

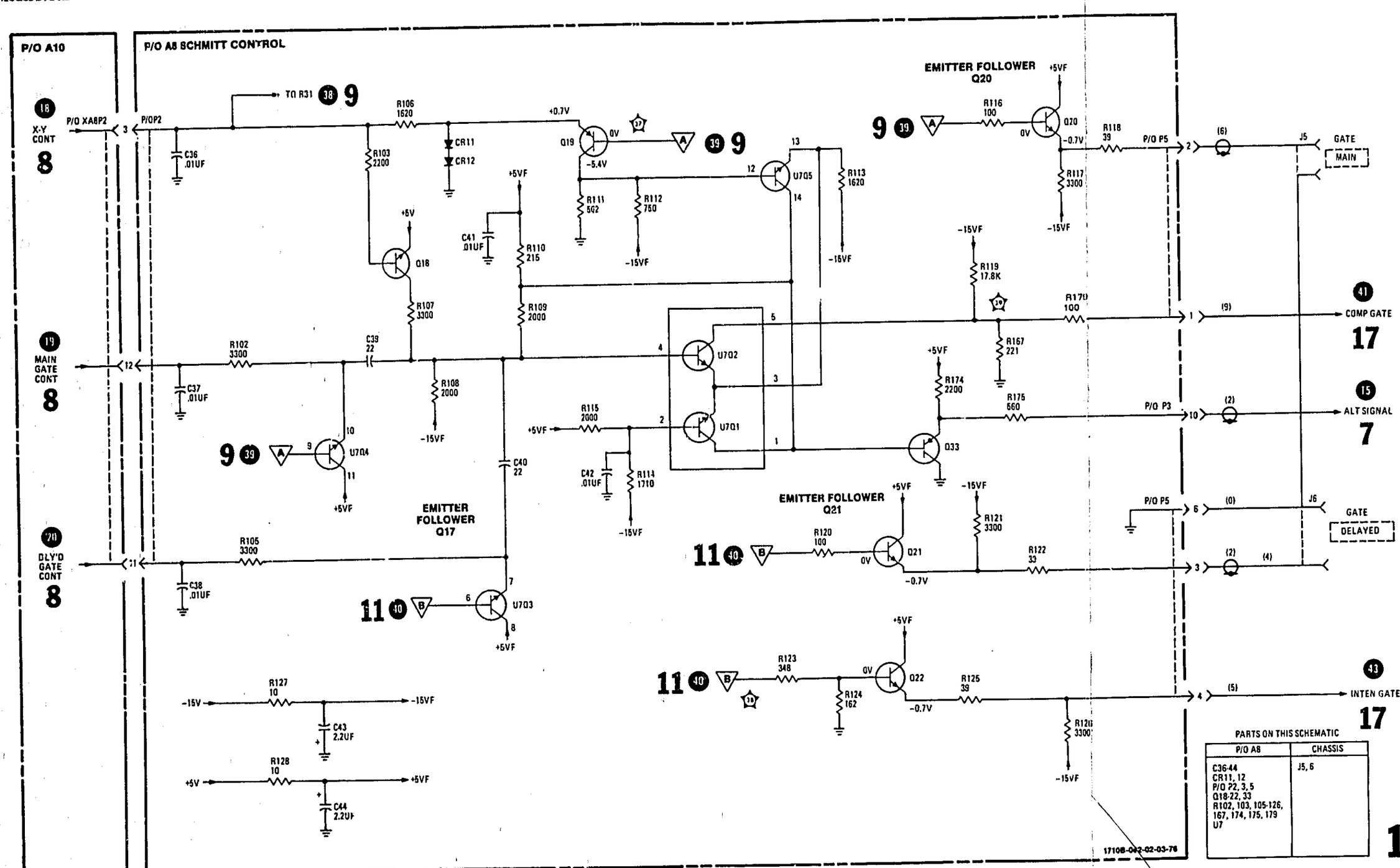


Figure 8-16.
Service Information, Schmitt Control, Assembly A8 (Sheet 2 of 2)

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 15

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

VERTICAL DISPLAY	X-Y
HORIZ DISPLAY	X-Y
POSITION (horizontal)	centered

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 15

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.

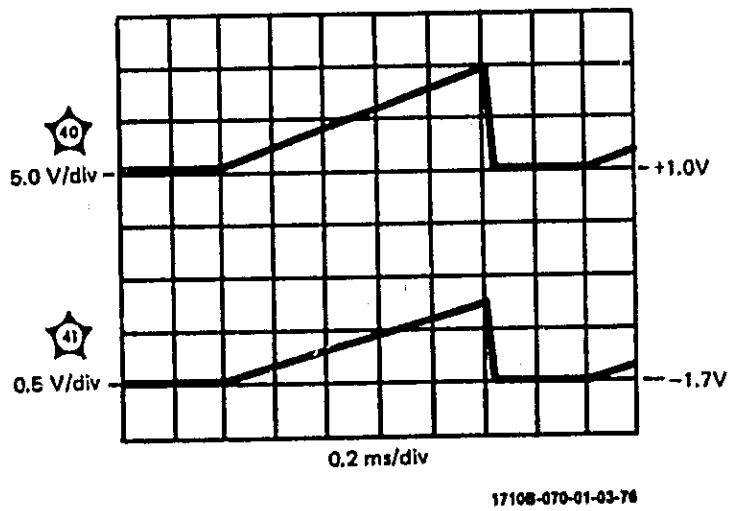


Figure 8-17. Service Information, Horizontal Preamplifier, Assembly A8 (Sheet 1 of 2)

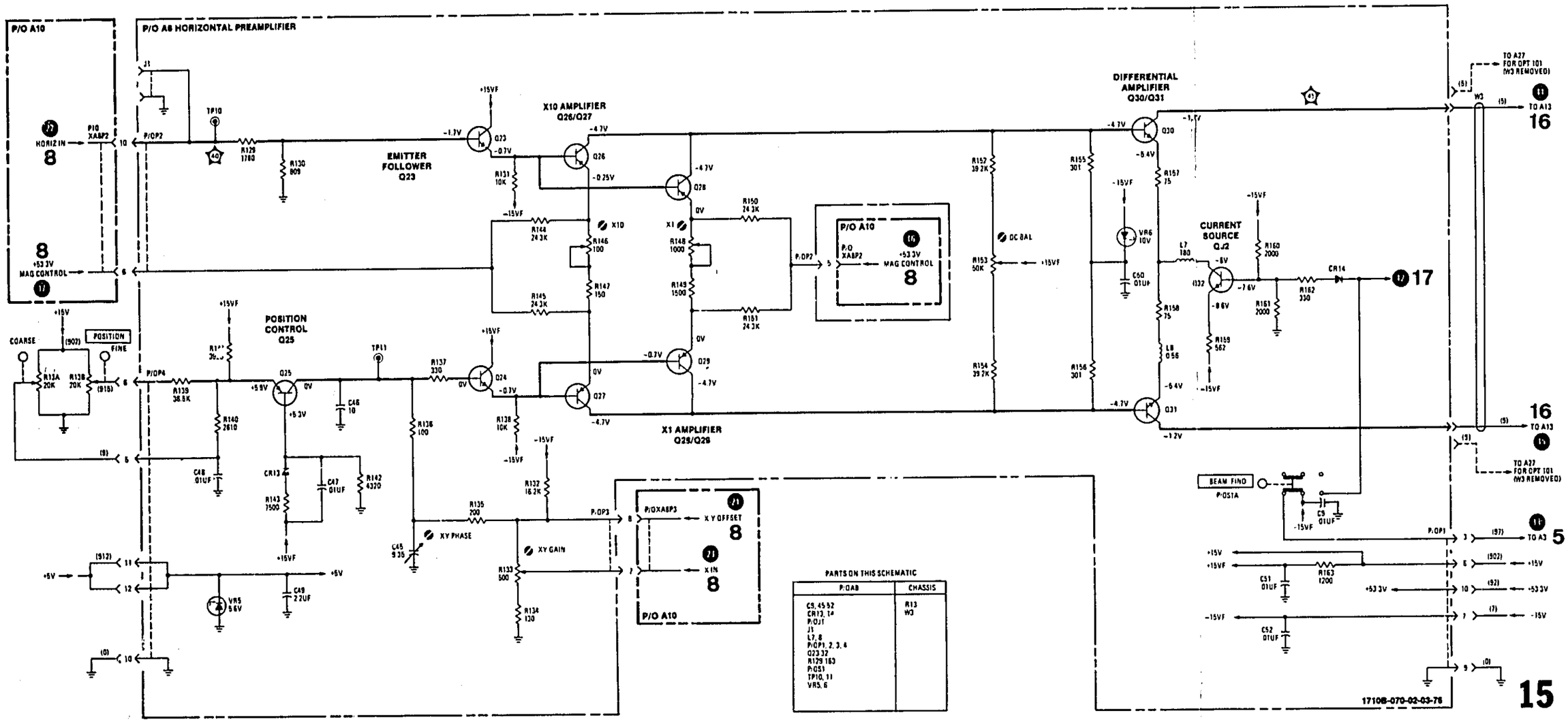
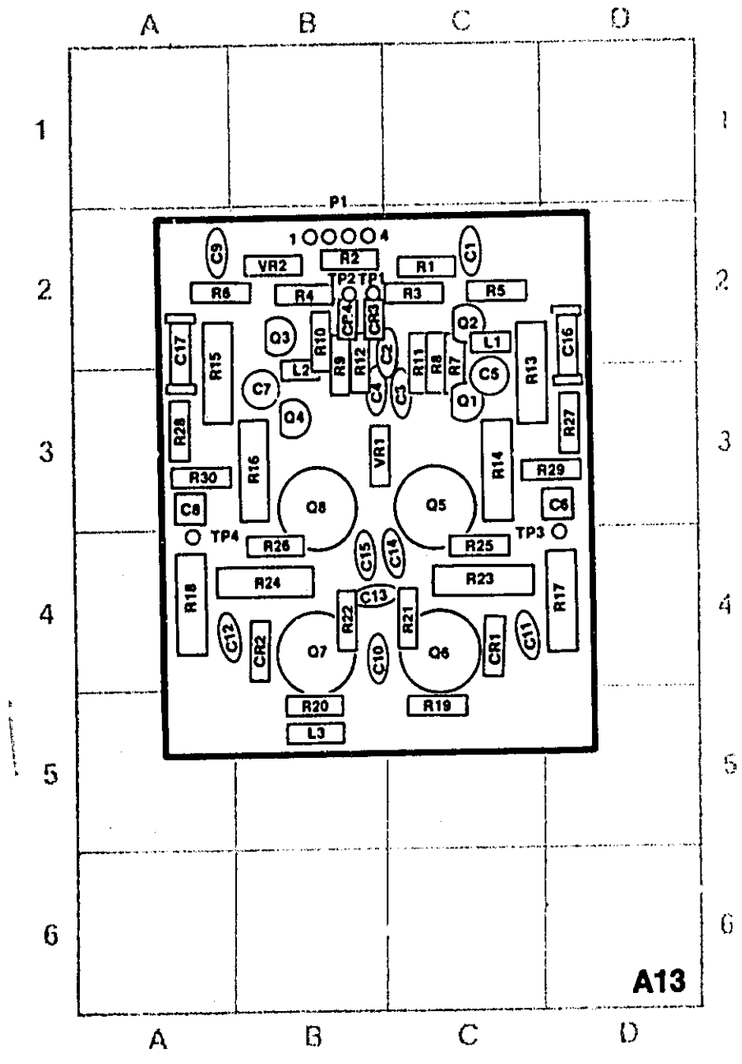


Figure 8-17.
Service Information, Horizontal Preamplifier, Assembly A8 (Sheet 2 of 2)



17108-072-01-03-76

REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	C-2	C12	A-4	L3	B-5	R2	B-2	R13	C-3	R25	C-4
C2	B-2	C13	B-4	P1	B-1	R3	C-2	R14	C-3	R26	B-4
C3	C-3	C14	C-4	Q1	C-3	R4	B-2	R15	A-3	R27	D-3
C4	B-3	C15	B-4	Q2	C-2	R5	C-2	R16	B-3	R28	A-3
C5	C-3	C16	D-2	Q3	B-2	R6	A-2	R17	D-4	R29	D-3
C6	D-3	C17	A-2	Q4	B-3	R7	C-2	R18	A-4	R30	A-3
C7	B-3	CR1	C-4	Q5	C-3	R8	C-2	R19	B-5	TP1	B-2
C8	A-3	CR2	B-4	Q6	C-4	R9	B-2	R20	B-5	TP2	B-2
C9	A-2	CR3	B-2	Q7	B-4	R10	B-2	R21	C-4	TP3	D-4
C10	B-4	CR4	B-2	Q8	B-3	R11	C-2	R22	B-4	TP4	A-4
C11	C-4	L1	C-2	R1	C-2	R12	B-2	R23	C-4	VR1	B-3
		L2	B-3					R24	B-4		

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 16

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

VERTICAL DISPLAY	X-Y
HORIZ DISPLAY	X-Y
POSITION (horizontal)	centered

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 16

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).
3. Connect pulse generator output to Model 1710B channel A INPUT connector.
4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 5 kHz.

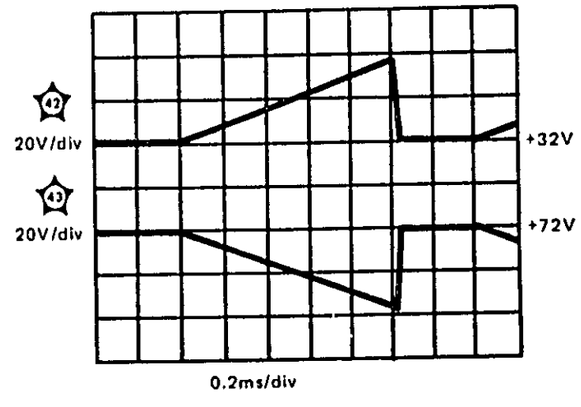


Figure 8-18. Service Information, Horizontal Output Amplifier, Assembly A13 (Sheet 1 of 2)

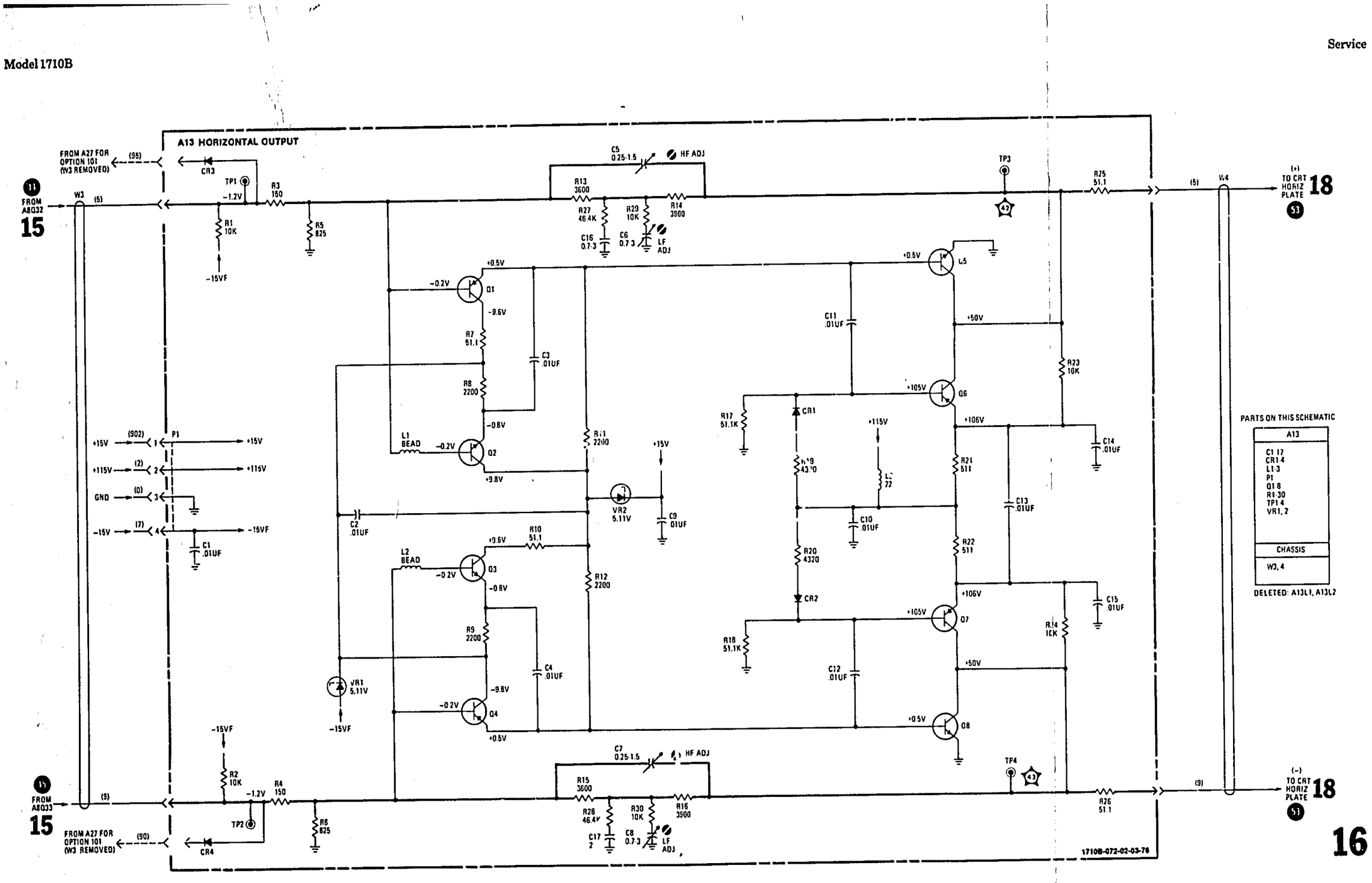
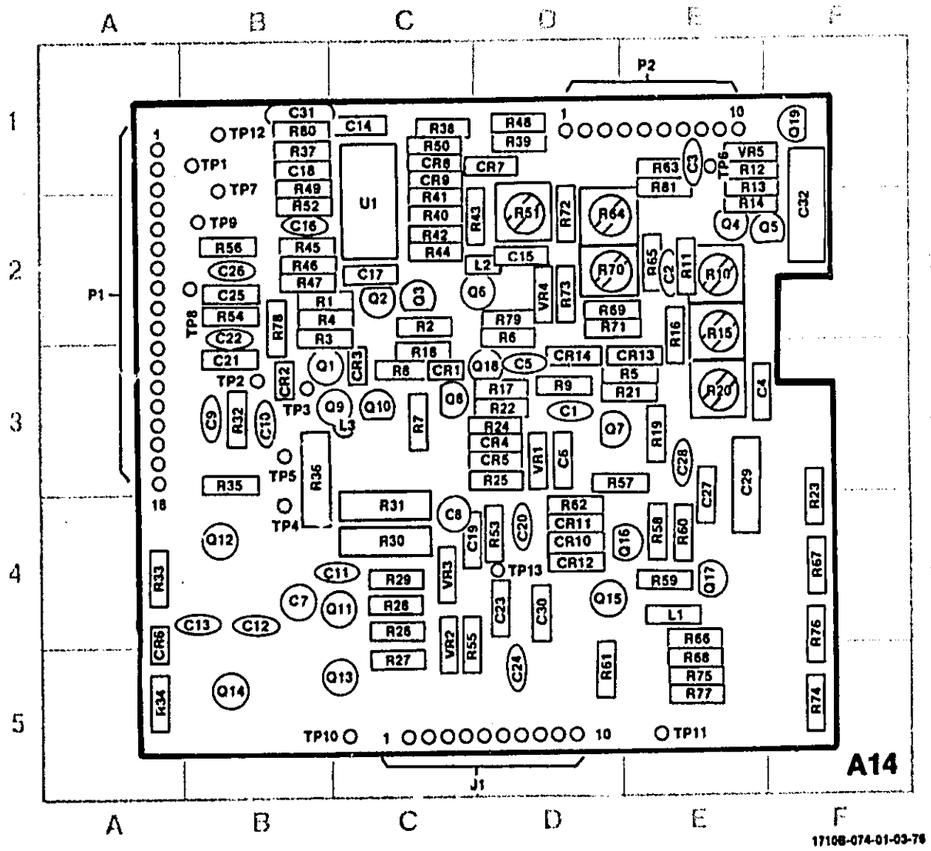


Figure 8-18.
Service Information, Horizontal Output Amplifier, Assembly A13 (Sheet 2 of 2)



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	D-3	C25	B-2	L2	C-3	R3	B-2	R27	C-5	R51	D-2	R76	F-4
C2	E-2	C26	B-2	L3	B-3	R4	B-2	R28	C-4	R52	B-2	R77	E-5
C3	E-1	C27	E-4	P1	A-2	R5	D-3	R29	C-4	R53	D-4	R78	B-2
C4	E-3	C28	E-3	P2	E-1	R6	D-2	R30	C-4	R54	B-2	R79	D-2
C5	D-3	C29	E-3	Q1	B-3	R7	C-3	R31	C-4	R55	C-4	R80	B-1
C6	D-3	C30	D-4	Q2	C-2	R8	C-3	R32	B-3	R56	B-2	R81	E-1
C7	B-4	C31	B-1	Q3	C-2	R9	D-3	R33	A-4	R57	D-3	TP1	B-1
C8	C-4	C32	F-2	Q4	E-2	R10	E-2	R34	A-5	R58	E-4	TP2	B-3
C9	B-3	CR1	C-3	Q5	F-2	R11	E-2	R35	B-3	R59	E-4	TP3	B-3
C10	B-3	CR2	B-3	Q6	D-2	R12	E-1	R36	B-3	R60	E-4	TP4	B-4
C11	B-4	CR3	C-3	Q7	D-3	R13	E-2	R37	B-1	R61	D-5	TP5	B-3
C12	B-4	CR4	D-3	Q8	C-3	R14	E-2	R38	C-1	R62	D-4	TP6	E-1
C13	B-4	CR5	D-3	Q9	B-3	R15	E-2	R39	D-1	R63	E-1	TP7	B-1
C14	C-1	CR6	A-4	Q10	C-3	R16	E-2	R40	C-2	R64	D-2	TP8	B-2
C15	D-2	CR7	D-1	Q11	C-4	R17	D-3	R41	C-2	R65	E-2	TP9	B-2
C16	B-2	CR8	C-1	Q12	B-4	R18	C-3	R42	C-2	R66	E-4	TP10	C-5
C17	C-2	CR9	C-1	Q13	C-5	R19	E-3	R43	C-2	R67	F-4	TP11	E-5
C18	B-1	CR10	D-4	Q14	B-5	R20	E-3	R44	C-2	R68	E-5	TP12	B-1
C19	C-4	CR11	D-4	Q15	D-4	R21	D-3	R45	B-2	R69	D-2	TP13	D-4
C20	D-4	CR12	D-4	Q16	D-4	R22	D-3	R46	B-2	R70	D-2	U1	C-2
C21	B-3	CR13	D-3	Q17	E-4	R23	F-3	R47	B-2	R71	D-2	VR1	D-3
C22	B-2	CR14	D-3	Q18	D-3	R24	D-3	R48	D-1	R72	D-2	VR2	C-5
C23	D-4	J1	C-5	Q19	F-1	R25	D-3	R49	B-1	R73	D-2	VR3	C-4
C24	D-5	L1	E-4	R1	B-2	R26	C-4	R50	C-1	R74	F-5	VR4	D-2
				R2	C-2					R75	E-5	VR5	E-1

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 17

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

VERTICAL DISPLAY	X-Y
HORIZ DISPLAY	X-Y
POSITION (horizontal)	off screen
INTENSITY	normal
	maximum ( )

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 17

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

Coupling (channel A)	50Ω
TRIGGER LEVEL (main)	stable display
TIME/DIV (delayed)	20 µs/div
DELAY	5.00
HORIZ DISPLAY	MAIN INTEN

2. Set monitor oscilloscope TIME/DIV and VOLTS/DIV controls as indicated under waveform(s).

3. Connect pulse generator output to Model 1710B channel A INPUT connector.

4. Adjust pulse generator output for four divisions of signal amplitude (.4 V) at 10 kHz.

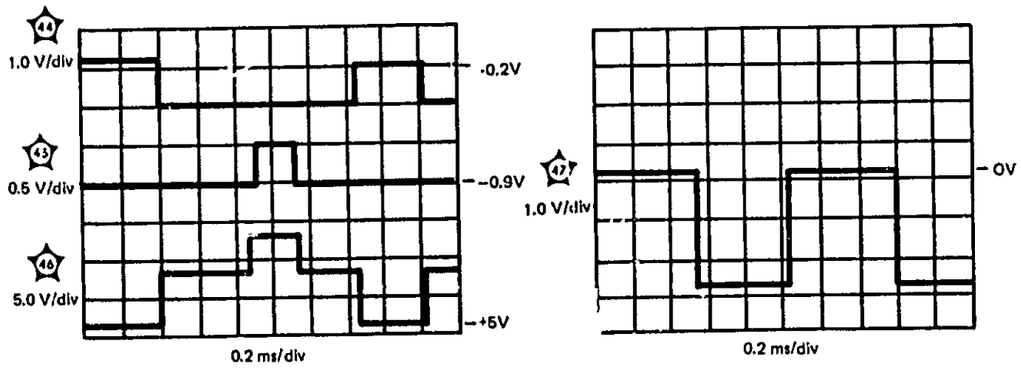
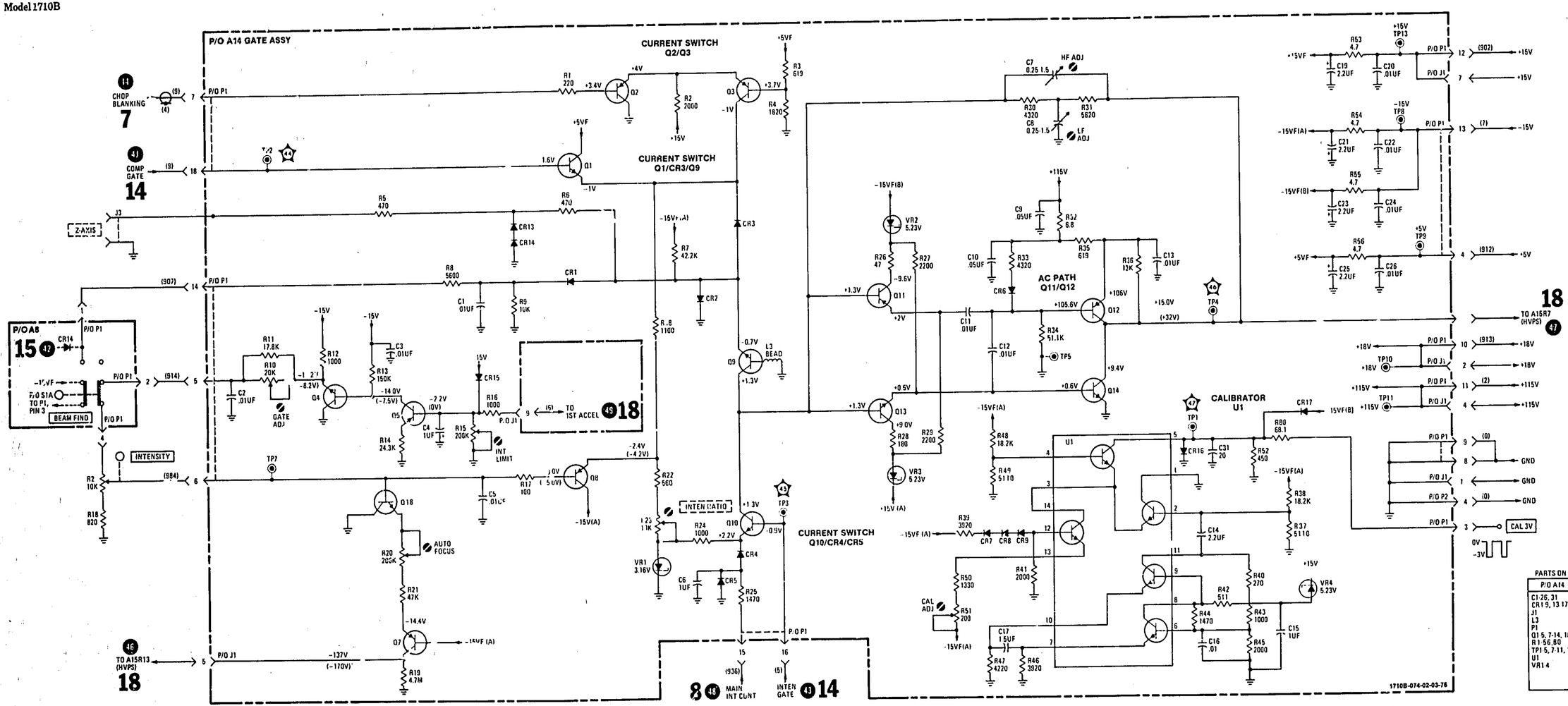


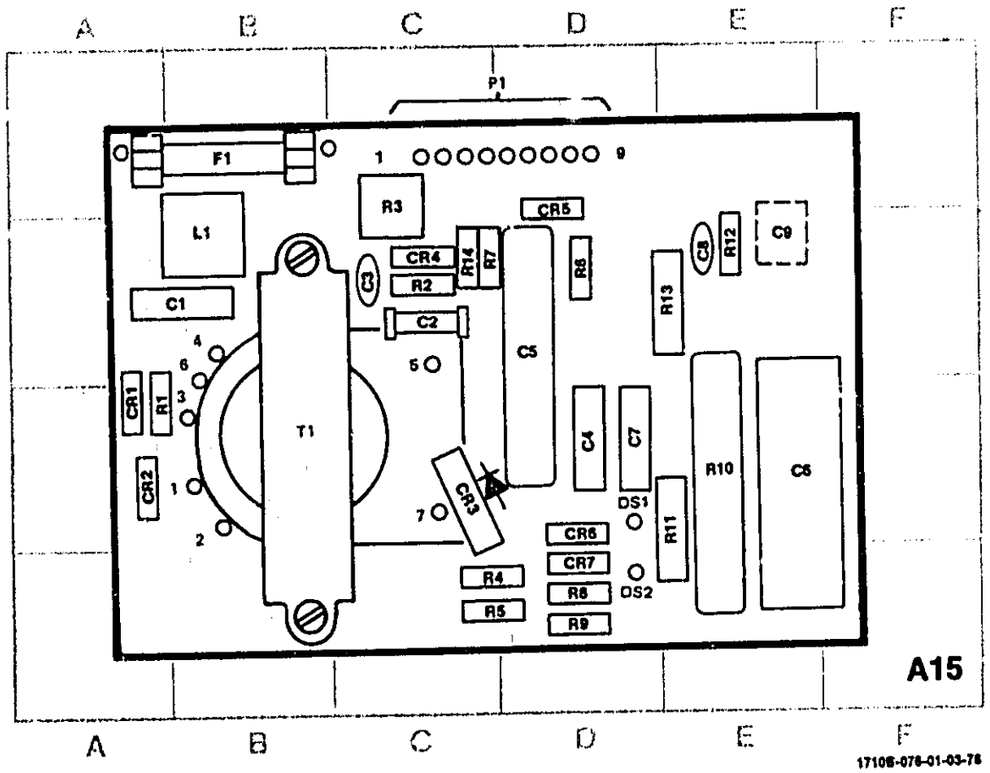
Figure 8-19. Service Information, Gate Control/Output, Assembly A14 (Sheet 1 of 2)



PARTS ON THIS SCHEMATIC	
P/O A14	P/O A8
C1-26, 31 CR1-9, 13 17 J1 L3 P1 Q1-5, 7-14, 18 R1-56, 80 TP1-5, 7-11, 13 U1 VR1-4	CR14 P/O S1
	CHASSIS
	J3 R2, 18

17

Figure 8-19.
Service Information, Gate Control/Output, Assembly A14 (Sheet 2 of 2)
8-43



REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC	REF DESIG	GRID LOC
C1	B-2	C9	E-2	CR7	D-4	R1	A-3	R8	D-4
C2	C-2	CR1	A-3	DS1	D-3	R2	C-2	R9	D-4
C3	C-2	CR2	A-3	DS2	D-4	R3	C-1	R10	E-3
C4	D-3	CR3	C-3	E1	A-1	R4	D-4	R11	E-3
C5	D-2	CR4	C-2	E2	C-1	R5	D-4	R12	E-2
C6	E-3	CR5	D-2	F1	B-1	R6	D-2	R13	E-2
C7	D-3	CR6	D-3	L1	B-2	R7	C-2	R14	C-2
C8	E-2			P1	C-1			T1	B-3

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 18

1. Set front-panel controls in accordance with paragraph 5-13, Section V, except as follows:

   SCALE ILLUM ..... maximum

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

WAVEFORM MEASUREMENT CONDITIONS
SCHEMATIC 18

1. Set front-panel controls in accordance with paragraph 5-13, Section V.

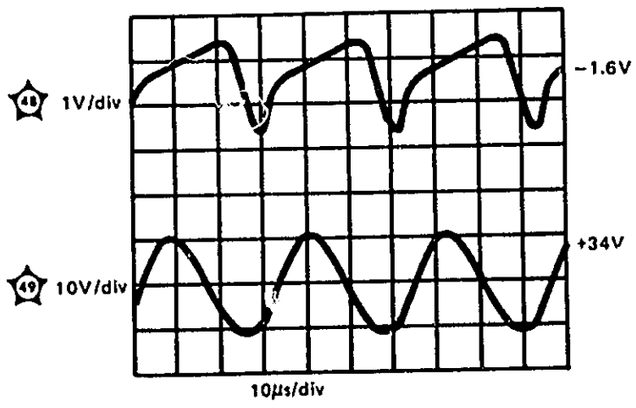


Figure 8-20. Service Information, Gate Assembly and HV Power Supply, Assemblies A14 and A15 (Sheet 1 of 2)

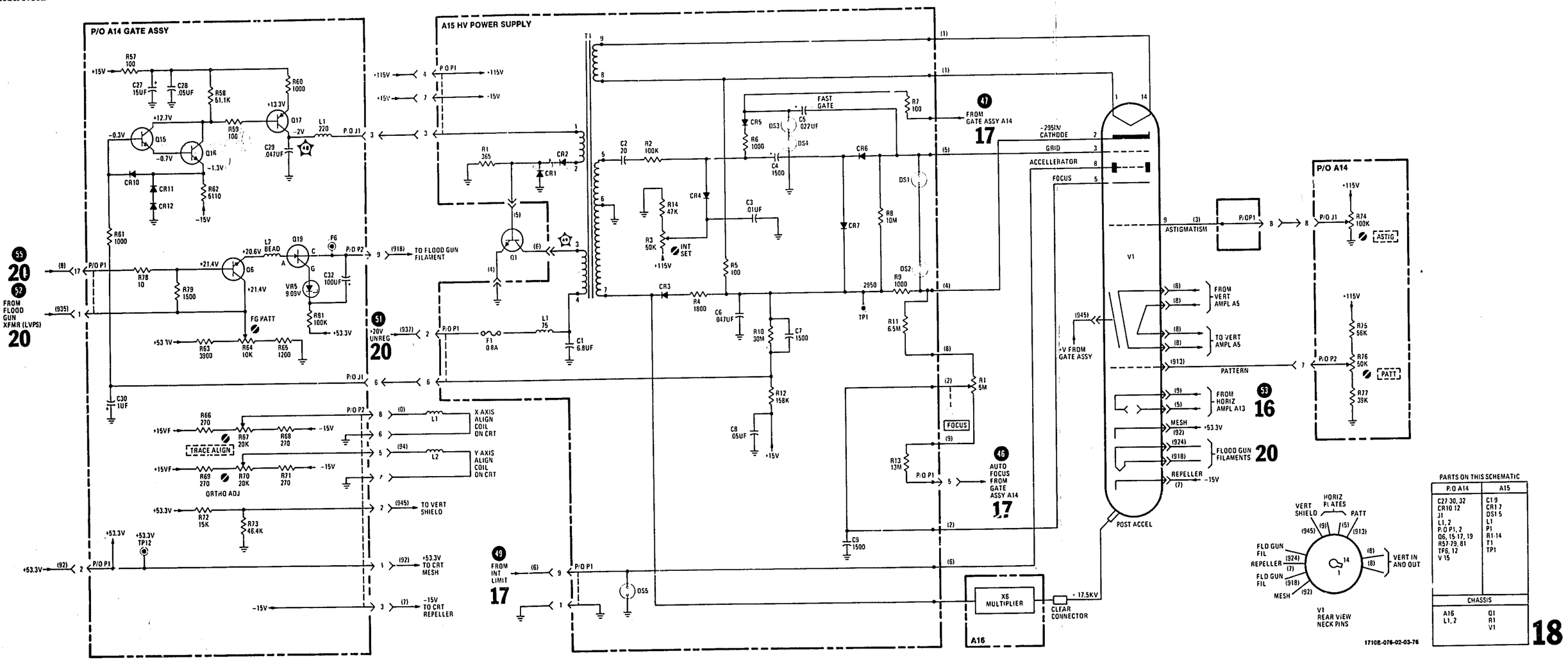
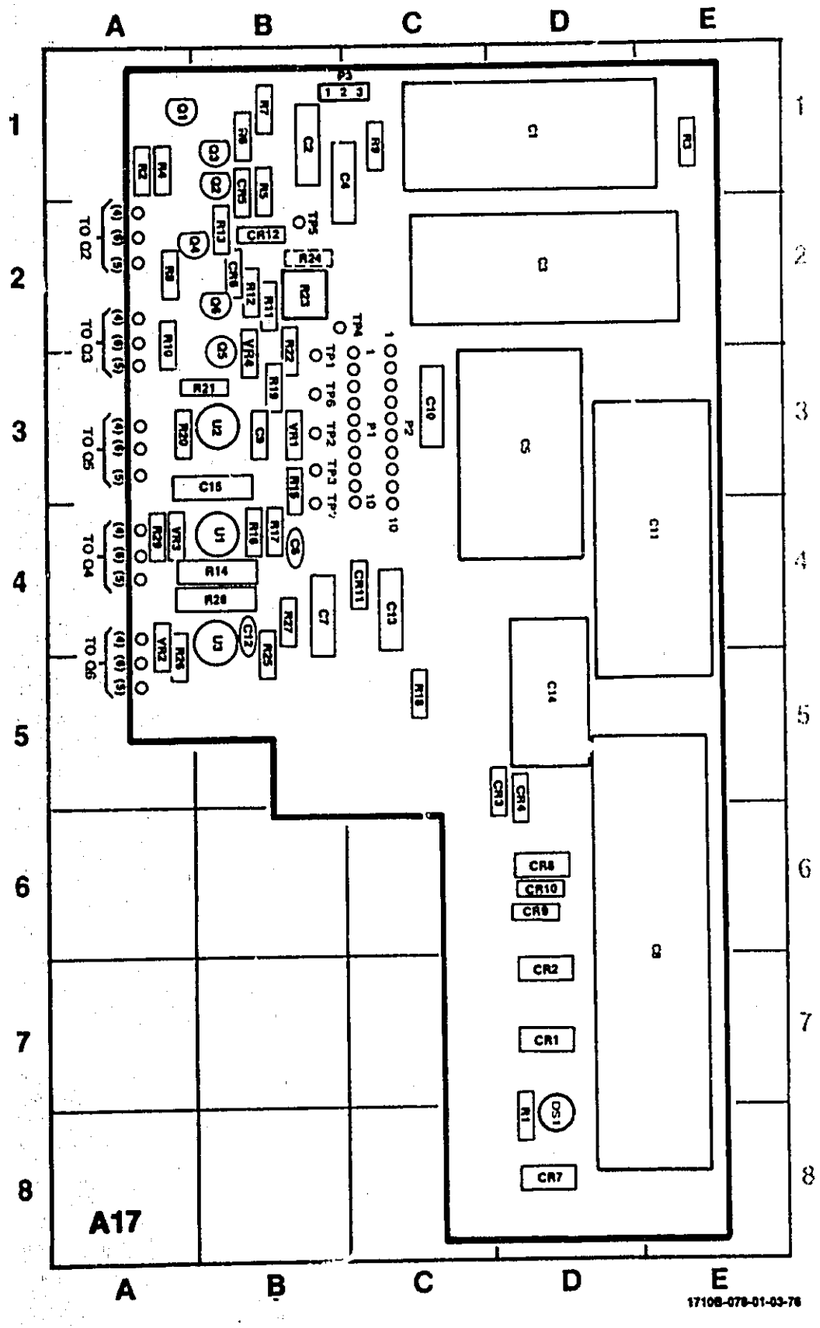


Figure 8-20.
Service Information, Gate Assembly and HV Power Supply, Assemblies A14 and A15 (Sheet 2 of 2)



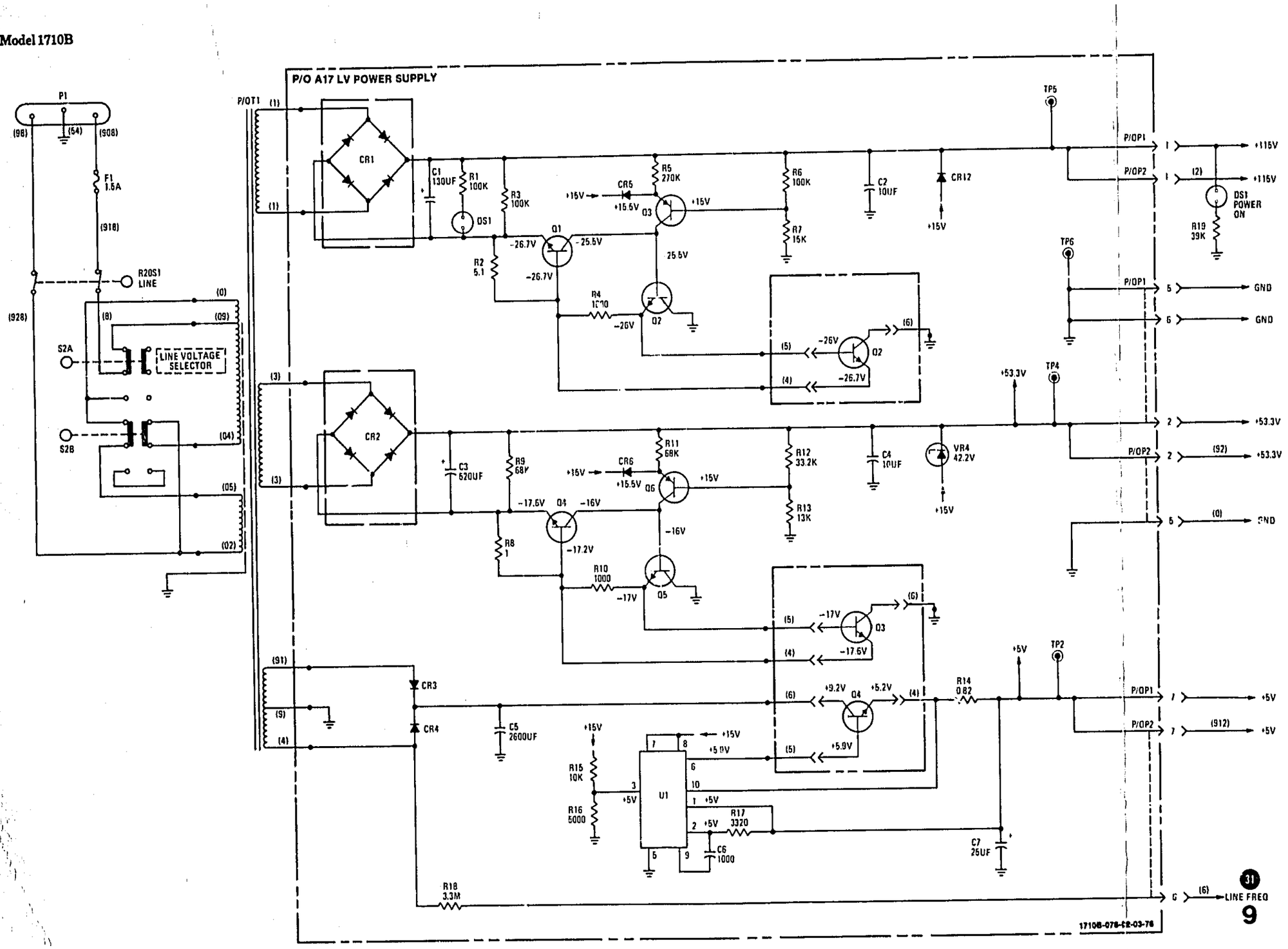
REF DESIG	GRID LOC
C1	D-1
C2	B-1
C3	D-2
C4	C-1
C5	D-3
C6	B-4
C7	B-4
C8	E-6
C9	B-3
C10	C-3
C11	E-11
C12	B-4
C13	C-4
C14	D-5
C15	B-3
CR1	D-7
CR2	D-7
CR3	D-5
CR4	D-5
CR5	B-1
CR6	B-2
CR7	D-8
CR8	D-6
CR9	D-6
CR10	D-6
CR11	C-4
CR12	B-2
DS1	D-8
P1	C-3
P2	C-3
P3	C-1
Q1	A-1
Q2	B-1
Q3	B-1
Q4	B-2
Q5	B-2
Q6	B-2
R1	D-8
R2	A-1
R3	E-1
R4	A-1
R5	B-1
R6	B-1
R7	B-1
R8	A-2
R9	C-1
R10	A-2
R11	B-2
R12	B-2
R13	B-2
R14	B-4
R15	B-4
R16	B-4
R17	B-4
R18	C-5
R19	B-3
R20	B-3
R21	B-3
R22	B-2
R23	B-2
R24	B-2
R25	B-5
R26	A-5
R27	B-4
R28	B-4
R29	A-4
TP1	B-3
TP2	B-3
TP3	B-3
TP4	C-2
TP5	B-2
TP6	B-3
TP7	B-4
U1	B-4
U2	B-3
U3	B-4
VR1	B-3
VR2	A-4
VR3	A-4
VR4	B-2

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 19

1. Set front-panel controls in accordance with paragraph 5-13, Section V.

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

Figure 8-21. Service Information, Low-voltage Power Supply, Assembly A17 (Sheet 1 of 4)



PARTS ON THIS SCHEMATIC

P/OA17	CHASSIS
C1-7 CR1 6, 12 DS1 F1 P/OP1,2 Q1 6 R1 18 TP2,4,5 U1 VR4	DS1 P1 Q2-4 R19 R20S1 S2 P/OT1

Figure 8-21.
Service Information, Low-voltage Power Supply, Assembly A17 (Sheet 2 of 4)

DC VOLTAGE MEASUREMENT CONDITIONS
SCHEMATIC 20

1. Set front-panel controls in accordance with paragraph 5-13, Section V.

2. All voltages are referenced to chassis ground. All indications are nominal and 15% variation from those indicated should be considered normal.

Figure 8-21. Service Information, Low-voltage Power Supply, Assembly A17 (Sheet 3 of 4)

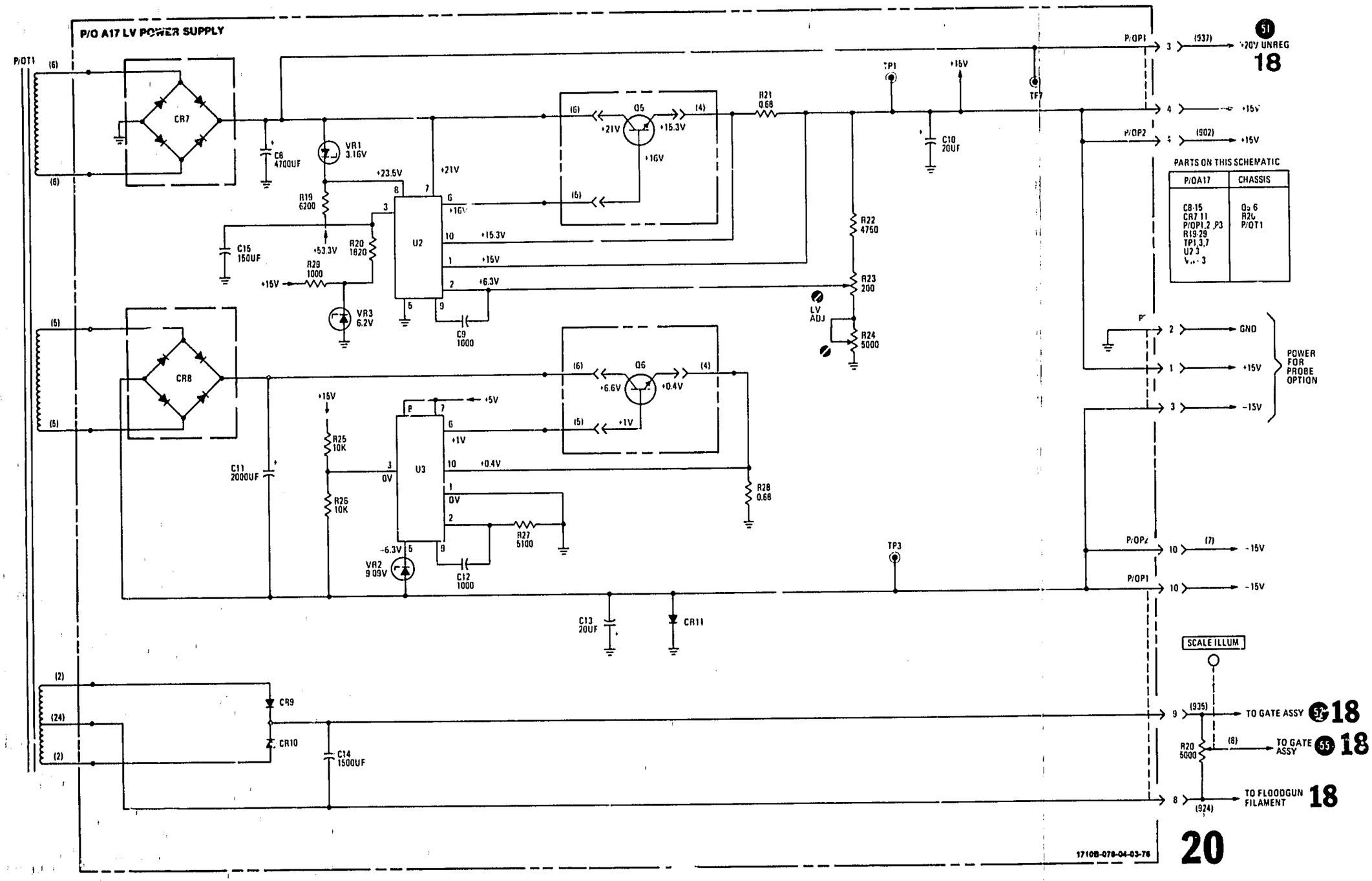


Figure 8-21.
Service Information, Low-voltage Power Supply, Assembly A17 (Sheet 4 of 4)

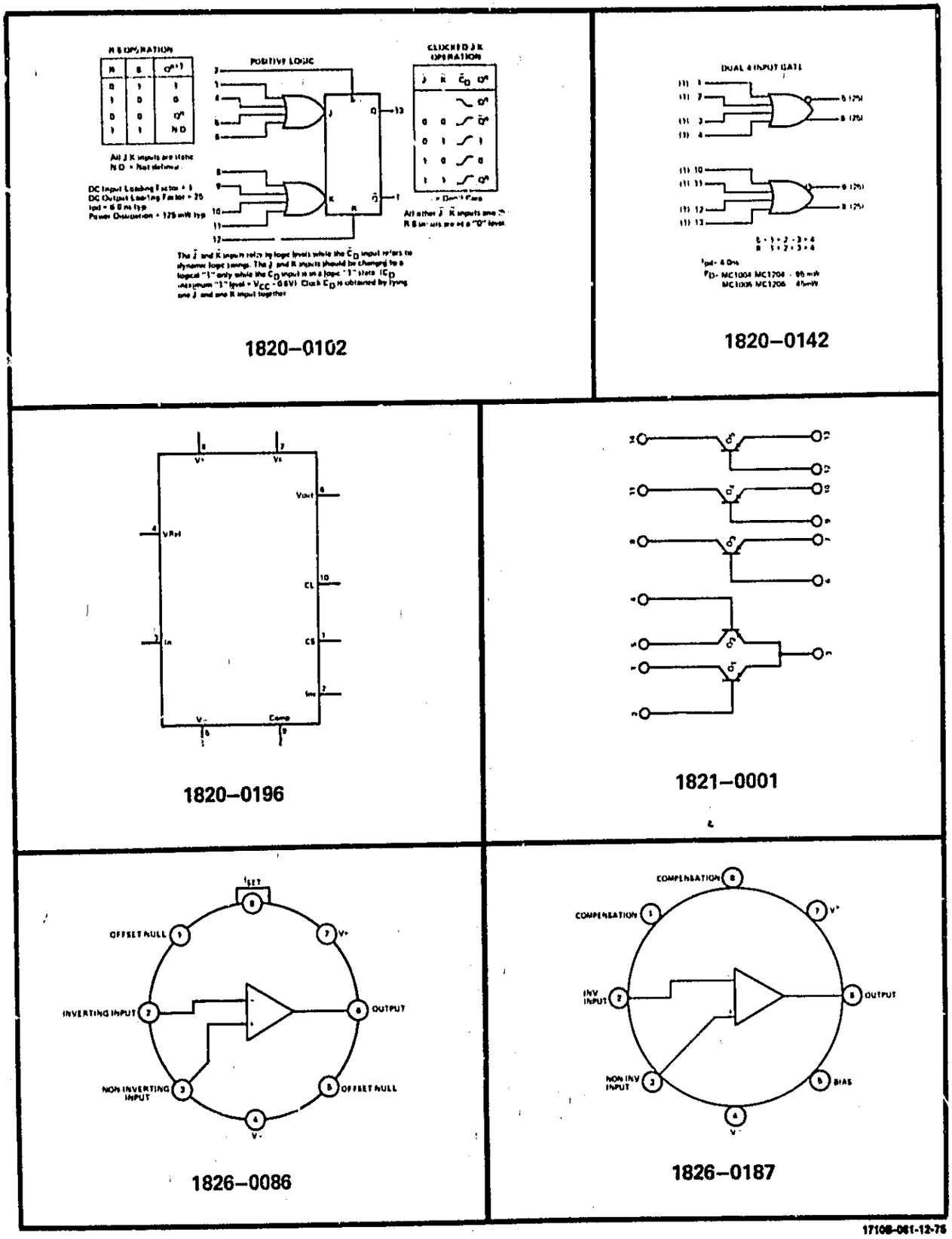
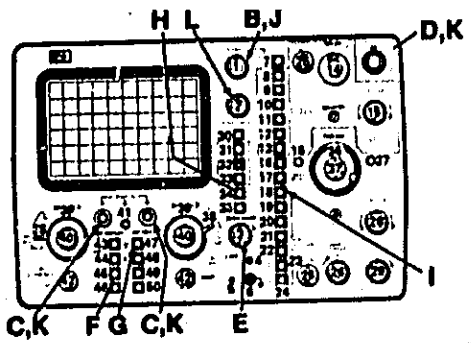


Figure 8-22. Model 1710B I.C. Data

PROCEDURES



TURN-ON PROCEDURE

A. SET REAR PANEL POWER MODE SWITCH FOR DESIRED POWER SOURCE.

B. SET INTENSITY TO MID RANGE.

C. SET POSITION A AND B TO MID RANGE.

D. SET HORIZONTAL POSITION TO MID RANGE.

E. SET LINE SWITCH ON AND ALLOW 6 MINUTE WARMUP.

F. SET VERT DISPLAY TO ALT.

G. SET INT TRIG TO A.

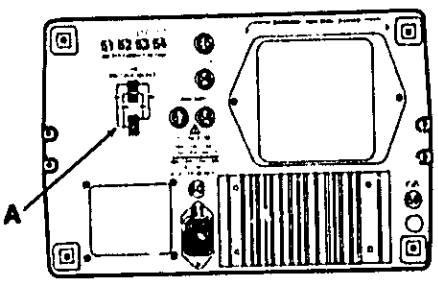
H. SET HORIZ DISPLAY TO MAIN

I. ALL OTHER PUSHBUTTONS DISENGAGED.

J. ADJUST INTENSITY FOR NORMAL BRIGHTNESS.

K. ADJUST VERTICAL AND HORIZONTAL POSITION TO CENTER TRACE.

L. ADJUST FOCUS FOR SHARP TRACE.



CONTROLS AND CONNECTORS

CRT AND GENERAL

1. **INTENSITY.** CONTROLS BRIGHTNESS OF DISPLAY.
2. **FOCUS.** FOCUSES TRACE FOR BEST CRT DISPLAY.
3. **LINE SWITCH AND SCALE ILLUM.** TURNS ON INSTRUMENT AND CONTROLS BRIGHTNESS OF SCALE ILLUMINATION.
4. **LINE LAMP.** LIGHTS WHEN LINE SWITCH IS IN ON POSITION.
5. **CAL 3V.** 1 KHZ SQUARE WAVE AT 3V ±1%
6. ⏚. CHASSIS GROUND CONNECTION FOR EXTERNAL EQUIPMENT.
7. **BEAM FIND.** RETURNS DISPLAY TO VIEWING AREA.

HORIZONTAL

8. **EXT ÷10.** ATTENUATES DELAYED EXTERNAL TRIGGER SIGNAL BY FACTOR OF 10.
9. **INT/EXT.** SELECTS INTERNAL OR EXTERNAL DELAYED SWEEP TRIGGERING
10. **AC/DC.** SELECTS DELAYED SWEEP COUPLING.
11. **LF REJ.** ATTENUATES DELAYED TRIGGER SIGNALS BELOW ≈15 KHZ.
12. **HF REJ.** ATTENUATES DELAYED TRIGGER SIGNALS ABOVE ≈15 KHZ.
13. **DELAYED SLOPE.** SELECTS SLOPE OF DELAYED TRIGGER SIGNAL THAT STARTS SWEEP.
14. **DELAY.** SELECTS DELAY TIME BETWEEN START OF MAIN SWEEP AND START OF DELAYED SWEEP.
15. **DELAYED TRIGGER LEVEL.** SELECTS AMPLITUDE POINT ON DELAYED TRIGGER SIGNAL THAT STARTS DELAYED SWEEP. STARTS DELAYED SWEEP AFTER DELAY POSITION AUTOMATICALLY STARTS DELAYED SWEEP AFTER DELAY TIME.
16. **RESET.** RESETS SWEEP IN SINGLE SWEEP MODE. LIGHT INDICATES WHEN SWEEP IS ARMED.
17. **SINGLE.** SELECTS SINGLE OR NORMAL SWEEP OPERATION.
18. **AUTO/NORM.**
    AUTO. AUTOMATIC SWEEP IN ABSENCE OF TRIGGER SIGNAL.
    NORM. SWEEP TRIGGERED ONLY BY APPLYING TRIGGER SIGNAL.
19. **MAIN SLOPE.** SELECTS SLOPE OF MAIN TRIGGER SIGNAL THAT STARTS SWEEP.
20. **HF REJ.** ATTENUATES MAIN TRIGGER SIGNALS ABOVE ≈15 KHZ.
21. **LF REJ.** ATTENUATES MAIN TRIGGER SIGNALS BELOW ≈15 KHZ
22. **AC/DC.** SELECTS MAIN SWEEP TRIGGER COUPLING.
23. **INT/EXT.** SELECTS INTERNAL OR EXTERNAL MAIN SWEEP TRIGGERING.
24. **EXT ÷10.** ATTENUATES MAIN EXTERNAL TRIGGER SIGNAL BY FACTOR OF 10.
25. **EXT TRIG INPUTS.** BNC CONNECTORS FOR DELAYED AND MAIN EXTERNAL TRIGGER SIGNALS.
26. **SWEEP VERNIER.** PROVIDES CONTROL OF MAIN SWEEP TIME BETWEEN CALIBRATED POSITIONS OF TIME/DIV SWITCH.
27. **UNCAL LIGHT.** INDICATES WHEN SWEEP VERNIER IS OUT OF CAL DETENT POSITION.
28. **MAIN TRIGGER LEVEL.** SELECTS AMPLITUDE POINT ON TRIGGER SIGNAL THAT STARTS MAIN SWEEP.
29. **TRIGGER HOLDOFF.** PROVIDES CONTROL OF TIME BETWEEN SWEEPS FOR TRIGGERING ON COMPLEX DIGITAL WAVEFORMS.
30. **MAG X10.** IN X10 POSITION, SWEEP IS MAGNIFIED 10 TIMES
31. **DLYD.** SELECTS DELAYED SWEEP MODE FOR DISPLAY.
32. **MIXED.** SELECTS MIXED SWEEP MODE FOR DISPLAY.
33. **MAIN INTEN.** INTENSIFIES DELAYED SWEEP PORTION OF DISPLAY.
34. **MAIN.** SELECTS MAIN SWEEP MODE FOR DISPLAY.
35. **X-Y.** DISPLAY MODE FOR PROVIDING X AXIS DEFLECTION WITH SIGNAL APPLIED TO CHANNEL B INPUT.
36. **DELAYED TIME/DIV.** CONTROLS SWEEP TIME IN DLYD SWEEP MODE. CONTROLS INTENSIFIED PORTION OF SWEEP IN MAIN INTEN SWEEP MODE
37. **MAIN TIME/DIV.** CONTROLS SWEEP TIME IN MAIN SWEEP MODE.

VERTICAL

38. **COUPLING.** SELECTS CAPACITIVE (AC), DIRECT (DC), OR 50-OHM COUPLING OF INPUT SIGNAL. GND POSITION DISCONNECTS INPUT SIGNAL AND GROUNDS INPUT TO VERTICAL PREAMPLIFIER.
39. **VOLTS/DIV.** SELECTS VERTICAL DEFLECTION FACTOR FOR CALIBRATED MEASUREMENTS.
40. **VERNIER.** PROVIDES ADJUSTMENT OF VOLTS/DIV BETWEEN CALIBRATED POSITIONS OF VOLTS/DIV CONTROL.
41. **UNCAL LIGHT.** LIGHTS WHEN EITHER CHANNEL A OR CHANNEL B VERNIER IS OUT OF CAL DETENT.
42. **INPUT.** BNC CONNECTORS FOR INPUT SIGNALS.
43. **VERT DISPLAY A.** SELECTS CHANNEL A INPUT SIGNAL FOR DISPLAY.
44. **VERT DISPLAY B.** SELECTS CHANNEL B INPUT SIGNAL FOR DISPLAY.
44.5. **A+B.** ENGAGING BOTH CHANNEL A AND CHANNEL B VERT DISPLAY SWITCHES RESULTS IN A+B (ALGEBRAIC ADDITION) DISPLAY.
45. **ALT.** DISPLAYS EACH CHANNEL ON ALTERNATE SWEEPS.
46. **CHOP.** DISPLAYS EACH CHANNEL BY SWITCHING BETWEEN CHANNELS AT ≈1 MHZ RATE.
47. **INT TRIG A.** SWEEP TRIGGERED ON CHANNEL A INPUT SIGNAL.
48. **INT TRIG B.** SWEEP TRIGGERED ON CHANNEL B INPUT SIGNAL.
48.5. **COMP.** DISPLAYED MODES TRIGGERED BY DISPLAY SIGNALS WHEN BOTH INT TRIG A (47) AND INT TRIG B (48) ARE SIMULTANEOUSLY ENGAGED
49. **BW LIMIT.** LIMITS BANDWIDTH OF VERTICAL AMPLIFIER TO ≈20 MHZ.
50. **B INVERT.** INVERTS POLARITY OF CHANNEL B INPUT SIGNAL.

REAR PANEL

51. **ASTIG.** ADJUSTS SHAPE OF CRT SPOT.
52. **PATT.** ADJUSTS FOR UNIFORM PATTERN OVER CRT VIEWING AREA
53. **TRACE ALIGN.** ALIGNS TRACE WITH HORIZONTAL GRATICULE.
54. **INTEN RATIO.** ADJUSTS INTENSITY OF INTENSIFIED PORTION OF SWEEP IN MAIN INTEN MODE OF OPERATION
55. **Z AXIS.** BNC CONNECTOR FOR Z AXIS INPUT.
56. **VERTICAL OUTPUT.** BNC CONNECTOR FOR VERTICAL AMPLIFIER OUTPUT.
57. **MAIN GATE.** BNC CONNECTOR FOR MAIN GATE OUTPUT TO EXTERNAL EQUIPMENT.
58. **DELAYED GATE.** BNC CONNECTOR FOR DELAYED GATE OUTPUT TO EXTERNAL EQUIPMENT.
59. **PROBE POWER.** PROVIDES POWER TO ACTIVE PROBES IF OPTION #003 IS INSTALLED.
60. **LINE FUSE.** PROVIDES AC INPUT PROTECTION
61. AC INPUT POWER CONNECTOR.

for

MODEL 1710B OSCILLOSCOPE

JULY 1974

MANUAL CHANGES

MANUAL CHANGES

MANUAL IDENTIFICATION

Model Number:	1710B
Date Printed:	MAR 1976
Part Number:	01710-90906

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
1626A	1
1710A	1, 2
1714A	1 thru 3

Serial Prefix or Number	Make Manual Changes

A: NEW ITEM

CHANGE 1

Table 6-2,

MP5: Change HP Part No. and Mfr Part No. to 01720-01211.

MP27: Change HP Part No. and Mfr Part No. to 01720-01212.

MP63: Change HP Part No. and Mfr Part No. to 01720-23707.

Add: MP73, HP Part No. 01720-01210, BRACKET: CABLE, HIGH VOLTAGE, Mfr Code 28480, Mfr Part No. 01720-01210.

W5: Change HP Part No. and Mfr Part No. to 01720-61630.

CHANGE 2

Table 6-2,

Add: A3CR11 and A3CR12, HP Part No. 1901-0179, DIODE, SWITCHING 15V 50MA DO-7, Mfr Code 28480, Mfr Part No. 1901-0179.

Add: A3L13 and A3L14, HP Part No. 9170-0016, CORE, SHIELDING BEAD, Mfr Code 02114, Mfr Part No. 56-590-65A1/38.

Schematic 5,

Add: A3CR11 and A3L13 (BEAD) from pin 9 of A3A1 to ground. Connect anode of A3CR11 to pin 9.

Add: A3CR12 and A3L14 (BEAD) from pin 21 of A3A1 to ground. Connect anode of A3CR12 to pin 21.

NOTE

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

HEWLETT PACKARD

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▲ CHANGE 3

Table 6-2,
A14: Change HP Part No. and Mfr Part No. to 01720-66551 (2 places).
Add: A14Q20 and A14Q21, HP Part No. 1855-0255, TRANSISTOR; FET, Mfr Code 28480, Mfr Part No. 1855-0255.
A14R5: Change to HP Part No. 0684-2211, RESISTOR; FXD 220 OHM 10% .25W CC, Mfr Code 01121, Mfr Part No. CB2211.
Schematic 17,
Modify Z-AXIS circuit according to figure 1 of this manual changes sheet.

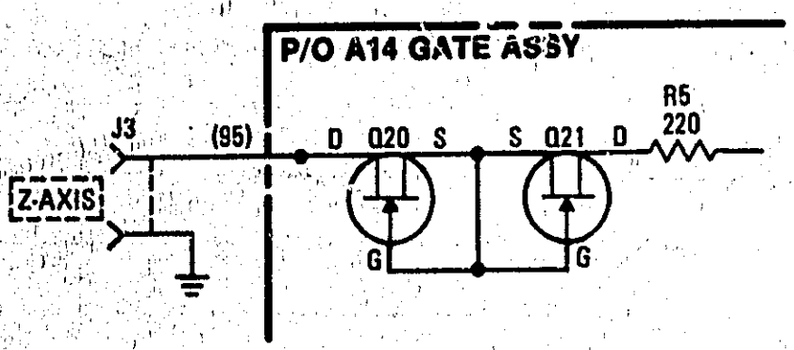

Figure 1. Z-axis Modification for Change 3