Errata

Title & Document Type: **8008A Pulse Generator Operating and Service Manual**

Manual Part Number: **08008-90002**

Revision Date: **October 1972**

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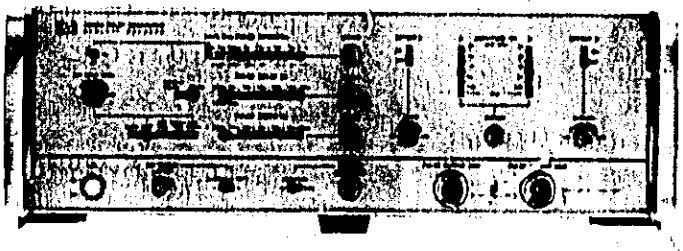
OPERATING AND SERVICE MANUAL

PULSE GENERATOR 8008A



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OPERATING MANUAL
MODEL 8008A
PULSE GENERATOR

Serial Prefix: 1139G

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1–1 INTRODUCTION

1–2 The Hewlett-Packard Model 8008A is a 200 MHz dual channel pulse source with variable repetition rate, pulse width, pulse delay, amplitude and polarity. The standard version delivers pulses with fixed transition times (< 1,2ns), however, with the optional versions of 8008A the transition times can be varied in 250ps steps from 1,2ns to 2,5ns. Flexibility is assured by the five different modes of operation.

1–3 **Normal Mode.** In this mod the 8008 A operates as a self contained pulse source wit\ full control of the pulse parameters by the front pa el controls.

1–4 **Gate Mode.** A gating signe' enables the generator. The first pulse is coincident with the start of the gate signal and the last pulse is of normal width even if the gate signal ends during the pulse.

1–5 **External Trigger.** The pulse and trigger output repetition rates are determined by the frequency of an externally applied signal. The other pulse parameters can be varied by the front panel controls.

1–6 **Width Trigge:.** The pulse repetition rate is determined by the frequency of an externally applied signal. The pulse delay (with respect to trigger input), width, amplitude and offset can be varied by the front panel controls The trigger output frequency can be varied by the rate controls and bears no time relationship to the input or output signals.

1–7 **External Width.** The pulse repetition rate and width are determined by the frequency and width of an externally applied signal. The delay between input and output is fixed. The trigger output frequency can be varied by the rate controls and bears no time relationship to the input or output signals.

TABLE 1–1. SPECIFICATIONS

PULSE CHARACTERISTICS
(50Ω source and load impedance)

Rise and Fall Times: ≤ 1,2ns (10%–90%) fixed
≤ 0,9ns (20%–80%) fixed

Overshoot and Ringing: ≤ ± 5% of pulse amplitude may increase to ≤ 10% with amplitude vernier ccw.

Preshoot: ≤ 5% of pulse amplitude

Pulse Width: < 2,5ns to 60ms in six ranges. Vernier provides continuous adjustment within ranges.

Width Jitter: <0,1% + 50ps on any width setting.

Maximum Duty Cycle: > 50% (in NORM mode)

Pulse Delay: 2,5ns (+30ns fixed) to 60ms (withrespect to trigger output) in six ranges. Vernier provides continuous adjustment within ranges.

Delay Jitter: < 0,1% + 50ps on any delay setting

Maximum Variable Delay: ≥ 50% of pulse period

Pulse Output: Normal and complement available simultaneously. Output polarity selectable.

ECL Compatible Output: Fixed voltage swing from both outputs (–0,9V to –1,7V). Internal adjustment to other values possible.

Maximum Output: Normal and complementary; 4V into 50Ω (8V across open circuit).

TABLE 1–1. SPECIFICATIONS (cont'd)

Source Impedance: 50Ω ± 5% shunted by typically 10pF.

Output Protection: cannot be damaged by short circuit or application of external voltage ≤ ± 8V (at 25°C) independent of control settings.

Attenuator: Two separate four-step attenuators reduce the outputs to 0.5V. Vernier provides continuous adjustment between steps to < 250mV. Vernier is common to both output channels.

DC Offset: ±2V across 50Ω, independent of amplitude attenuator and vernier settings. Can be switched off

REPETITION RATE AND TRIGGER

Repetition Rate: 10 Hz to 200 MHz in six ranges. Vernier provides continuous adjustment within ranges.

Double Pulse: 100 MHz max. (simulates 200 MHz).

Period Jitter: < 0.1% + 50ps on any period setting.

Trigger Output: Amplitude: 1V or 200mV (switchable) into 50Ω load.

Width: Typically, 3ns at 200MHz increasing to > 0.5ms at 10 Hz.

EXTERNALLY CONTROLLED OPERATION

External Input

Input Impedance: 50Ω (typically).

Coupling: dc coupled.

Maximum Input: ± 5V.

Trigger Level: Continuously adjustable +1V to –1V.

External Triggering

Repetition Rate: 0 to 200 MHz.

Delay: Approximately 15ns between trigger input and trigger output.

Manual: Front panel push-button for single pulse.

Width Trigger: External drive input switched to delaygenerator. Pulse width determined by width setting. Trigger output available from rate generator.

External Width: Output pulse width determined by width of drive input. Trigger output available from rate generator.

Synchronous Gating: Gating signal turns generator 'ON'. First pulse is delayed (by fixed and variable delay) with respect to leading edge of gate, last pulse is of normal width even if gate ends during the pulse. Repetition rate, width amplitude and polarity determined by control settings.

GENERAL

Operating Temperature Range: 0°C (32°F) to 55°C (131°F).

Power Requirements: 115V or 230V, +10%, –15%, 48 -- 440 Hz.

Power Consumption: 100VA max.

Weight: Net; 8 kg (17.6 lbs)
Shipping; 9 kg (19.8 lbs)

Dimensions: 425mm wide, 140mm high, 336 mm deep (16 3/4 ins. x 5 1/2 ins. x 13 1/4 ins.).

2–1 GENERAL

2–2 Initial Inspection

2–3 Inspect the instrument and accessories for physical damage and if damage is evident refer to paragraph 2–14 for the recommended claim procedure and repacking information.

2–4 The 8008A is delivered complete with the following items:

ITEM	HP STOCK NUMBER
Power Cord	8120–1689
0.5A Fuse for 230V	2110–0202
or 1A Fuse for 115V	2110–0007

2–5 Temperature Requirements

2–6 The Model 8008A operates within specifications when the ambient temperature is between 0°C (32°F) and 55°C (131°F). The pulse generator may be stored between –40°C (–40°F) and 75°C (167°F).

2–7 INSTALLATION

2–8 Power Cable

2–9 The 3-wire power cable supplied with the 8008A, when connected to the appropriate power outlet, grounds the instrument cabinet and panels. To preserve this safety feature when operating the instrument from an outlet without a ground connection use an appropriate adapter and connect the ground lead (green/yellow) to an external ground.

2–10 If the plug on the cable does not fit your power outlet then cut the cable at the plug end and connect a suitable plug. The plug should meet local safety requirements and include the following features:

a. Minimum current rating of 2A
b. Ground connection
c. Cable clamp

The colour coding used in the cable is:

brown – line
blue – neutral
green/yellow – ground

2–11 Power Source Requirements

2–12 The Model 8008A may be operated from an ac line supply of either 115V or 230V (+10%, –15%) at 48 Hz to 440 Hz. The power dissipation is 84VA, typ. (100VA max).

> CAUTION
>
> Before applying power to the instrument, check on the rear panel that the 8008A is set in accordance with local supply conditions.

2–13 To check the power requirements proceed as follows:

a. Remove the fuse and check its value:
for 230V operation 0.5A
for 115V operation 1.0A.

b. Check that the line selector switch position corresponds to the local supply voltage. If it does not correspond use a screwdriver to change the switch position.

c. Insert the correct fuse into the fuse-holder.

d. Connect the power cable to the rear connector.

2–14 CLAIMS AND REPACKAGING

2–15 Claims for Damage

2–16 If physical damage is evident or if the instrument does not meet specifications when received, notify the carrier and the nearest Hewlett-Packard Sales/Service Office. The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

2–17 Repackaging for Shipment or Storage

2–18 If the instrument is to be shipped to a Hewlett-Packard Sales/Service Office, attach a tag showing owner, address, model and serial number and the repair required. The original shipping carton and packing material may be re-usable but the Hewlett-Packard Sales/Service Office will also provide information and recommendations on materials to be used if the original packing is not available or re-usable.

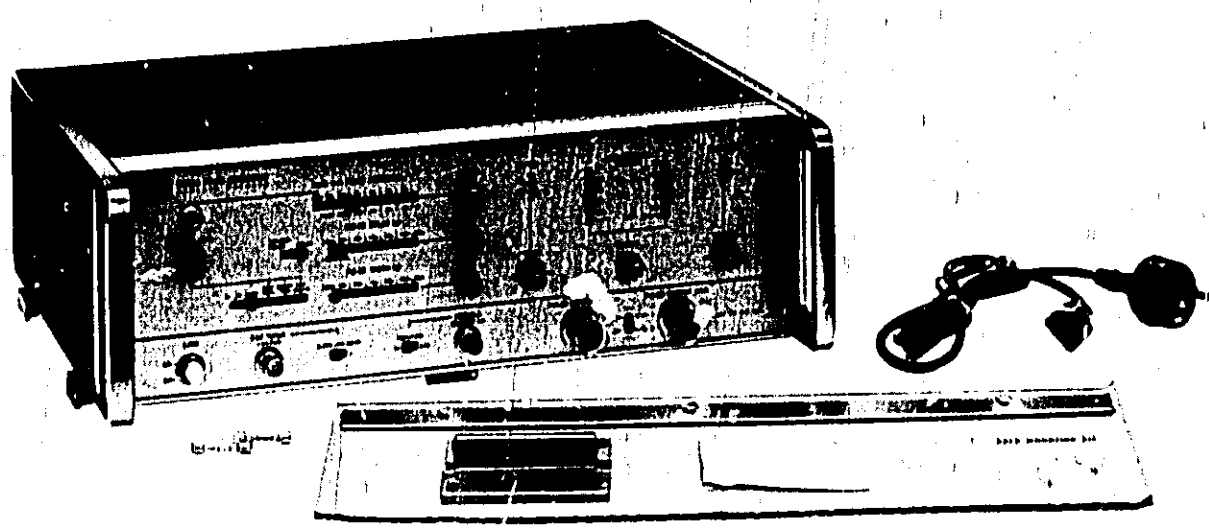
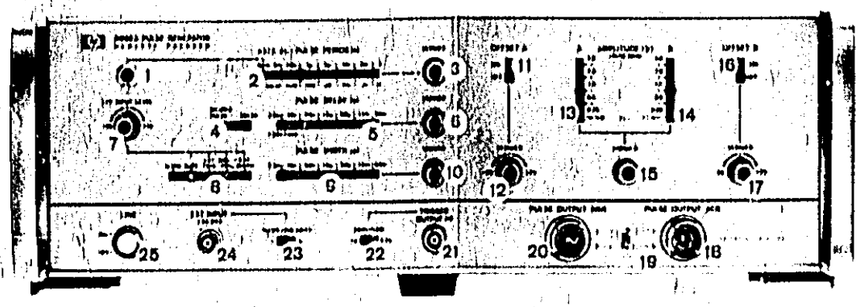


Figure 2–1. 8008A and Supplied Accessories

OPERATION

THEORY



1. Push button to generte a single pulse (or two in the double pulse model when the RATE switch is in the MAN position.
2. RATE switch: for selecting the range of pulse rate.
3. Rate VERNIER: for continuous adjustment of the repetition rate between the limits of the range selected on the RATE switch. Clockwise rotation increases the pulse period (i. e. reduces the rate). In the WIDTH TRIG and EXT WIDTH modes the RATE controls define the frequency of trigger output pulses only.
4. DOUBLE PULSE-DELAY switch: In the DOUBLE PULSE position the 8008A delivers two pulses for every trigger output – one pulse in phase with the trigger output and one delayed by the amount set on the PULSE DELAY controls. Double pulse is not available in the WIDTH TRIG and EXT WIDTH modes and is automatically inhibited if selected.
5. PULSE DELAY switch: for selecting the range of pulse delay with respect to a) trigger output in NORM, GATE and EXT TRIG modes and b) trigger input in WIDTH TRIG mode. Has no effect in the EXT WIDTH mode.
6. PULSE delay VERNIER: for continuous adjustment of pulse delay between the limits of the range selected on the PULSE DELAY switch. Clockwise rotation increases the delay.
7. EXT INPUT LEVEL control: defines the threshold level of the EXTERNAL INPUT over a range –1V to +1V.
8. Mode switch: selects either the internal (NORM) mode or one of four external modes (GATE, EXT TRIG, WIDTH TRIG or EXT WIDTH).
9. PULSE WIDTH switch: for selecting the range of pulse width required in all modes except EXT WIDTH.
10. Pulse width VERNIER: for continuous adjustment of pulse width between the limits of the range set on the PULSE WIDTH switch.
11. OFFSET A switch: for enabling/disabling the offset VERNIER which permits the baseline of PULSE OUTPUT A to be adjusted. In the off position, the baseline of output A is zero volts.
12. Offset VERNIER: for adjustment of the baseline of PULSE OUTPUT A over the range –2V to +2V.
13. Output AMPLITUDE switch: for selecting the range of pulse amplitude available at PULSE OUTPUT A. In the ECL position, PULSE OUTPUT A delivers pulses of fixed amplitude (–0,9V to –1,7V); the amplitude vernier and both A and B offset controls are disabled.
14. Output AMPLITUDE switch: for selecting the range of pulse amplitude available at PULSE OUTPUT B. In the ECL position PULSE OUTPUT B delivers pulses of fixed amplitude (–0,9V to –1,7V) and the amplitude vernier and both A and B offset controls are disabled.
15. Amplitude VERNIER. for continuous adjustment of pulse amplitude from both pulse outputs simultaneously between the limits of the ranges set on the AMPLITUDE switches.
16. OFFSET B switch: for enabling/disabling the offset VERNIER which permits the baseline of PULSE OUTPUT B to be adjusted. In the off position, the baseline of output B is zero volts.
17. Offset VERNIER: for adjustment of the baseline of PULSE OUTPUT B over the range –2V to +2V.
18. PULSE OUTPUT B: GR connector.
19. POS-NEG switch: for selecting the pulse polarity with a consequent transposition of the Normal/Complement relationship of output A to output B.
20. PULSE OUTPUT A: GR connector.
21. TRIGGER OUTPUT connector: BNC connector supplies positive trigger pulses.
22. Trigger output AMPLITUDE switch: for selecting trigger pulse amplitudes of either 1V or 200mV.
23. SLOPE/POLARITY switch: selects the slope (rising or falling) of the input signal which will cause triggering/gating.
24. EXT INPUT connector: BNC connector to which trigger pulses are applied in the GATE, EXT TRIG, WIDTH TRIG and EXT WIDTH modes.
25. LINE ON-OFF switch: press-for-on-press-for-off switch. Glows red when on.

Figure 3–1. Front Panel Controls and Connectors

3–1 GENERAL

3–2 Figure 3–1 identifies and gives a brief description of the function of each front panel control and connector.

3–3 To achieve the specified amplitudes and rise times and minimise reflection it is most important that all outputs be terminated with exactly 50Ω. Even at low repetition rates the pulses contain harmonics in the UHF range.

3–4 MODES OF OPERATION

3–5 There are five modes in which the 8008A is capable of operating, four of which require the application of an external signal.

3–6 Normal Mode

3–7 In this mode the 8008A requires no external signal to produce an output. Rate, width, delay, amplitude and offset are all adjustable by the front panel controls.

3–8 Gate Mode

3–9 The repetition rate is defined by the rate controls but no output occurs until the voltage of an externally applied signal rises above (SLOPE/POLARITY switch to +) or falls below (SLOPE/POLARITY switch to –) the level set on the EXT INPUT LEVEL control. The last pulse of a 'burst' is always of correct width even if the gate ends during the pulse.

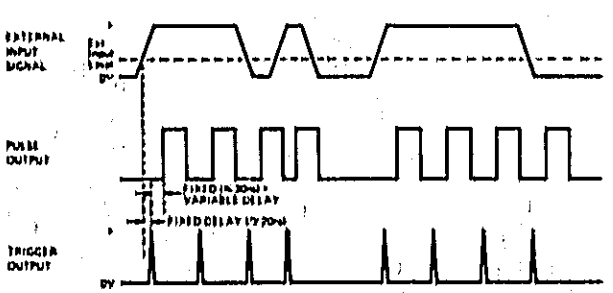


Figure 3–2. Gate Mode Example

3–10 Gate and Manual. If GATE and MAN (Rate switch) are selected together then the external signal has no effect and pulses are generated only on manual command.

3–11 External Trigger

3–12 The pulse repetition rate and trigger output frequency are determined by the frequency of an externally applied signal. Trigger pulses must be ≥ 2,5ns wide at the level at which triggering is to occur.

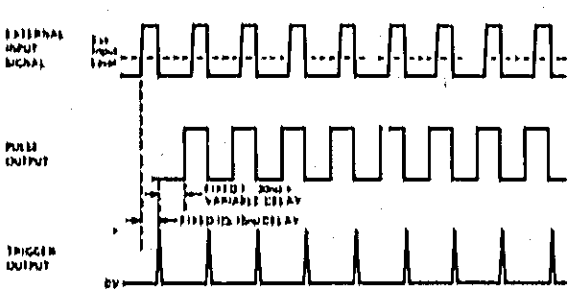


Figure 3–3. External Trigger Example

3–13 External trigger and manual. If EXT TRIG and MAN (Rate switch) are selected together, the external signal has no effect and pulses are generated on manual command.

3–14 Width Trigger Mode

3–15 The pulse repetition rate is determined by the frequency of an externally applied signal. The frequency of the trigger output can be varied by the rate controls and is independent of the pulse output (unless it is used to derive the external signal). Alternatively, the trigger output can be switched off by selecting MAN on the RATE switch.

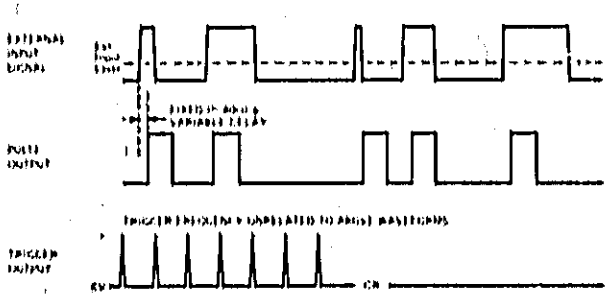


Figure 3–4. Width Trigger Example

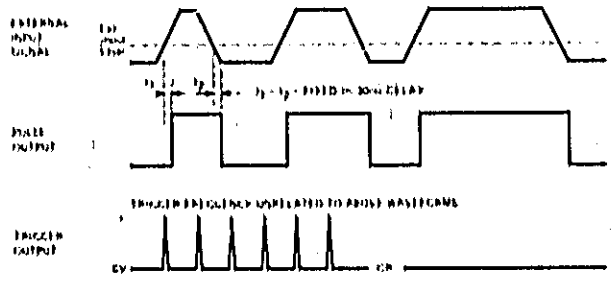


Figure 3–5. External Width Example

3–16 **Width Trigger and Double Pulse.** The double pulse facility is not available in conjunction with Width Trigger and is automatically inhibited if selected.

3–17 External Width Mode

3–18 The pulse repetition rate and width are determined by the frequency and width (at the external input level) of an externally applied signal. As in the Width Trigger mode the frequency of the trigger output can be independently varied by the rate controls or switched off.

3–19 **External Width and Double Pulse.** The double pulse facility is not available in conjunction with External Trigger and is automatically inhibited if selected.

3–20 EXTERNAL INPUT CHARACTERISTICS

3–21 The EXT. INPUT LEVEL control and the SLOPE/POLARITY switch define the point on the input signal which will cause triggering (or gating). Figure 3–6 illustrates the effects of the these controls in the external width mode.

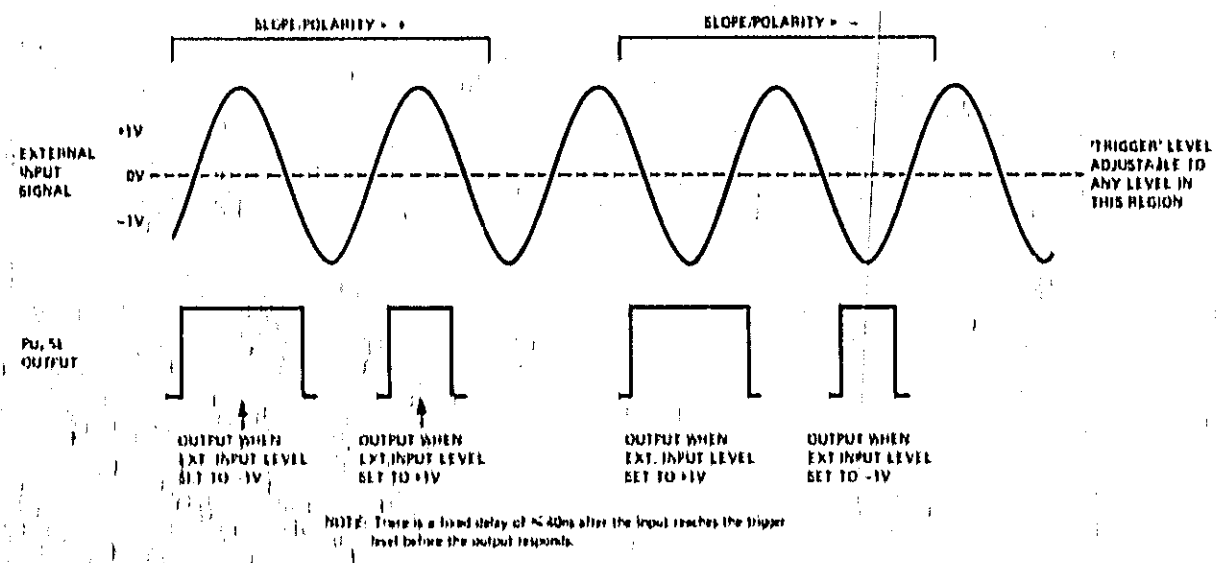


Figure 3–6. Effect of External Input Controls

3–22 OUTPUT AMPLITUDE CONTROLS

3–23 Verniers

3–24 Because the amplitude vernier is common to both outputs the amplitude relationship of one output to the other is either 1:1, 1:2, 1:4 or 1:8 (i. e. the amplitude range switches follow a 1, 2, 4, 8 sequence).

3–25 ECL Outputs

3–26 To obtain normal and complement ECL compatible pulses from outputs A and B respectively both amplitude switches must be set to the ECL position. If only one is in the ECL position only the output which corresponds to that switch will deliver an ECL amplitude output, however, both outputs have the correct offset. If pulse levels other than −0,9/−1,7V are required the

amplitude may be adjusted by R47 on A6 (between 0V and –1.6V) and the baseline by R49 on A6 (between 0V and –2V).

3–27 Driving ECL Devices

3–28 The technique to use when driving ECL ICs with the 8008A differs depending on the IC input configuration. The following diagrams illustrate these techniques for most common input configurations.

3–29 **Example 1.** One ECL device feeds another in close proximity to it. How should a signal from 8008A be injected into the second device ?

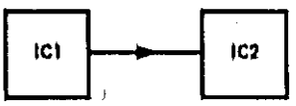


Figure 3–7 Example 1

Solution: Unplug IC1, set the AMPLITUDE switches of 8008A to ECL and connect the output of 8008A to IC2 as shown in figure 3–8.

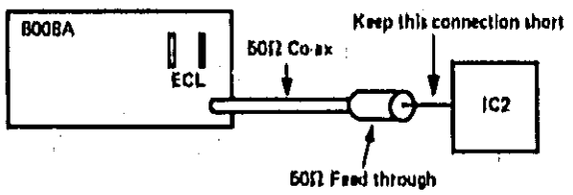


Figure 3–8, First Solution to Example 1

This configuration is valid when up to 5 ECL devices are fed from the feedthrough. With more than 5, the shunting effect of the IC input resistance (≃ 2kΩ) becomes significant and the configuration of figure 3–9 should be applied. A parallel resistor (R) > 50Ω should be used (instead of the 50Ω feedthrough) to bring the total load to 50Ω.

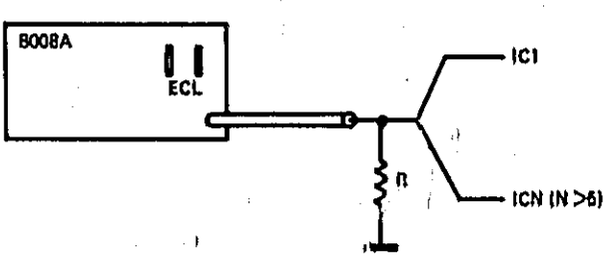


Figure 3–9, Second Solution to Example 1

3–30 **Example 2.** One ECL device feeds another some distance from it. A co-axial transmission must be used when the distance exceeds a few inches. A common arrangement when the ICs are on different assemblies is shown in figure 3–10.

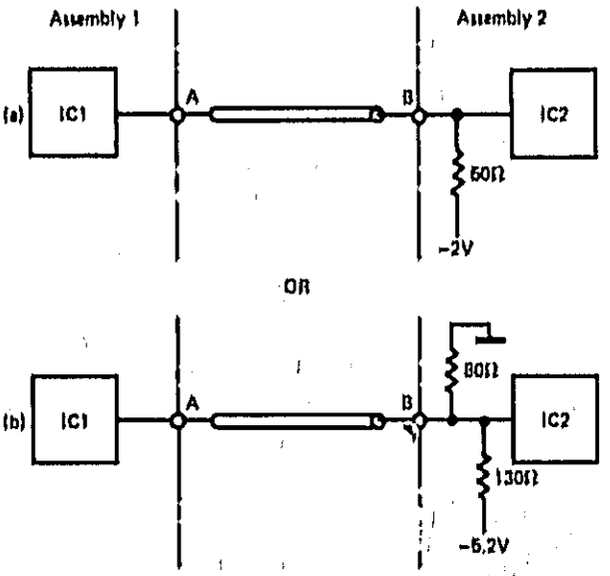


Figure 3–10, Example 2

These alternatives are identical from the point of view of the transmission line, they merely meet the requirements of different supply voltages.

Solution: It is probably impractical to remove the input resistors to apply the previous solution. Therefore, we have to cope with the problem of a line which, although correctly terminated (50Ω), has a dc bias introduced. The answer is to adjust the pulse baseline to compensate for the bias (the pulse amplitude remains the same). Analysis of an equivalent circuit of one of the examples is necessary to determine the new dc baseline level.

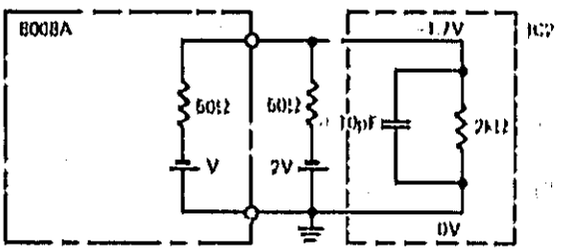


Figure 3–11, Equivalent circuit of fig. 3–10(a)

The equivalent circuit represents the example of figure 3–10(a) in the 'low' state (thus identifying the polarity of V and magnitude of voltage across the 'chip' input R, –1.7V). Solution of the simultaneous equations derived from this circuit gives V as 1.4V, corresponding to an offset of –0.7V when set-up across a 50Ω load.

3–31 To set-up the correct levels, before applying the 8008A output to IC2, monitor the output from

8008A on a sampling oscilloscope (50Ω input Z). Adjust the amplitude and offset controls to produce a 0.8V amplitude pulse with a −0.7V baseline. Having done this, unplug IC1 and connect the 8008A to A with co-axial cable.

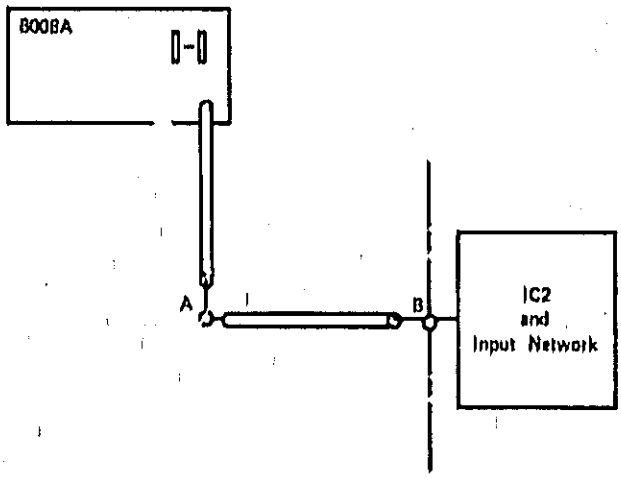


Figure 3–12. Solution of Example 2

3–32 **Example 3:** Another way in which an ECL transmission line may be arranged between two assemblies is to use a series load. This means that pulses generated by IC1 will be reflected at B and travel back to A where they will be absorbed because this end of the line is properly terminated. The effect is for the pulse amplitude at B to be twice that of A.

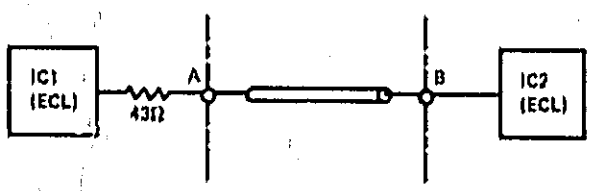


Figure 3–13. Example 3

Solution. If it is feasible to detach the connection at B, the 8008A signal can be applied to IC2 as in the first example. Alternatively, unplug IC1, set the 8008A to the ECL mode and connect to A via co-ax and a 6dB attenuator (i.e., we apply a half-amplitude pulse in order to counter the amplitude-doubling effect when the pulse is reflected).

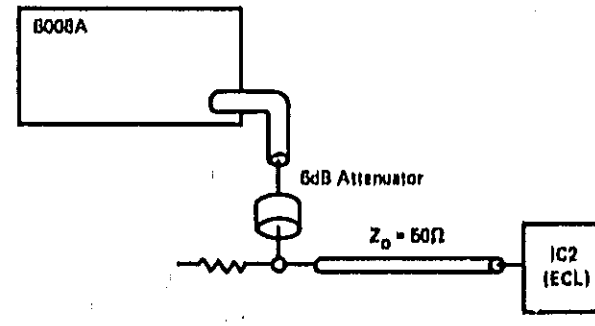


Figure 3–14 Solution of Example 3

3–33 RATE, WIDTH and DELAY CONTROLS

3–34 The layout of these controls helps avoid incompatible settings.

3–35 Generally, the Rate control should be the furthest right, however, if they are all in a straight vertical line that too is alright but the positions of the verniers are then critical.

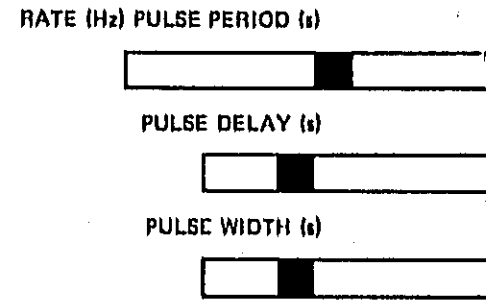


Figure 3–15. Positioning of Controls

4–1 GENERAL

4–2 The basic operating principle of the 8008A is illustrated in Figure 4–1.

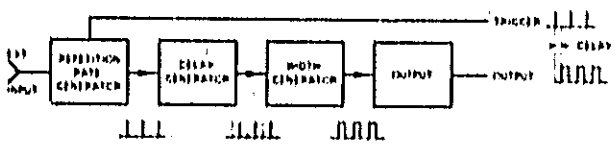


Figure 4–1. Basic Principle

4–3 The pulse repetition rate is generated either internally or by an external source. The repetition rate generator provides a trigger output and a stimulus for the delay generator which can delay the pulses at its input by greater than half their period. For each pulse from the delay generator, the width generator produces a pulse of defined width. The final operation involves power amplification and attenuating to achieve the desired amplitude and correct output impedance. Refinements to this basic system enable direct triggering of the width generator and double pulse generation.

4–4 Each block of Figure 4–1 is dealt with in greater detail in the following descriptions. Signal flow is indicated on the circuit diagrams.

4–5 REPETITION RATE GENERATOR

4–6 The function of this unit is to provide pulses to either the delay generator or width circuit (Ext. Width mode) and produce a trigger output.

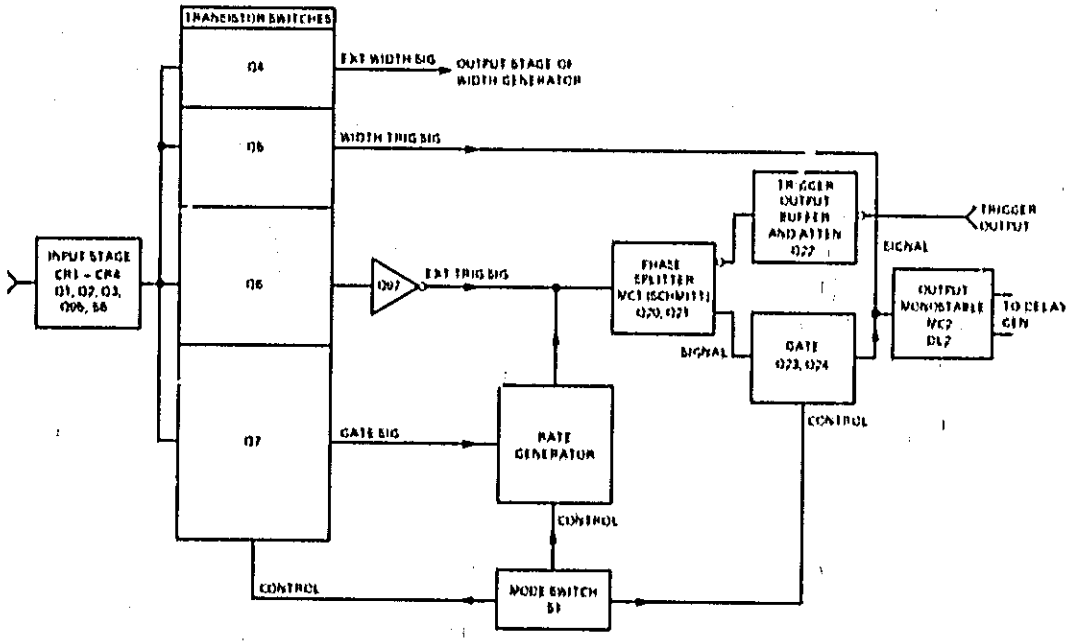


Figure 4–2. Repetition Rate Generator

4–7 Input Stage

4–8 A bridge circuit limits signal amplitude to ±2V maximum. A level control and slope / polarity switch determine which part of the signal will cause an output from this stage. If MAN and either GATE or EXT TRIG mode are selected together, the input stage is disabled.

4–9 Transistor Switches

4–10 Four transistors which in the external modes (EXT WIDTH, WIDTH TRIG, EXT TRIG and GATE) direct the signal from the input stage. In the NORM mode, all are disabled thereby blocking any signal from the input stage.

4–11 Rate Generator

4–12 The rate generator produces positive pulses at a rate determined either manually or by the oscillating frequency of a multivibrator. Under control of the Mode switch, the rate generator can 'free run' in the NORM, WIDTH TRIG and EXT WIDTH modes. In the GATE mode it is permitted to 'free run' only under control of the signal from Q7. It is disabled in the EXT TRIG mode.

4–13 Operation. The rate generator (See Circuit Diagram 1) comprises a Schmitt trigger (Q11, Q12 and Q13), which switches when the voltage output of a ramp generator (Q15 and one or more of capacitors C95, C21, C22, C34, C35, C36 and C37) reaches the threshold level defined by a voltage source (Q87 and Q88). When switched, it activates a switch (Q14) which rapidly discharges the ramp capacitor(s), causing the voltage to fall and reset the Schmitt. This turns the switch off and the cycle repeats. A positive pulse occurs at the junction of R301 and R76 and lasts for the duration for which Q14 conducts.

4–14 Provided that the Rate switch is not in the MAN position, the rate generator operates as described in the NORM, WIDTH TRIG and EXT WIDTH modes. In the EXT TRIG and GATE modes the generator is 'held off' because Q10 conducts (caused by Q9 cut off), however, in the GATE mode, Q10 can be cut off by the external signal and the generator enabled for the duration of this signal.

4–15 Manual. The Rate switch in the MAN position automatically prevents the generator from 'free running' and a positive pulse (at CR9 cathode) occurs only when the MAN push-button is pressed.

4–16 Phase Splitter

4–17 For each pulse in, the phase splitter produces a negative pulse, from which the trigger output is derived, and a positive pulse which is applied to the Gate.

4–18 Trigger Output Buffer and Attenuator

4–19 Negative pulses from the phase splitter are inverted and may be attenuated to provide positive trigger pulse of either 1V or 200mV amplitude.

4–20 Gate

4–21 Positive pulses from the phase splitter are either blocked (EXT WIDTH and WIDTH TRIG modes) or inverted (NORM and EXT TRIG modes). Thus, in the EXT WIDTH and WIDTH TRIG modes, the rate generator can be used to control the trigger output frequency whilst not interferring with the operation of these modes.

4–22 Output Monostable

4–23 A Schmitt trigger, connected as a monostable, which produces anti-phase outputs to drive the Delay Generator.

4–24 DELAY GENERATOR

4–25 The delay generator is capable of operating in two different modes. The mode selected depends on the length of the delay required, either short (2.5ns to 10ns) or long (10ns to 50ms). Operation is described first for the case when short delay is selected and then for long delay. Functions common to both modes are covered in the description in the short delay mode.

4–26 Short Delay

4–27 INPUT STAGE AND DOUBLE PULSE SWITCHING

4–28 Anti-phase pulses from the repetition rate generator drive a differential amplifier. If DOUBLE PULSE is selected two outputs occur, one to the 2.5ns to 10ns delay stage and one to the Output Stage. If DELAY is selected (or a mode in which double pulse is inhibited i.e. EXT WIDTH or WIDTH TRIG) only the output to the delay stage occurs.

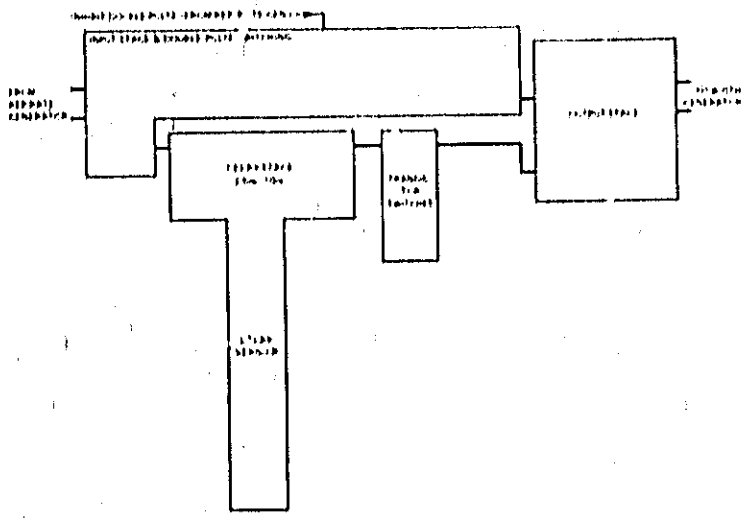


Figure 4–3. Delay Generator – 2.5ns to 10ns

4–29 2.5ns TO 10ns DELAY STAGE

4–30 For each input pulse, this stage produces a positive pulse which starts at the same time as the input pulses and finishes 2.5ns to 10ns later. The duration is dependent on the settings of the delay vernier.

4–31 Operation. A current pulse from the input stage, a) causes CR16 to switch very rapidly and b) charges C40 so that Q30 conducts (Q31 cuts off). Q30 conducting a) causes CR16 to switch back and b) prevents further pulses from triggering the delay stage. C40 discharges linearly through Q34, the delay vernier and Q64 until Q30 cuts off (causing Q31 to conduct). The rate at which C40 discharges, and consequently the duration of the pulse output, is determined by the setting of the delay vernier. Input sensitivity is set by R126.

4–32 TRANSISTOR SWITCHES

4–33 Q36 and Q37, under control of the delay switch, determine the path of the signal from the short delay stage. When 2.5ns to 10ns delay is selected, the input is directed to the output stage via Q36. When delays greater than 10ns are selected the input is directed to the 10ns to 60ms delay stage (see Figure 4–4.).

4–34 OUTPUT STAGE

4–35 Produces two anti-phase outputs for each input (negative edge) from either the input stage or the delay stage. The sensitivity of both inputs is adjustable (R168, R176). The outputs, derived from a short duration monostable, drive the Width Generator.

4–36 Long Delay

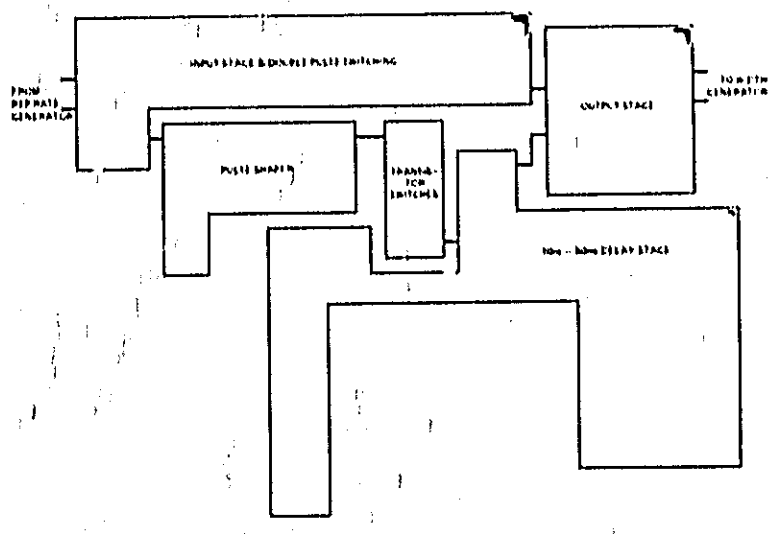


Figure 4–4. Delay Generator – 10ns to 60ms

4–37 PULSE SHAPER

4–38 This is the 2,5ns to 10ns delay stage using a fixed constant current source (Q32) into which C40 discharges. The output pulses have a fixed width.

4–39 10ns TO 50ms DELAY STAGE

4–40 This stage produces a positive pulse whose leading edge is coincident with the input pulse and whose trailing edge occurs 10ns to 50ms later.

4–41 **Operation.** The delay stage comprises a Schmitt trigger (Q38, Q39 and Q45) which controls a switch (Q40) which in turn controls a ramp generator (delay vernier, Q51, Q55 and one or more of C95, C57, C58, C59, C60 and C61). Before an input pulse arrives, Q38 is off, Q39 is conducting and consequently Q40 is conducting and maintaining the output of the ramp generator at a constant potential (–2,6V approx.). When an input pulse arrives, the Schmitt is triggered causing Q40 to cut off. The output from the ramp generator rises linearly until the threshold level of the Schmitt is reached causing it to be reset, Q40 conducts and discharges the ramp capacitor(s). The circuit remains in this (the original) state until the next input pulse.

4–42 WIDTH GENERATOR

4–43 The sections which define the pulse width are identical to those which define pulse delay. Figure 4–5 and 4–6 illustrate the arrangements for pulse width of 2,5ns to 10ns and 10ns to 50ms respectively. The only difference between the delay and width generators is that the output stage comprises two differential amplifiers and a common base stage. In EXT WIDTH the first differential stage Q79/Q80 drives the second differential stage Q93/Q78 via the common base stage Q89. In all other modes, only amplifier Q93/Q78 is driven.

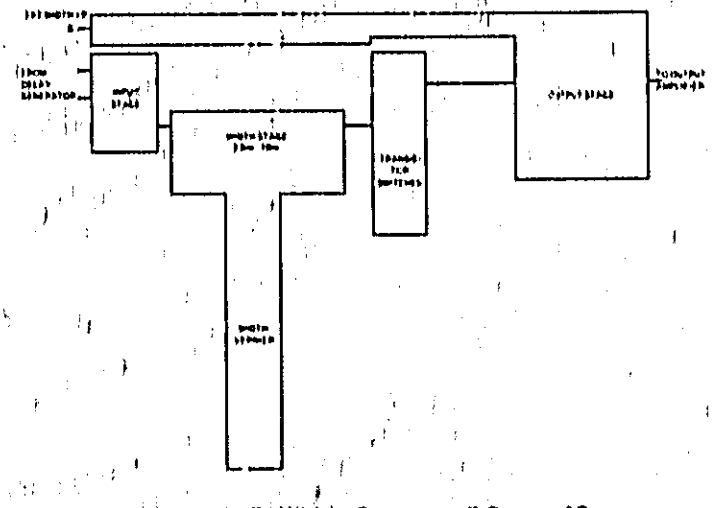


Figure 4–5. Width Generator 2,5ns to 10ns

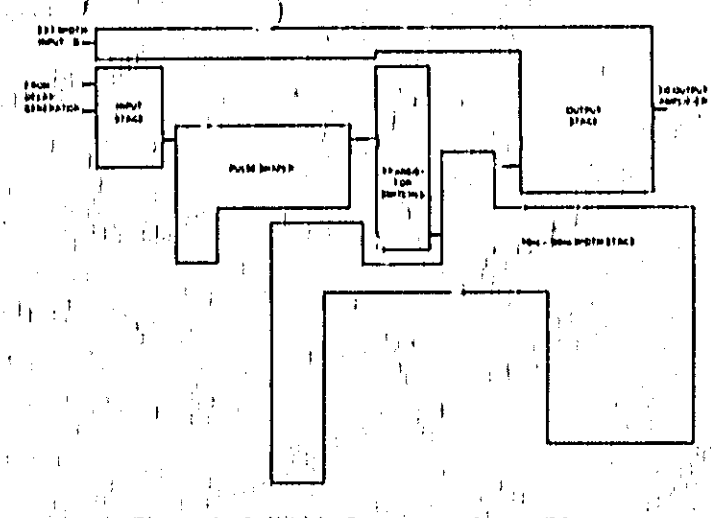


Figure 4–6. Width Generator 10ns to 50ms

4–44 OUTPUT AMPLIFIER

4–45 The output amplifier comprises a Schmitt trigger (MC1) and a 4 stage cascaded differential amplifier to produce the complementary outputs The amplifiers are powered from separate voltage and current sources and it is by controlling these that amplitude and polarity are controlled.

4–46 Figure 4–7 shows the output amplifier arrangement for both the positive and negative polarity modes. Apart from the additional current sources, the negative polarity arrangement differs from the positive polarity arrangement in that the potentials of the voltage sources (VS1, 2, 3) have been offset in a negative direction It is this difference which causes the NORM/COMP reversal when the polarity is changed. This can be readily appreciated by considering figure 4–8.

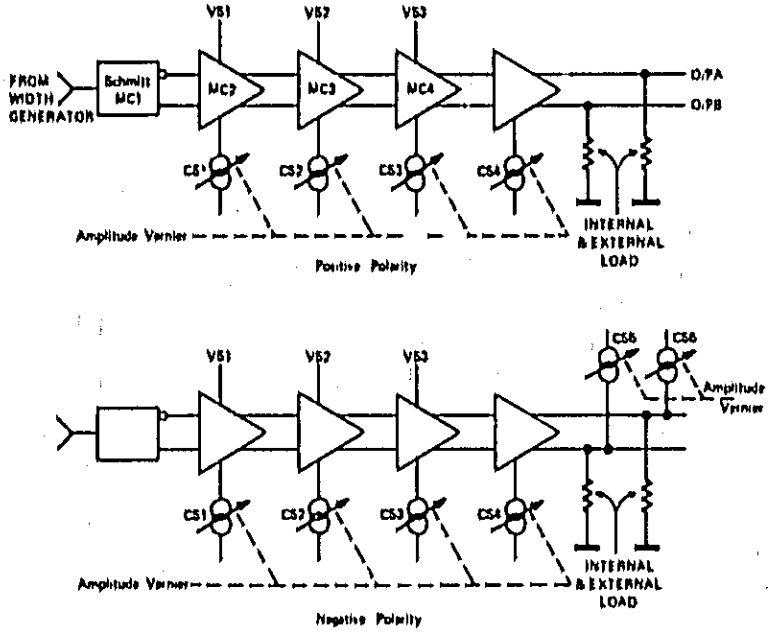


Figure 4–7, Output Amplifier – Positive and Negative Polarity

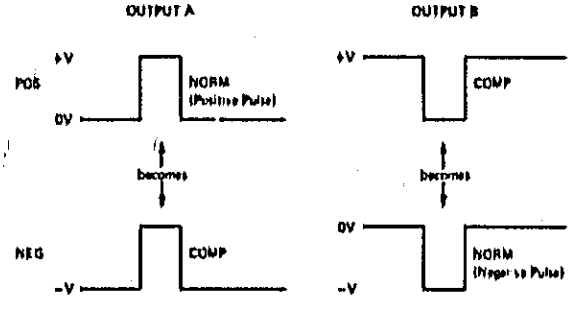


Figure 4–8, Effect of Polarity Reversal by Offsetting Supplies

4–47 The additional current sources (CS5 and CS6) draw current from the grounded loads to produce negative signals (as opposed to positive output amplifiers supplying grounded loads which results in positive signals). Also, the overall shifting of the supply potentials means that the operating point of the amplifier remains unchanged.

4–48 AMPLIFIER SUPPLIES

4–49 Voltage Sources

4–50 Voltage sources VS1, VS2 and VS3 are simple voltage followers whose output potentials are dependent on the state of POLARITY CONTROL 1. When POS is

selected, POLARITY CONTROL 1 is open circuit and the outputs of the voltage sources are: VS1, ≃ +4.6V ; VS2; ≃ +0V; VS3, ≃ +11.43V. When NEG is selected, the outputs fall to the following levels: VS1, ≃ +2V;VS2, ≃ +5V; VS3, ≃ 7.25V. When ECL is selected,POLARITY CONTROL 1 is at 0V (the same as NEG).

4–51 Current Sources

4–52 CS1, CS2, CS3 and CS4. Amplifiers MC8, MC9,MC10and MC6 define the voltages across R64, R68, R71 and R91/R92 respectively, which consequently defines the output current. The output current is varied by varying the input voltage to each amplifier. This voltage is derived from AMPLITUDE CONTROL via the amplifier MC5 and ranges, approximately, from +1.6V to +11.6V.

4–53 CS5 and CS6. These current sources operate in the same way as CS1 - CS4, however, only in the NEG mode (and ECL). When POLARITY CONTROL 2 is at −20V (NEG mode), Q10/Q27 and Q11/Q28 conduct and an output occurs. When POLARITY CONTROL 2 is open circuit (POS mode), Q10/Q27 and Q11/Q28 are cut off so that no output occurs. The output current is dependent on the potential of AMPLITUDE CONTROL.

4–54 AMPLITUDE CONTROL. When ECL is selected this line is fixed at a pre-set potential to provide 0.9V amplitude.

4–55 OFFSET AMPLIFIERS AND ECL SWITCHING

4–57 The offset circuits control the baseline positions of both outputs. Both circuits are identical and only OFFSET AMP A is described.

4–56 Offset Amplifiers

4–58 With the OFFSET ON/OFF switch at OFF, Q5 and Q6 hold off Q12 and Q13 respectively and no output occurs from Q15/Q17. In the ON position, the bias potentials of Q12 and Q13 are dependent on the position of OFFSET A VERNIER. As the vernier is moved towards +20V, current flows from Q15 into the OUTPUT A load to give a positive offset. Similarly, as the vernier moves towards −20V, current is drawn from the output load by Q17 to give a negative offset.

4–59 ECL. When ECL is selected by either one or both of the AMPLITUDE switches, the voltage level (which has output signal superimposed on it) of ECL SWITCH CONTROL (P and/or O) is more positive than −20V. Therefore, A6Q1 conducts. This causes K1 to energize and cuts-off Q5, Q6, Q7 and Q8. K1 energized a) causes the signal polarity (NEG) to be selected and b) connects preset potentiometers in place of the AMPLITUDE and OFFSET VERNIERS. Q5 – Q8 cut off, enable the OFFSET AMPLIFIERS when the OFFSET switches are OFF.

4–60 POWER SUPPLY

4–61 The power supply comprises 4 series regulated short circuit protected supplies which provide +20V, −20V, +5V and −5V.

MAINTENANCE

5–1 GENERAL

5–2 This section contains information on the removal of covers and assemblies, performance verification and recalibration (internal checks and adjustments) procedures.

5–3 **Before attempting removal of covers, assemblies or components,disconnect the instrument from the ac line supply.** It is advisable also to leave the instrument for a few minutes after disconnecting from the line, to enable capacitors to discharge.

5–4 REMOVAL OF COVERS

5–5 These are removed by releasing the two securing screws of the respective cover and sliding the cover to the rear of the instrument.

5–6 REMOVAL OF ASSEMBLIES

5–7 Timing Board – Assembly 1

5–8 Remove the rear bracket which retains the Timing Board and disconnect the following:

a) at this board, the co-axial lead to the output amplifier (A4).

b) the co-axial lead to the timing switch board (A2) at A2.

c) the co-axial lead to the EXT INPUT BNC connector (remove the two screws which secure the cable bush and unsolder the lead).

Slide the board to the rear (to disconnect from the motherboard (A5)) until it can be raised clear.

5–9 Output Amplifier – Assembly 4

5–10 Disconnect:

a) the co-axial lead to the timing board (A1) at A1.

b) at this board, the two co-axial leads to the output switch board (A6).

Slide the board to the rear (to disconnect from the motherboard (A5)) until is can be raised clear.

5–11 Power Supply Board – Assembly 3

5–12 Disconnect the two cableform connectors and remove six screws from the board perimeter. Slide the board to the rear (to disconnect from motherboard) and lift clear.

5–13 Motherboard – Assembly 5

5–14 Remove A1, A3 and A4. Stand the instrument on its handles, remove three securing screws from the board perimeter and 8 screws which secure the spring contact connectors. Lift the board off the two switch boards.

5–15 Timing Switch Board – Assembly 2

5–16 Remove A1, A3, A4 and A5. Unsolder the connections on the RATE, DELAY, WIDTH and EXT INPUT LEVEL verniers and the MAN push-button. Remove five securing screws and lift the board clear.

5–17 Output Switchboard –Assembly 6

5–18 Remove A1, A3, A4 and A5. Unsolder the connections on the PULSE OUTPUT connectors and the AMPLITUDE and OFFSET verniers. Remove three securing screws and lift the board clear.

5–19 PERFORMANCE CHECKS

5–20 Tables 5–2 to 5–22 give the procedures for verifying that the instrument is working to the specifications. Rigid observance of the sequence in which the checks appear is unnecessary. However, to aid rapid sequential execution of the tests, in the list of control settings with which each check starts, the controls which require a setting different from that of the preceding test are printed in a bold type face.

5–21 INTERNAL CHECKS AND ADJUSTMENTS

5–22 Tables 5–23 to 5–26 give the procedure for bringing a servicable instrument within specifications. These tests must be completed in the order in which they appear.

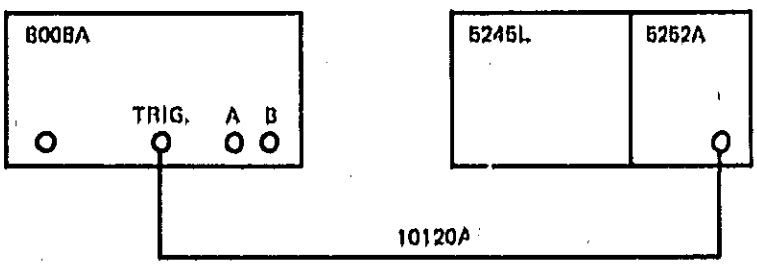
Table 5–1. Test Equipment and Accessories Required

INSTRUMENT	BRIEF SPECIFICATION	RECOMMENDED MODEL
Oscilloscope	Dual Channel, 50 MHz bandwidth, 5mV/div. sensitivity, sweep speeds 5ns/div. to 2s/div. with sweep delay.	HP 180A with plug-ins 1801A and 1820A
Sampling Oscilloscope	Dual Channel, 1 GHz bandwidth, 1mV/div. sensitivity, sweep speeds 10ns/div. to 2s/div.	HP 140A with plug-ins 1410A and 1424A
Digital Voltmeter	100V range to 4 significant figures. Accuracy ±0.05% ± 1 digit.	HP 3440A with plug-in 3444A.
AC Voltmeter	Sensitivity 100μV to 300V rms.	HP 3400A
Test Oscillator	Frequency Range 10 Hz to > 200 MHz	HP 3200A.
Pulse Generator	Rep. Rate 100 Hz – 10 MHz	HP 8004A

ACCESSORIES	RECOMMENDED MODEL
50Ω co-axial cable terminated with BNC male connectors (2 required)	HP 10120A
50Ω termination type GR (2 required)	GR 874–W50B
50Ω Tee connector (2 required)	HP 10221A
50Ω Feed-through	HP 11048B
20dB Attenuator (2 required)	HP 8491A
Adder	HP 15104A
10:1 Divider Probe Tip	HP 10214A

Table 5–2. Performance Check – Repetition Rate

TEST SET–UP

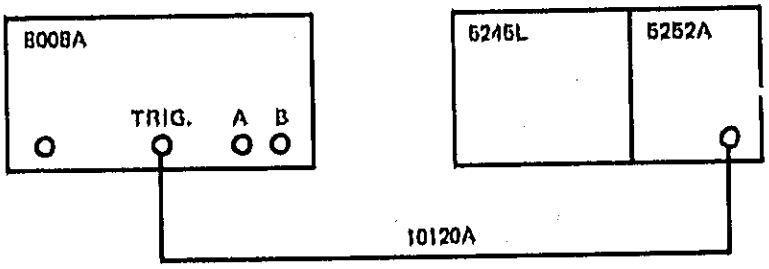


STEP	INSTRUCTION			RESULT
1	Set the controls of 8008A as follows:			
	PULSE PERIOD	2	5n–20n	
	PERIOD VERNIER	3	CCW	
	DOUBLE PULSE/DELAY	4	DELAY	
	PULSE DELAY	5	2,5n–10n	
	DELAY VERNIER	6	CCW	
	EXT. INPUT LEVEL	7	—	
	MODE	8	NORM	
	PULSE WIDTH	9	2,5n–10n	
	WIDTH VERNIER	10	CCW	
	OFFSET A	11	OFF	
	OFFSET A VERNIER	12	—	
	AMPLITUDE A	13	4,0–2,0	
	AMPLITUDE B	14	4,0–2,0	
	AMPLITUDE VERNIER	15	CW	
	OFFSET B	16	OFF	
	OFFSET B VERNIER	17	—	
	POS-NEG	19	POS	
	TRIGGER AMPLITUDE	22	0,2V	
	SLOPE/POLARITY	23	+	
2	Check the repetition rate for each setting of the controls listed below.			

PULSE PERIOD (2)	PERIOD VERNIER (3)	REP. RATE (Hz)
5n – 20n	CCW	>200M
	CW	< 50M
20n – .1μ	CCW	> 50M
	CW	< 10M
.1μ – 3μ	CCW	> 10M
	CW	<300K
3μ – .1m	CCW	>300K
	CW	< 10K
.1m – 3m	CCW	> 10K
	CW	<300
3m – .1	CCW	>300
	CW	< 10

Table 5–3. Performance Check – Manual Operation

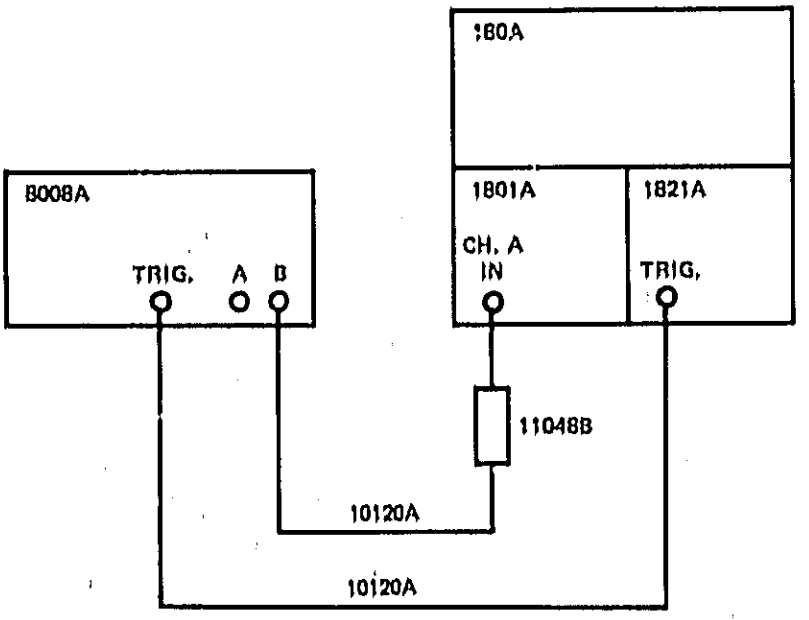
TEST SET–UP



STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	MAN
	PERIOD VERNIER	3	—
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2.5n–10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	2.5n–10n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	4.0–2.0
	AMPLITUDE B	14	4.0–2.0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0.2V
	SLOPE/POLARITY	23	+
2	Set the controls of the test equipment as follows: 5245L Function – MAN. 5252A Max Count Rate – 100 MHz		
3	Press the 8008A MAN push-button an even number of times. Check that the 5245L displays a result which equals half the number of push-button depressions.		

Table 5–4. Performance Check – Pulse Width (> 50ns) and Duty Cycle

TEST SET–UP



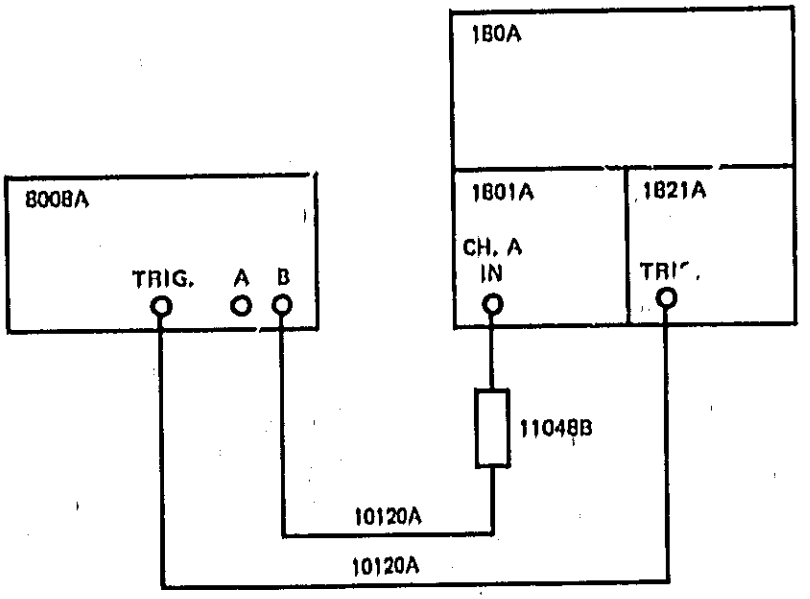
STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	.1μ – 3μ
	PERIOD VERNIER	3	CW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2,5n–10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	50n–1,5μ
	WIDTH VERNIER	10	CW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	0,5–0,25
	AMPLITUDE B	14	2,0–1,0
	AMPLITUDE VERNIER	15	CCW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	1V
	SLOPE/POLARITY	23	+

Table 5–4, Performance Check – Pulse Width (> 50ns) and Duty Cycle (cont'd)

STEP	INSTRUCTION			RESULT
2	Check the pulse width for each setting of the controls listed below:			
	PULSE PERIOD	PULSE WIDTH	WIDTH VERNIER	WIDTH
	,1μ– 3μ	50n 1,5μ	CW	>1,5μ
	,1μ– 3μ	1,5μ–50μ	CCW	<1,5μ
	3μ–,1m	1,5μ–50μ	CW	>50μ
	3μ–,1m	50μ–1,5m	CCW	<50μ
	,1m – 3m	50μ–1,5m	CW	>1,5m
	,1m – 3m	1,5m–50m	CCW	<1,5m
	3m – ,1	1,5m–50m	CW	> 50m
3	Set the period vernier (3) CCW and width vernier (10) CCW.			
4	Slowly turn the period vernier CW and check that the pulse width does not vary until the duty cycle is			>50%

Table 5–5. Performance Check – Pulse Delay (~ 10ns)

TEST SET–UP

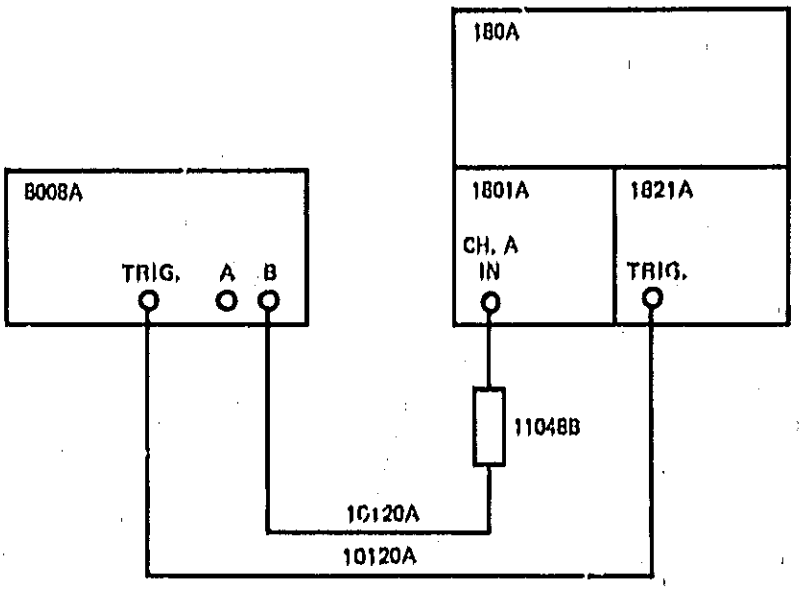


STEP	INSTRUCTION		RESULTS
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	.1μ – 3μ
	PERIOD VERNIER	3	CW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	50n – 1.5μ
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	
	MODE	8	NORM
	PULSE WIDTH	9	10n – 50n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	0.5–0.25
	AMPLITUDE B	14	2.0–1.0
	AMPLITUDE VERNIER	15	CCW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	1V
	SLOPE/POLARITY	23	+
2	Adjust the scope controls so that the leading edge of the pulse is coincident with the extreme left vertical line of the graticule with suitable Xaxis scale (Time/Div) check the movement of the pulse leading edge for each of the settings listed below:		

PULSE PERIOD (2)	PULSE WIDTH(9)	PULSE DELAY (5)	DELAY VERNIER (6)	DELAY
.1μ – 3μ	10n–50n	50n–1.5μ	CW	>1.5μs
.1μ – 3μ	10n–50n	1.5μ–50μ	CCW	<1.5μs
3μ – .1m	50n–1.5μ	1.5μ–50μ	CW	>50 μs
3μ – .1m	50n–1.5μ	50μ–1.5m	CCW	<50 μs
.1m – 3m	1.5μ – 50μ	50μ–1.5m	CW	>1.5ms
.1m – 3m	1.5μ – 50μ	1.5m–50m	CCW	<1.5ms
3m – .1	50μ – 1.5m	1.5m–50m	CW	>50ms

Table 5–6. Performance Check – Period Jitter

TEST SET–UP



STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	3μ – .1m
	PERIOD VERNIER	3	See below
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2,5n–10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	1,5μ – 50μ
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	0,5–0,25
	AMPLITUDE B	14	2,0–1,0
	AMPLITUDE VERNIER	15	CCW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	1V
	SLOPE/POLARITY	23	+
2	Set the controls of 1821A as follows:		
	Main Sweep		.1ms/CW
	Delayed Sweep		.1μs/CW
	Sweep Display		MAIN
3	Adjust the pulse period vernier (3) to obtain a 0.1ms pulse period.		
4	Adjust the 1821A Delay (Div.) until the intensified spot coincides with the leading edge of the second pulse on the display.		
5	Switch to MIXED sweep display on 1821A.		
6	Measure pulse period jitter.		

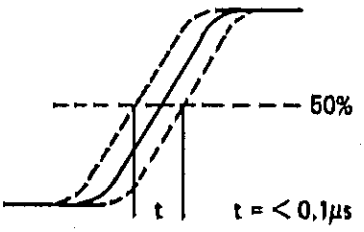
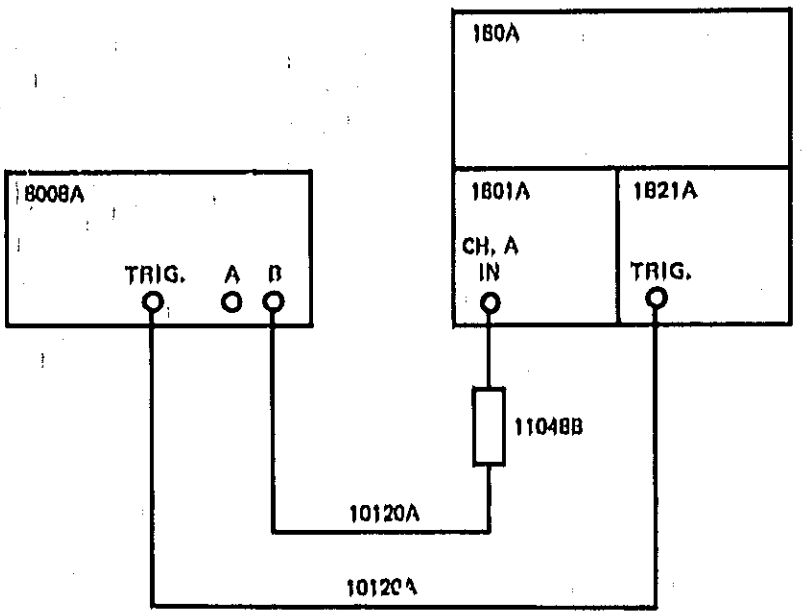


Table 5–7. Performance Check – Width Jitter

TEST SET–UP



STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	3μ – .1m
	PERIOD VERNIER	3	CW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2,5n – 10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	50μ – 1,5m
	WIDTH VERNIER	10	See below
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	0,5 – 0,25
	AMPLITUDE B	14	2,0 – 1,0
	AMPLITUDE VERNIER	15	CCW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	1V
	SLOPE/POLARITY	23	+
2	Set the controls of 1821A as follows:		
	Main Sweep		10μs/cm
	Delayed Sweep		.1μs/cm
	Sweep Display		MAIN
3	Adjust the pulse width vernier to obtain a 50μs pulse width.		

Table 5–7, Performance Check – Width Jitter (cont'd)

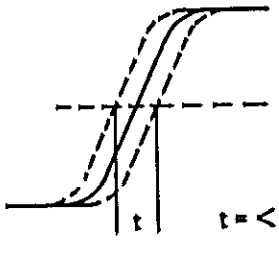
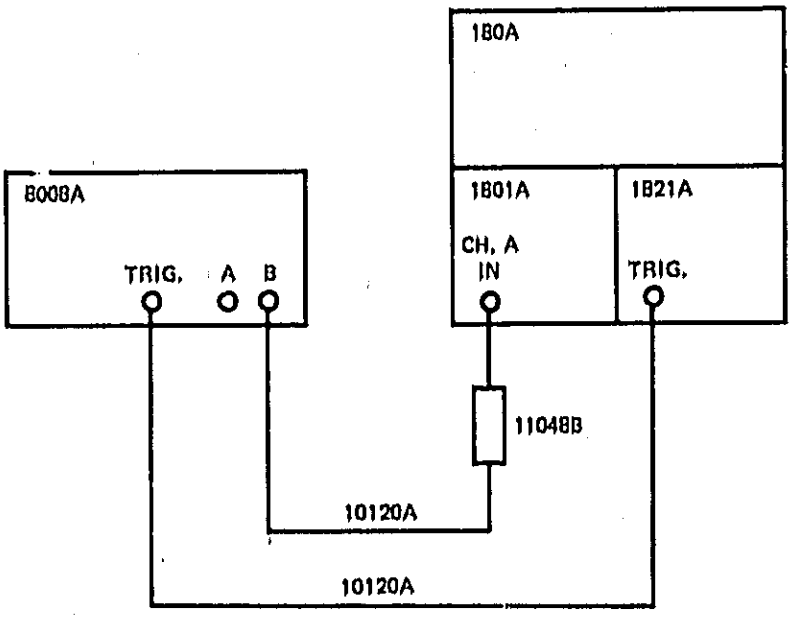
STEP	INSTRUCTION	RESULT
4	Using the delay vernier (6), move the trailing edge of the pulse to the centre of the display using the delay vernier (6).	
5	Adjust the 1821A Delay (Div.) until the intensified spot coincides with the trailing edge.	
6	Switch to delayed sweep on 1821A.	
7	Set magnifier of 180A to X5 and measure the width jitter.	 t = < 50ns

Table 5–8, Performance Check – Delay Jitter

TEST SET–UP



STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	3μ – .1m
	PERIOD VERNIER	3	CW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	1.5μ – 50μ
	DELAY VERNIER	6	See below
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	1.5μ – 50μ
	WIDTH VERNIER	10	CW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	0.5 – 0.25
	AMPLITUDE B	14	2.0 – 1.0
	AMPLITUDE VERNIER	15	CCW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	1V
	SLOPE/POLARITY	23	+
2	Set the controls of 1821A as follows:		
	Main Sweep		10μs/cm
	Delayed Sweep		.1μs/cm
	Sweep Display		MAIN
3	Adjust the delay vernier (6) for a pulse delay of 50μs.		
4	Adjust the 1821A Delay (Div.) until intensified spot coincides with the leading edge of the second pulse.		
5	Switch to MIXED sweep display on 1821A and measure the delay jitter.		

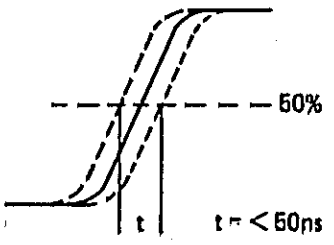
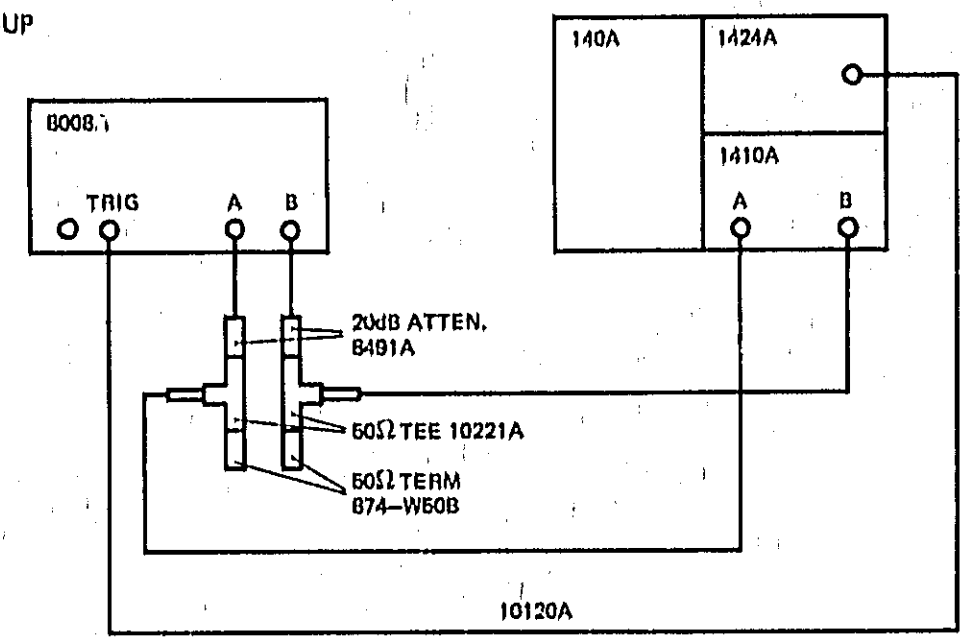


Table 5–9. Performance Check – Pulse Width (< 1.5μs)

TEST SET–UP

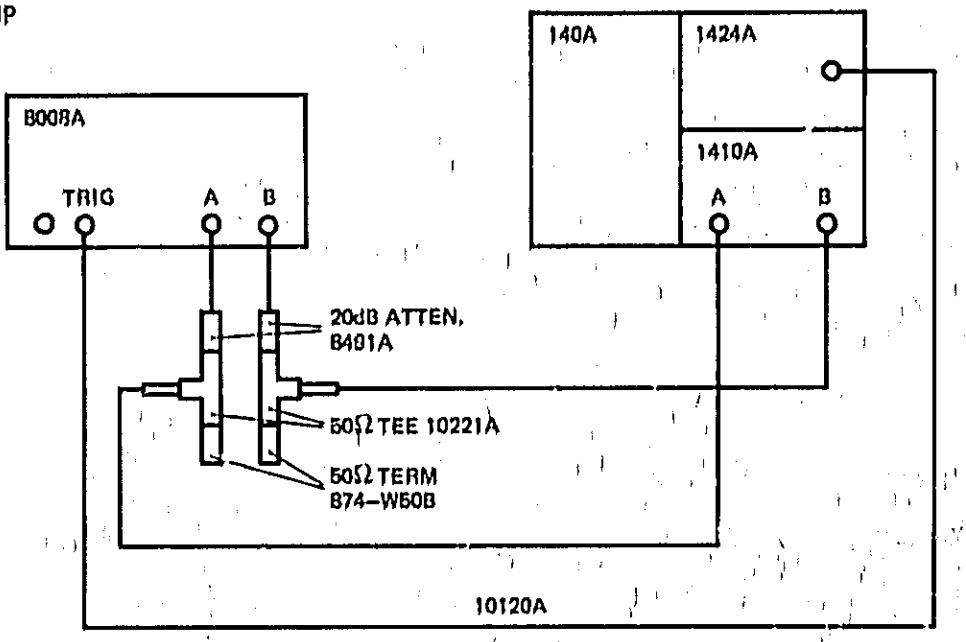


STEP	INSTRUCTION			RESULT
1	Set the controls of 8008A as follows:			
	PULSE PERIOD	2	5n – 20n	
	PERIOD VERNIER	3	CCW	
	DOUBLE PULSE/DELAY	4	DELAY	
	PULSE DELAY	5	2.5n – 10n	
	DELAY VERNIER	6	CCW	
	EXT. INPUT LEVEL	7	—	
	MODE	8	NORM	
	PULSE WIDTH	9	2.5n – 10n	
	WIDTH VERNIER	10	CCW	
	OFFSET A	11	OFF	
	OFFSET A VERNIER	12	—	
	AMPLITUDE A	13	2.0 – 1.0	
	AMPLITUDE B	14	2.0 – 1.0	
	AMPLITUDE VERNIER	15	CW	
	OFFSET B	16	OFF	
	OFFSET B VERNIER	17	—	
	POS-NEG	19	POS	
	TRIGGER AMPLITUDE	22	0.2V	
	SLOPE/POLARITY	23	+	
2	Check the pulse width for each setting of the controls listed below:			

PULSE PERIOD (2)	PULSE DELAY (5)	PULSE WIDTH (9)	WIDTH VERNIER (10)	WIDTH
5n–20n	2.5n–10n	2.5n–10n	CCW	< 2.5ns
5n–20n	2.5n–10n	2.5n–10n	CW	> 10ns
5n–20n	2.5n–10n	10n–50n	CCW	< 10ns
20n–.1μ	50n–1.5μ	10n–50n	CW	> 50ns
20n–.1μ	50n–1.5μ	50n–1.5μ	CCW	< 50ns

Table 5–10. Performance Check — Pulse Delay (< 50ns)

TEST SET–UP



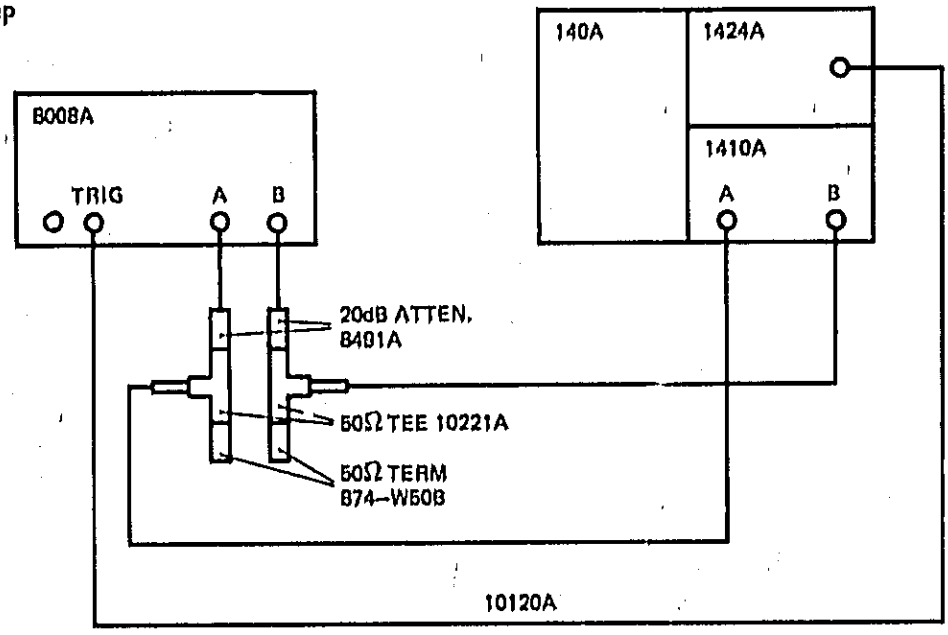
STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	.1μ - 3μ
	PERIOD VERNIER	3	CCW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2.5n – 10n
	DELAY VERNIER	6	CW
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	2.5n –10n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	2.0 – 1.0
	AMPLITUDE B	14	2.0 – 1.0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0.2V
	SLOPE/POLARITY	23	+

2 Using the same technique as in Table 5–5 check the pulse delay for each of the settings listed below:

PULSE DELAY (5)	DELAY VERNIER (6)	DELAY
2.5n–10n	CW	> 10ns
10n–50n	CCW	< 10ns
10n–50n	CW	> 50ns
50n–1.5μ	CCW	< 50ns

Table 5–11. Performance Check – Double Pulse

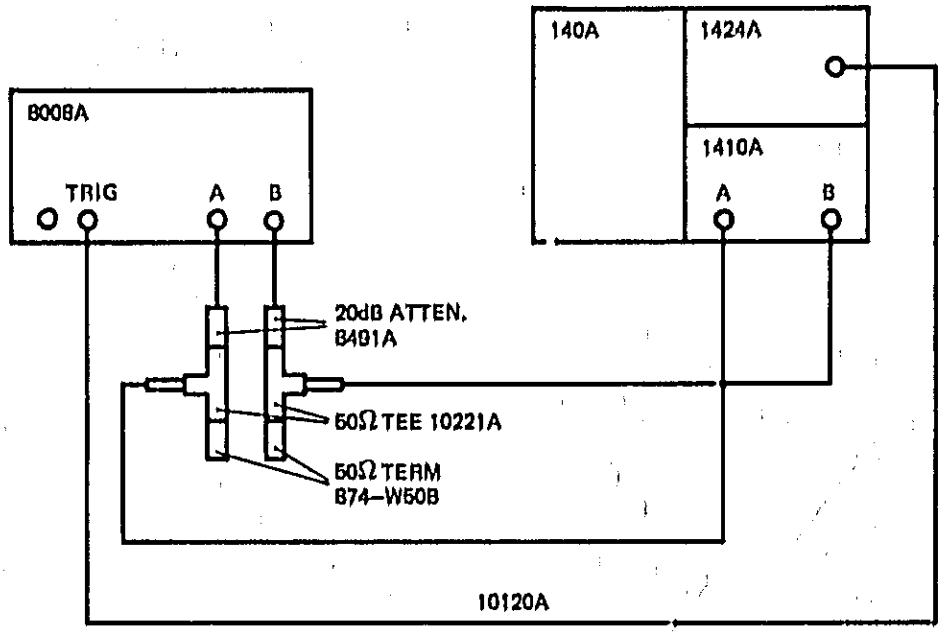
TEST SET-UP



STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	.1μ – 3μ
	PERIOD VERNIER	3	CCW
	DOUBLE PULSE/DELAY	4	DOUBLE
	PULSE DELAY	5	2.5n–10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	2.5n–10n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	2.0–1.0
	AMPLITUDE B	14	2.0–1.0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0.2V
	SLOPE/POLARITY	23	+
2	If double pulse does not occur, turn the delay vernier (6) CW.		
3	When double pulse does occur, the leading edges of the pulses should be separated by		< 5ns

Table 5–12. Performance Check – Transition Time

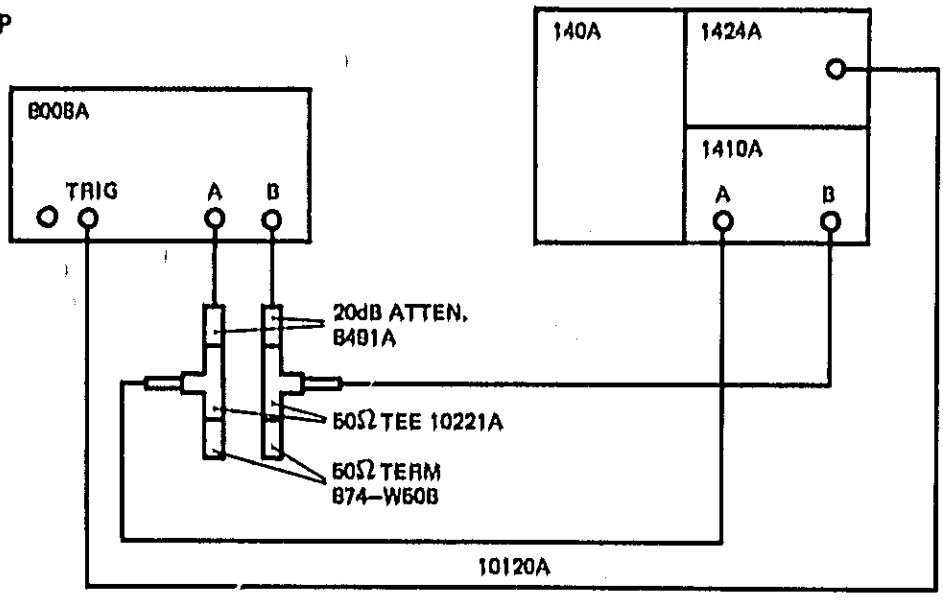
TEST SET–UP



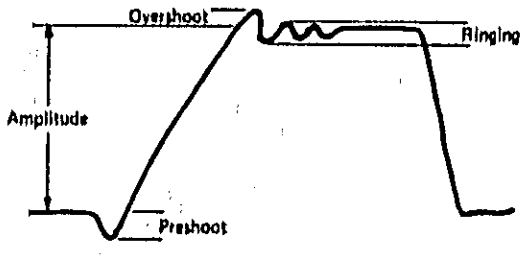
STEP	INSTRUCTIONS		RESULT
	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	5n – 20n
	PERIOD VERNIER	3	CW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2,5n – 10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	10n – 50n
	WIDTH VERNIER	10	See below
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	4,0 – 2,0
	AMPLITUDE B	14	4,0 – 2,0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS NEG	19	POS
	TRIGGER AMPLITUDE	22	0,2V
	SLOPE/POLARITY	23	+
2	Adjust the width vernier (10) for 50% duty cycle.		
3	Adjust the 1424A sensitivity for a full screen display, set to Expand and centre the leading edge of the pulse on the display.		
4	Measure the rise time between the 10% and 90% points.		≤ 1,2ns
5	Centre the trailing edge on the display and measure the fall time between the 10% and 90% points.		≤ 1,2ns
6	Repeat 3, 4 and 5 with the amplitude vernier (15) CCW.		

Table 5–13. Performance Check – Preshoot, Overshoot and Ringing

TEST SET–UP



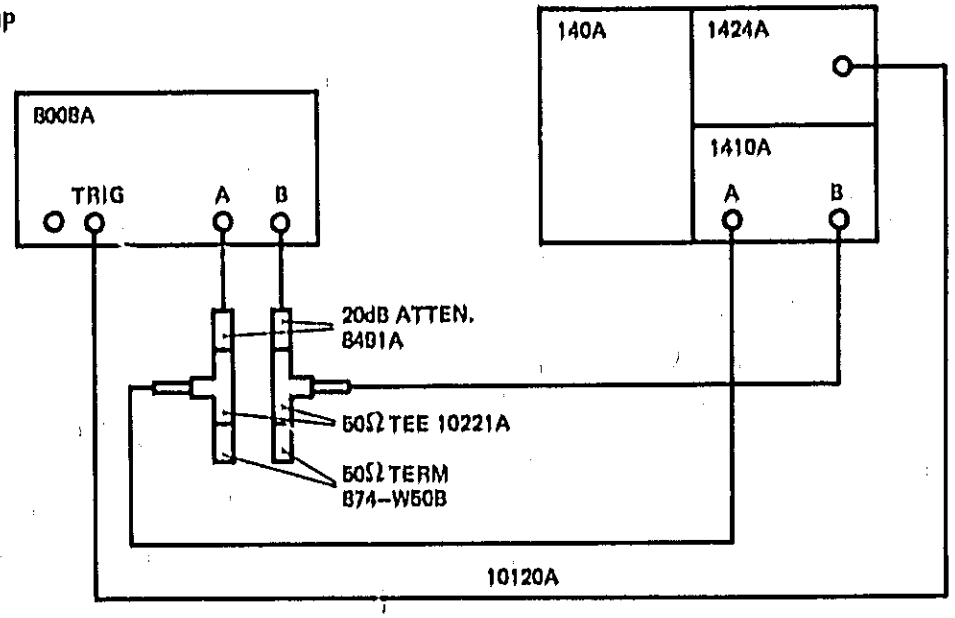
STEP	INSTRUCTION			RESULT
1	Set the controls of 8008A as follows:			
	PULSE PERIOD	2	5n – 20n	
	PERIOD VERNIER	3	CW	
	DOUBLE PULSE/DELAY	4	DELAY	
	PULSE DELAY	5	2,5ns – 10ns	
	DELAY VERNIER	6	CCW	
	EXT. INPUT LEVEL	7	—	
	MODE	8	NORM	
	PULSE WIDTH	9	10n–50n	
	WIDTH VERNIER	10	See below	
	OFFSET A	11	OFF	
	OFFSET A VERNIER	12	—	
	AMPLITUDE A	13	4.0 – 2,0	
	AMPLITUDE B	14	4.0 – 2,0	
	AMPLITUDE VERNIER	15	CW	
	OFFSET B	16	OFF	
	OFFSET B VERNIER	17	—	
	POS-NEG	19	POS	
	TRIGGER AMPLITUDE	22	0,2V	
	SLOPE/POLARITY	23	+	
2	Adjust the width vernier (10) for a 50% duty cycle.			
3	With reference to the diagram below, measure preshoot, overshoot and ringing. All should be			≤ 5% of pulse * amplitude



* Overshoot may increase to 10% with Amplitude vernier CCW.

Table 5–14. Performance Check – Amplitude

TEST SET–UP



STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	5n – 20n
	PERIOD VERNIER	3	CW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2,5n – 10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	—
	MODE	8	NORM
	PULSE WIDTH	9	10n – 50n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	4,0 – 2,0
	AMPLITUDE B	14	4,0 – 2,0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0,2V
	SLOPE/POLARITY	23	+

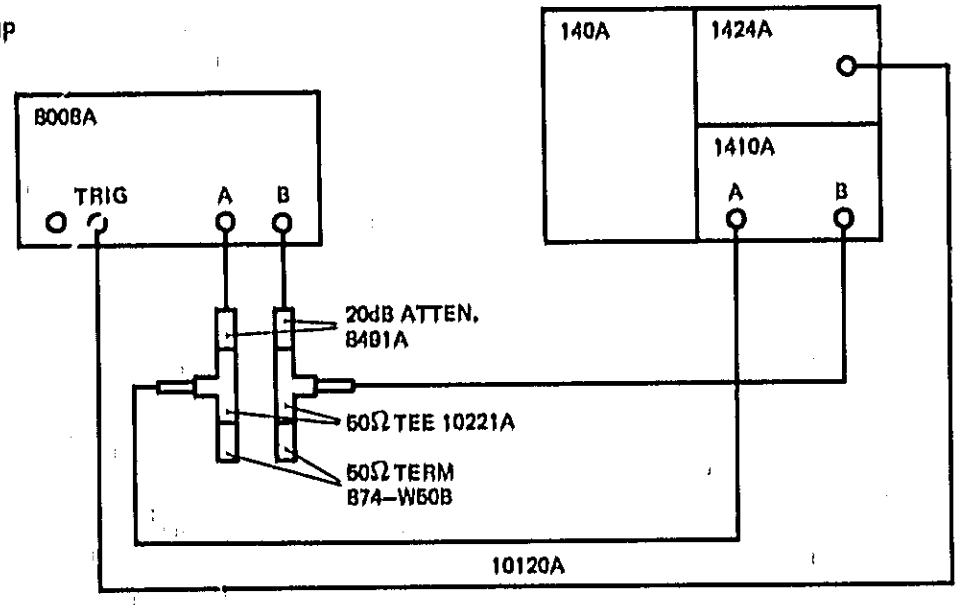
2 Check the pulse amplitude of each output for each setting of the controls listed below:

AMPLITUDE A(13) and B(14)	AMPLITUDE VERNIER	AMPLITUDE
4,0 – 2,0	CW	>+4,0V
4,0 – 2,0	CCW	<+2,0V
2,0 – 1,0	CW	>+2,0V
2,0 – 1,0	CCW	<+ 1,0V
1,0 – 0,5	CW	>+ 1,0V
1,0 – 0,5	CCW	<+ 0,5V
0,5 – 0,25	CW	>+ 0,5V
0,5 – 0,25	CCW	<+ 0,25V

3 Repeat the checks for NEG output.

Table 5–15. Performance Check – Offset

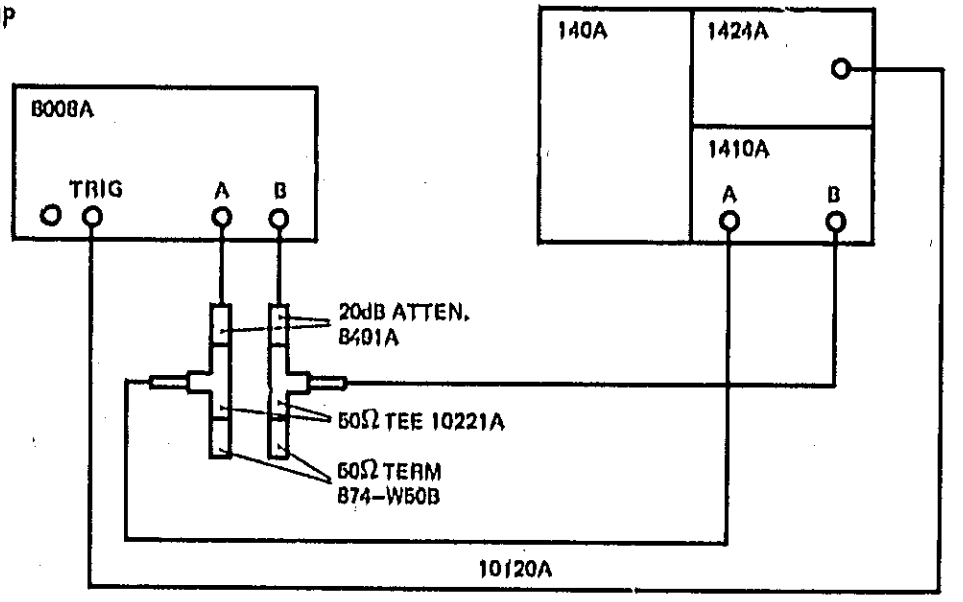
TEST SET–UP



STEP	INSTRUCTION			RESULT
1	Set the control of 8008A as follows:			
	PULSE PERIOD	2	5n – 20n	
	PERIOD VERNIER	3	CW	
	DOUBLE PULSE/DELAY	4	DELAY	
	PULSE DELAY	5	2.5n – 10n	
	DELAY VERNIER	6	CCW	
	EXT. INPUT LEVEL	7	—	
	MODE	8	NORM	
	PULSE WIDTH	9	10n – 50n	
	WIDTH VERNIER	10	CCW	
	OFFSET A	11	OFF	
	OFFSET A VERNIER	12	—	
	AMPLITUDE A	13	4.0 – 2.0	
	AMPLITUDE B	14	4.0 – 2.0	
	AMPLITUDE VERNIER	15	CW	
	OFFSET B	16	OFF	
	OFFSET B VERNIER	17	—	
	POS-NEG	19	POS	
	TRIGGER AMPLITUDE	22	0.2V	
	SLOPE/POLARITY	23	+	
2	Connect the oscilloscope to OUTPUT A and switch OFFSET A (11) to ON.			
3	Turn the offset A VERNIER (12) fully CW and check the dc level of the baseline			≥ +2.0V
4	Turn the offset A VERNIER (12) fully CCW and check the dc level of the baseline			≥ – 2.0V
5	Switch OFFSET A to OFF.			
6	Connect the oscilloscope to OUTPUT B and repeat steps 2, 3, 4 and 5 for OFFSET B.			
7	Verify that the pulse shape, rise time, overshoot etc. do not vary with variation of offset.			

Table 5–16. Performance Check – ECL Position

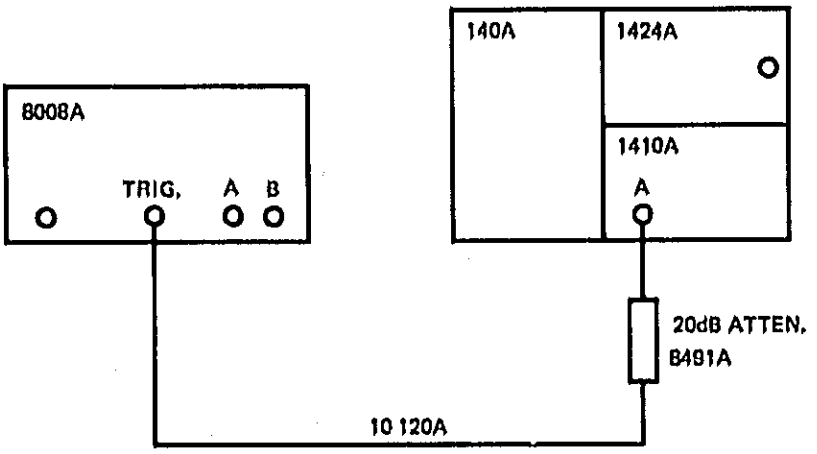
TEST SET–UP



STEP	INSTRUCTION			RESULT
1	Set the controls of 8008A as follows:			
	PULSE PERIOD	2	5n – 20n	
	PERIOD VERNIER	3	CW	
	DOUBLE PULSE/DELAY	4	DELAY	
	PULSE DELAY	5	2.5n – 10n	
	DELAY VERNIER	6	CCW	
	EXT. INPUT LEVEL	7	—	
	MODE	8	NORM	
	PULSE WIDTH	9	10n – 50n	
	WIDTH VERNIER	10	CCW	
	OFFSET A	11	OFF	
	OFFSET A VERNIER	12	—	
	AMPLITUDE A	13	4.0 – 2.0	
	AMPLITUDE B	14	4.0 – 2.0	
	AMPLITUDE VERNIER	15	CCW	
	OFFSET B	16	OFF	
	OFFSET B VERNIER	17	—	
	POS-NEG	19	POS	
	TRIGGER AMPLITUDE	22	0.2V	
	SLOPE/POLARITY	23	+	
2	Connect the oscilloscope input to OUTPUT A and switch A AMPLITUDE (13) to ECL			
3	Check that the pulse top is at			–0.9V
4	Check that the pulse baseline is at			–1.7V
5	Check that altering the positions of the amplitude vernier, offset verniers (with offset ON) and POS/NEG switch has no effect on the output.			
6	Return A AMPLITUDE to 4.0 – 2.0			
7	Repeat steps 2, 3, 4, 5 and 6 for pulse OUTPUT B			Pulse top –0.9V Pulse base –1.7V

Table 5–17. Performance Check – Trigger Output

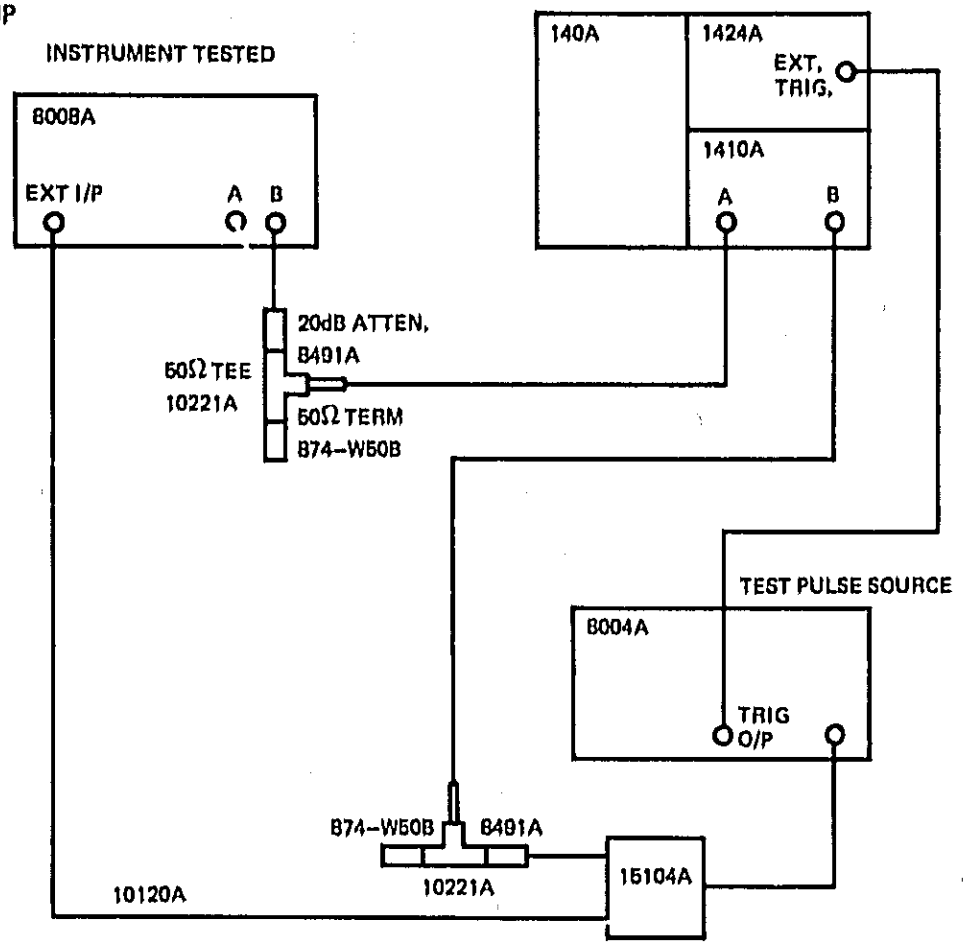
TEST SET–UP



STEP	INSTRUCTION			RESULT
1	Set the controls of 8008A as follows:			
	PULSE PERIOD	2	5n – 20n	
	PERIOD VERNIER	3	CCW	
	DOUBLE PULSE/DELAY	4	DELAY	
	PULSE DELAY	5	2,5n – 10n	
	DELAY VERNIER	6	CCW	
	EXT. INPUT LEVEL	7	—	
	MODE	8	NORM	
	PULSE WIDTH	9	2,5n – 10n	
	WIDTH VERNIER	10	CCW	
	OFFSET A	11	OFF	
	OFFSET A VERNIER	12	—	
	AMPLITUDE A	13	4,0 – 2,0	
	AMPLITUDE B	14	4,0 – 2,0	
	AMPLITUDE VERNIER	15	CW	
	OFFSET B	16	OFF	
	OFFSET B VERNIER	17	—	
	POS-NEG	19	POS	
	TRIGGER AMPLITUDE	22	1V	
	SLOPE/POLARITY	23	+	
2	Measure the amplitude of the trigger output pulses			>0,9V
3	Switch the TRIGGER AMPLITUDE (22) to 0,2V and check the trigger pulse amplitude			>200mV

Table 6–18, Performance Check – External Width

TEST SET–UP



STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	5n – 10n
	PERIOD VERNIER	3	CCW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2.5n – 10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	Positive
	MODE	8	EXT WIDTH
	PULSE WIDTH	9	2.5n – 10n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	2.0 – 1.0
	AMPLITUDE B	14	2.0 – 1.0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0.2V
	SLOPE/POLARITY	23	+

Table 5–18. Performance Check – External Width (cont'd)

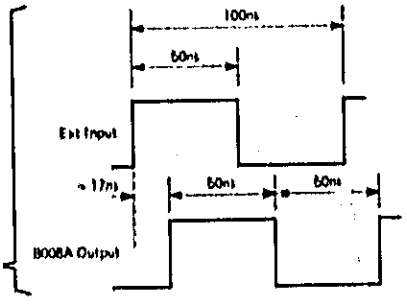
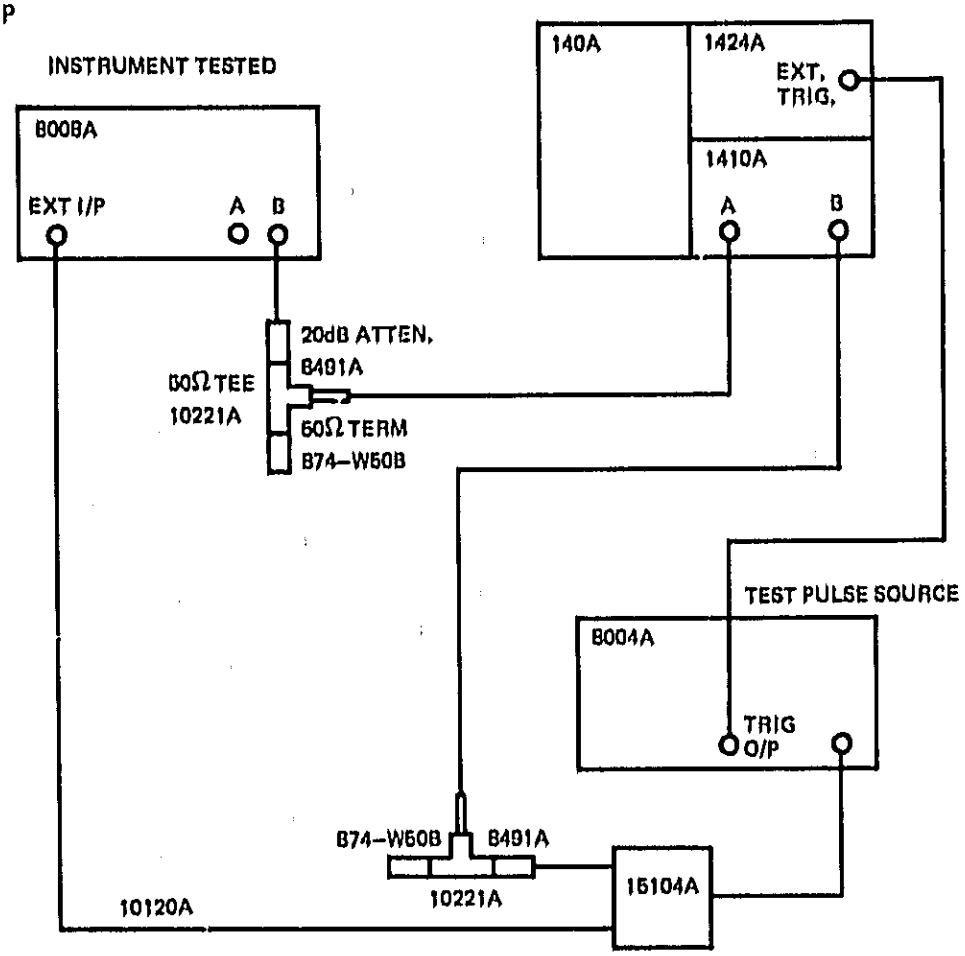
STEP	INSTRUCTION	RESULT
2	Set the controls of 8004 A as follows: REP RATE 10M RATE VERNIER CCW PULSE DELAY 10n DELAY VERNIER CCW PULSE WIDTH 0.1μ WIDTH VERNIER See below AMPLITUDE 1V AMPLITUDE VERNIER CW PULSE POLARITY +	
3	Set the 8004A pulse width vernier to obtain a 50ns pulse width.	
4	Check that both displayed pulses are	
5	Switch SLOPE/POLARITY (23) on 8008A to – and check that the only difference from the result of step 4 is	8008A output complement of step 4

Table 5–19. Performance Check – Width Trigger

TEST SET–UP



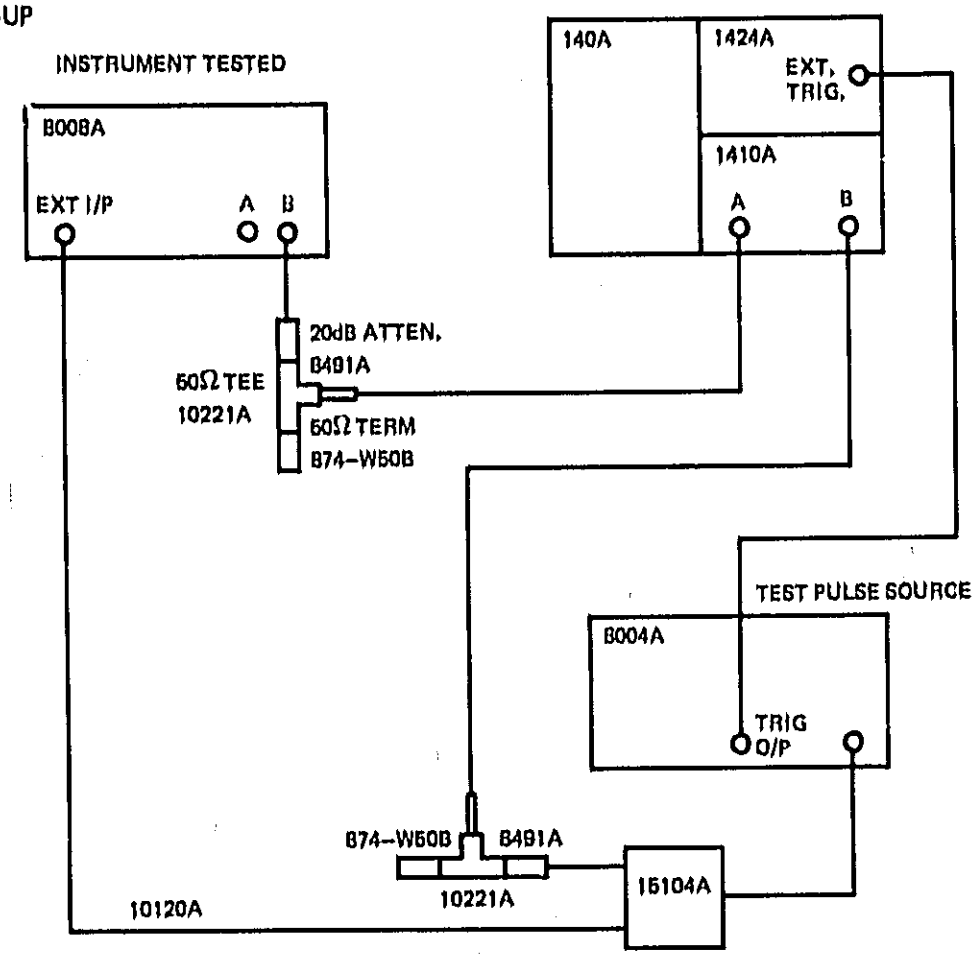
STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	5n – 20n
	PERIOD VERNIER	3	CCW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2.5n – 10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	Positive
	MODE	8	WIDTH TRIG
	PULSE WIDTH	9	2.5n – 10n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	2.0 – 1.0
	AMPLITUDE B	14	2.0 – 1.0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0.2V
	SLOPE/POLARITY	23	+

Table 5–19, Performance Check–Width Trigger (cond't).

STEP	INSTRUCTION	RESULT
2	Set the controls of 8004A as follows:	
	REP RATE 10M RATE VERNIER CCW PULSE DELAY 10n DELAY VERNIER CCW PULSE WIDTH 0,1µ WIDTH VERNIER See below AMPLITUDE 1V AMPLITUDE VERNIER CW PULSE POLARITY +	
3	Set the 8004A pulse width vernier to obtain a 60ns pulse width.	
4	Check that the 8008A output pulse width can be varied over the range	< 2,5ns – > 10ns

Table 5–20. Performance Check – External Trigger

TEST SET–UP



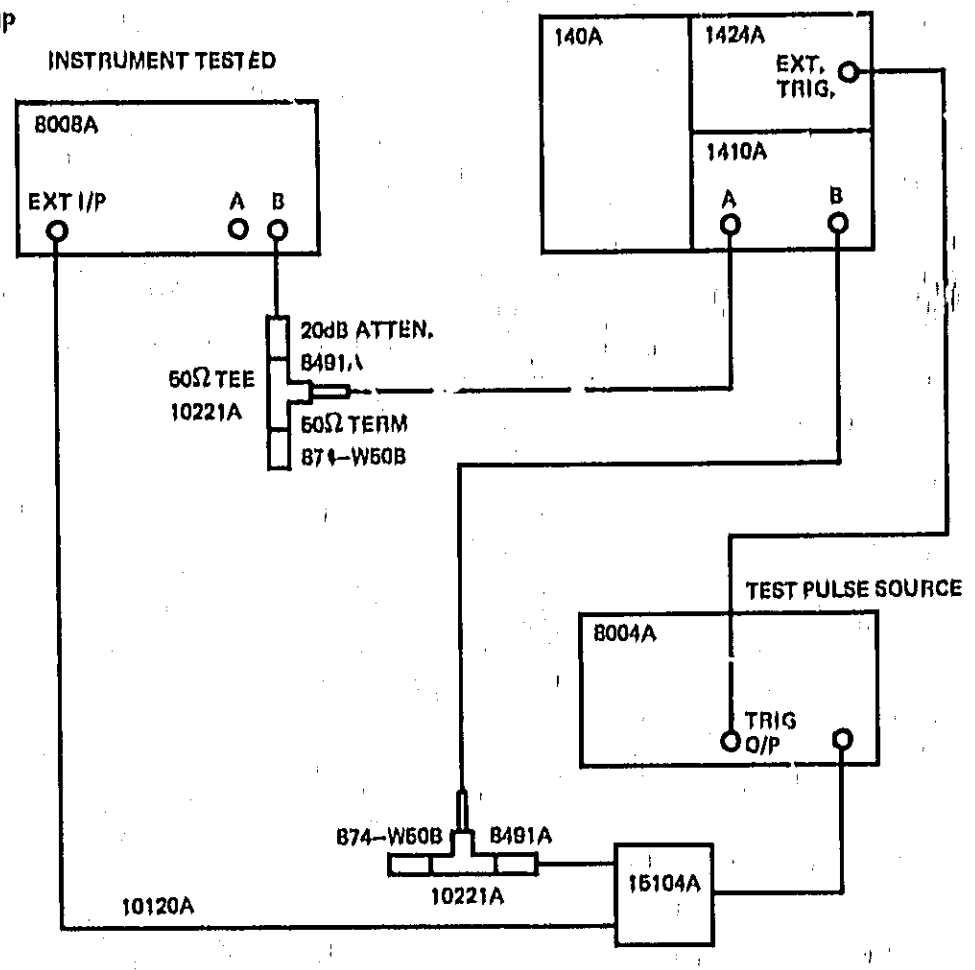
STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	20n – .1μ
	PERIOD VERNIER	3	CCW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2.5n – 10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	Positive
	MODE	8	EXT TRIG
	PULSE WIDTH	9	10n – 50n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	2.0 – 1.0
	AMPLITUDE B	14	2.0 – 1.0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0.2V
	SLOPE/POLARITY	23	+

Table 5–20. Performance Check–External Trigger (cond't).

STEP	INSTRUCTION	RESULT
2	Set the controls of 8004A as follows: REP RATE 10M RATE VERNIER CCW PULSE DELAY 10n DELAY VERNIER CCW PULSE WIDTH 0.1μ WIDTH VERNIER See below AMPLITUDE 1V AMPLITUDE VERNIER CW PULSE POLARITY +	
3	Adjust the 8004A pulse width vernier to obtain a 50ns pulse width.	
4	Check that the 8008A pulse delay (with respect to the External Input) and the pulse width is varied by turning the DELAY (5) and WIDTH (10) verniers.	

Table 5–21. Performance Check – Gate Mode

TEST SET–UP

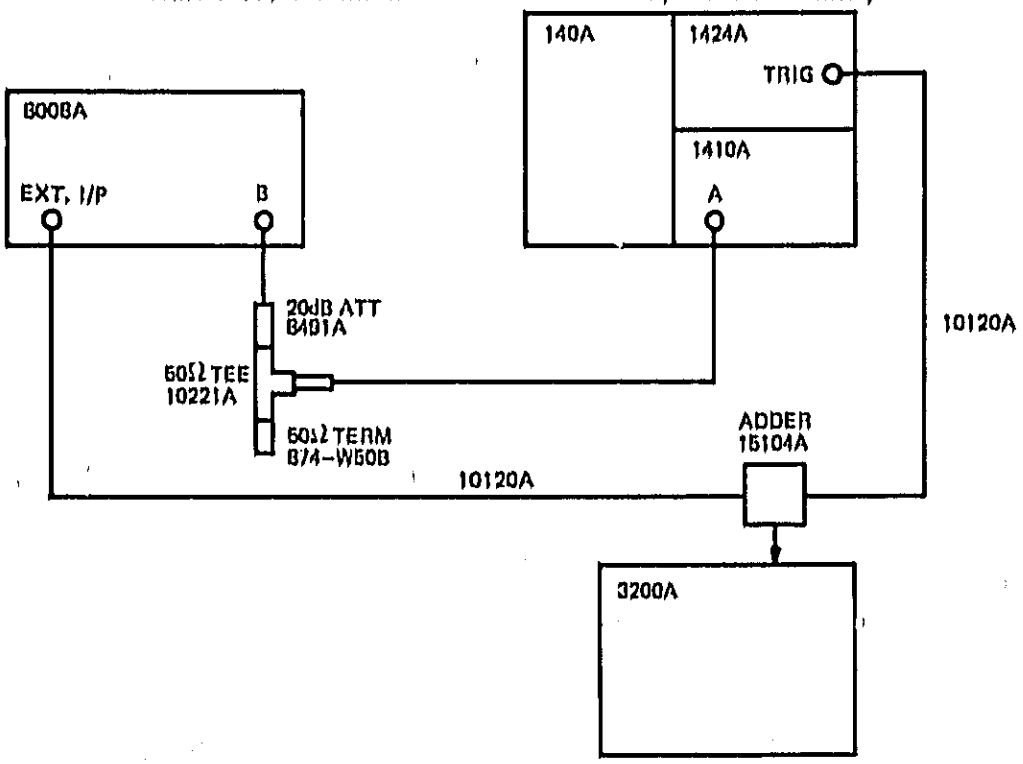


STEP	INSTRUCTION		RESULT
1	Set the controls of 8008A as follows:		
	PULSE PERIOD	2	5n – 20n
	PERIOD VERNIER	3	CCW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2.5n – 10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	Positive
	MODE	8	EXT TRIG
	PULSE WIDTH	9	2.5n – 10n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	2.0 – 1.0
	AMPLITUDE B	14	2.0 – 1.0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0.2V
	SLOPE/POLARITY	23	+

Table 5–21, Performance Check–Gate Mode (cont'd).

STEP	INSTRUCTION	RESULT
2	Set the controls of 8004A as follows: REP RATE 10M RATE VERNIER CCW PULSE DELAY 10n DELAY VERNIER CCW PULSE WIDTH 0.1μ WIDTH VERNIER See below AMPLITUDE 1V AMPLITUDE VERNIER CW PULSE POLARITY +	
3	Set the width vernier of 8004A for a pulse width of 50ns.	
4	Check that output pulses occur for the duration of the gate signal and that the last pulse of the 'burst' is of normal width.	

Table 5-22. Performance Check – External Input Level Sensitivity



STEP	INSTRUCTION		RESULT
1	Set the controls of 6008A as follows:		
	PULSE PERIOD	2	5n – 20n
	PERIOD VERNIER	3	CCW
	DOUBLE PULSE/DELAY	4	DELAY
	PULSE DELAY	5	2.5n – 10n
	DELAY VERNIER	6	CCW
	EXT. INPUT LEVEL	7	See below
	MODE	8	EXT WIDTH
	PULSE WIDTH	9	2.5n – 10n
	WIDTH VERNIER	10	CCW
	OFFSET A	11	OFF
	OFFSET A VERNIER	12	—
	AMPLITUDE A	13	2.0 – 1.0
	AMPLITUDE B	14	2.0 – 1.0
	AMPLITUDE VERNIER	15	CW
	OFFSET B	16	OFF
	OFFSET B VERNIER	17	—
	POS-NEG	19	POS
	TRIGGER AMPLITUDE	22	0.2V
	SLOPE/POLARITY	23	+
2	Disconnect the signal to the EXT. I/P. Turn the EXT. INPUT LEVEL control from CW to CCW and check that the output level changes as the control approaches mid travel.		
3	Disconnect the 20dB Attenuator from Pulse Output B and connect the signal from the 3200A to the attenuator. Adjust the 3200A for a 200MHz, 1V p-p output. Reconnect as shown in the test set-up.		

Table 5–22, Performance Check – External Input Level Sensitivity (cond't).

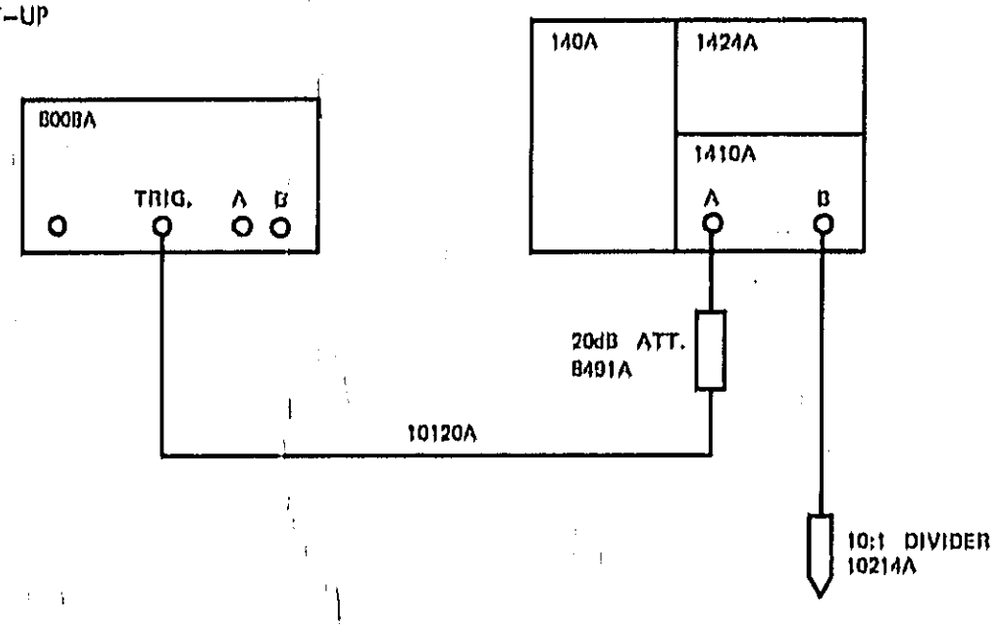
4	Adjust the EXT INPUT LEVEL CONTROL for an output from 8008A.	

Table 5–23. Internal Checks and Adjustments – Power Supplies (A3)

STEP	INSTRUCTION		ADJUST	RESULT
1	Set the controls of 8008A as follows:			
	PULSE PERIOD	2 MAN		
	PERIOD VERNIER	3 CCW		
	DOUBLE PULSE/DELAY	4 DELAY		
	PULSE DELAY	5 2.5n – 10n		
	DELAY VERNIER	6 CCW		
	EXT. INPUT LEVEL	7 —		
	MODE	8 NORM		
	PULSE WIDTH	9 2.5n – 10n		
	WIDTH VERNIER	10 See below		
	OFFSET A	11 OFF		
	OFFSET A VERNIER	12 —		
	AMPLITUDE A	13 4.0 2.0		
	AMPLITUDE B	14 4.0 – 2.0		
	AMPLITUDE VERNIER	15 CW		
	OFFSET B	16 OFF		
	OFFSET B VERNIER	17 —		
	POS NEG	19 POS		
	TRIGGER AMPLITUDE	22 1V		
	SLOPE/POLARITY	23 +		
2	Adjust the width vernier for a duty cycle of 50%.			
3	The following measurements are with respect to chassis using the dc digital voltmeter:			
	Measure:	+20V Test point Board A3	A3R8	+20V ± 100mV
		20V Test point Board A3	A3R16	20V ± 100mV
		+5V Test point Board A3	A3R24	+5V ± 30m
		5 Test point Board A3	A3R34	5V ± 30mV
4	The following ripple measurements are with respect to chassis using the ac voltmeter:			
	Measure:	+20V Test point		< 1mV rms
		–20V Test point		< 1mV rms
		+5V Test point		< 0.4mV rms
		–5V Test point		< 0.4mV rms

Table 5–14. Internal Checks and Adjustments – Timing

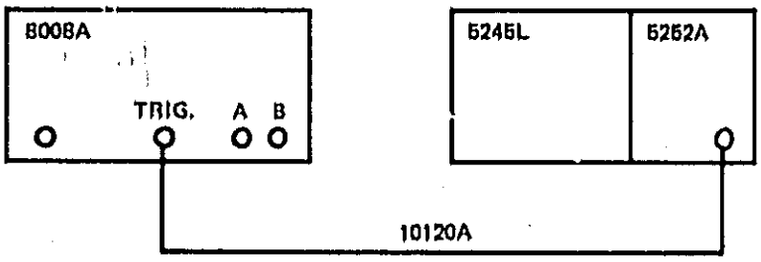
TEST SET–UP



STEP	INSTRUCTION			ADJUST	RESULT
1	Set the controls of B008A as follows:				
	PULSE PERIOD	2	5n – 20n		
	PERIOD VERNIER	3	CCW		
	DOUBLE PULSE/DELAY	4	DELAY		
	PULSE DELAY	5	2.5n – 10n		
	DELAY VERNIER	6	CCW		
	EXT. INPUT LEVEL	7	—		
	MODE	8	NORM		
	PULSE WIDTH	9	2.5n – 10n		
	WIDTH VERNIER	10	CCW		
	OFFSET A	11	OFF		
	OFFSET A VERNIER	12	—		
	AMPLITUDE A	13	4.0 – 2.0		
	AMPLITUDE B	14	4.0 – 2.0		
	AMPLITUDE VERNIER	15	CW		
	OFFSET B	16	OFF		
	OFFSET B VERNIER	17	—		
	POS-NEG	19	POS		
	TRIGGER AMPLITUDE	22	1V		
	SLOPE/POLARITY	23	+		
2	Adjust to obtain min. repetition rate.			A1 R68	
3	Measure the waveform at TP,1 using the sampling probe and 10:1 divider			A1 R126	Max pulse amplitude without shifting the baseline.
4	Monitor the waveform at TP,2			A1 R168	Max pulse amplitude
5	Check correct performance at 200MHz.				Amplitude must not decrease at 200MHz.

Table 5–24. Internal Checks and Adjustments–Timing (cond't).

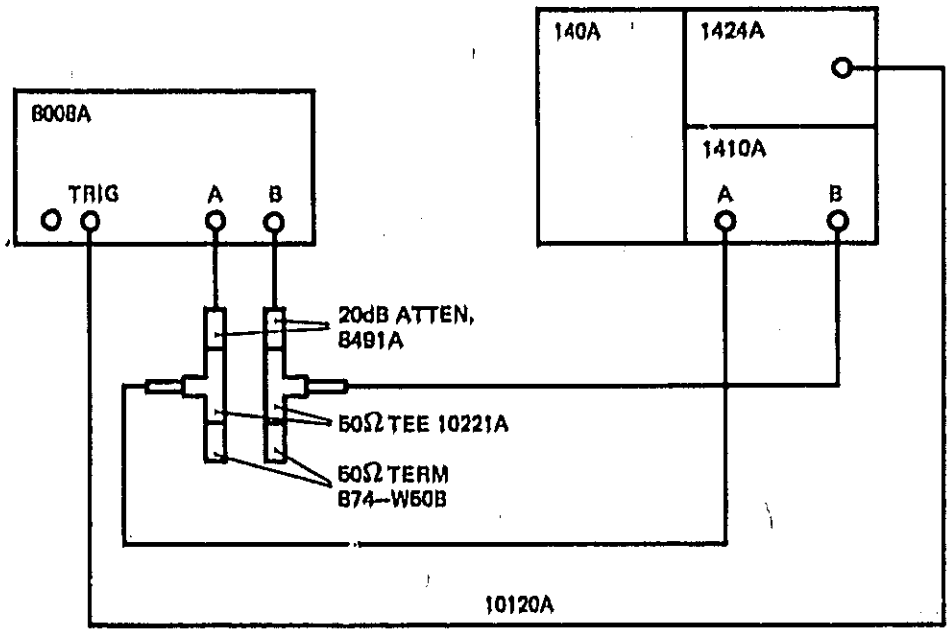
STEP	INSTRUCTION	ADJUST	RESULT
6	Switch to DOUBLE PULSE and monitor the waveform at TP3. Adjust the pulse delay vernier for a distance of 10ns between pulses	A1 R175	Equal pulse amplitude
7	Return the delay vernier to the CCW position and the DOUBLE PULSE/DELAY switch to DELAY.		
8	Monitor the waveform at TP4,with sampling probe and 10:1 divider	A1 R216	Max pulse amplitude without shifting the baseline.
9	Monitor the waveform at TP5	A1 R258	Max pulse amplitude
10	Verify steps 8 and 9 at 200 MHz rep.rate.		≥ 0.8V
11	Switch the mode switch (8) to GATE		
12	Turn the EXT INPUT LEVEL control from −1V to +1V and check that the trigger output disappears as the control passes the zero point.		
13	Set the SLOPE/POLARITY switch (23) to −.		
14	Turn the EXT INPUT LEVEL control from +1V to −1V and check that the trigger output disappears as the control passes the zero point.		
15	Switch back to NORM mode		
16	Connect the equipment as shown below:		



17	Turn the rate vernier (3) fully CCW and measure the repetition rate	A1 C95	205 MHz

Table 5–24 Internal Checks and Adjustments–Timing (cond't).

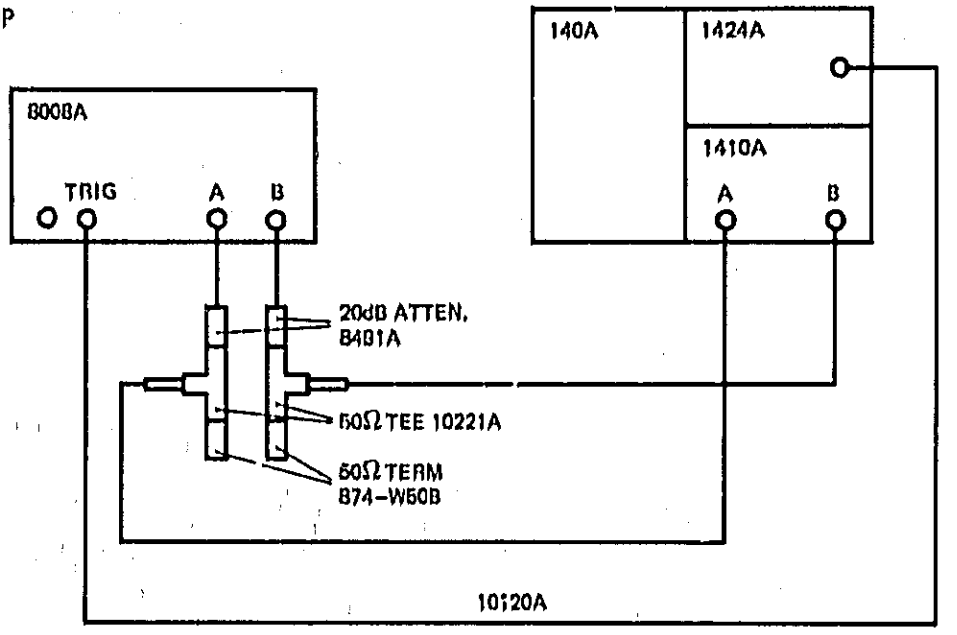
STEP	INSTRUCTION	ADJUST	RESULT
18	Connect the equipment as shown below:		



19	Turn the width vernier fully CCW and measure the pulse width	A4 R145	2.4ns

Table 5–25. Internal Checks and Adjustments – Output Amplifier (A4)

TEST SET–UP



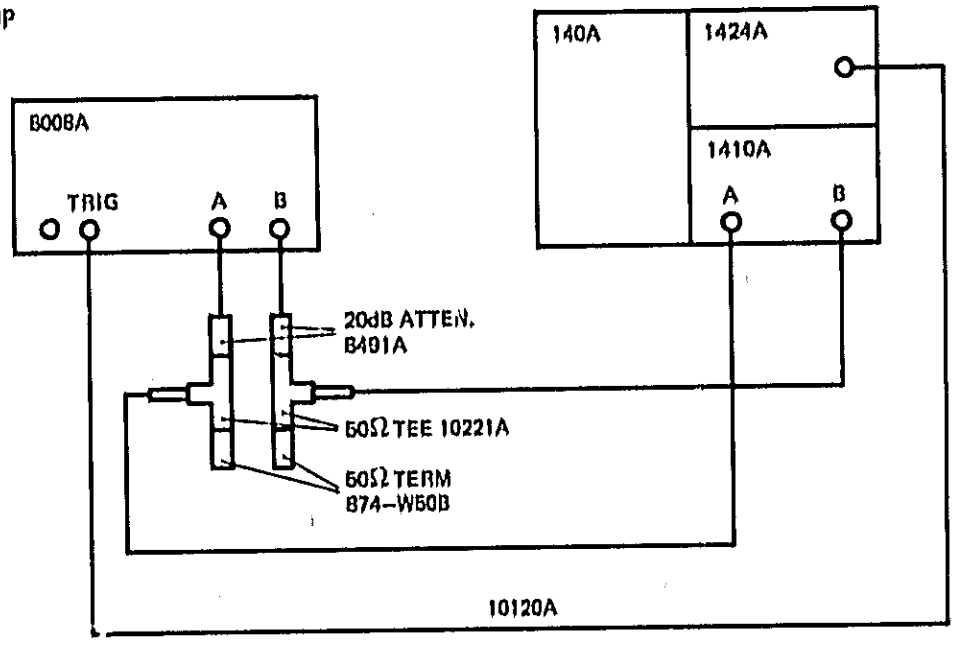
STEP	INSTRUCTION –		ADJUST	RESULT
1	Set the controls of 8008A as follows:			
	PULSE PERIOD	2	5n – 20n	
	PERIOD VERNIER	3	CW	
	DOUBLE PULSE/DELAY	4	DELAY	
	PULSE DELAY	5	2,5n – 10n	
	DELAY VERNIER	6	CCW	
	EXT. INPUT LEVEL	7	—	
	MODE	8	NORM	
	PULSE WIDTH	9	10n –50n	
	WIDTH VERNIER	10	See below	
	OFFSET A	11	OFF	
	OFFSET A VERNIER	12	—	
	AMPLITUDE A	13	4 0 – 2.0	
	AMPLITUDE B	14	4 0 2 0	
	AMPLITUDE VERNIER	15	C\	
	OFFSET B	16	OFF	
	OFFSET B VERNIER	17	—	
	POS-NEG	19	POS	
	TRIGGER AMPLITUDE	22	0,2V	
	SLOPE/POLARITY	23	+	
2	Adjust the width vernier for a 50% duty cyle.			
3	Adjust the 1410A channel A sensitivity control for a 10 div. amplitude pulse		A4 R26	4% Overshoot on leading edge.

Table 5–25. Internal Checks and Adjustments – Output Amplifier (A4) (cond't).

STEP	INSTRUCTION	ADJUST	RESULT
4	Repeat 3 for channel B	A4 R25	4% Overshoot on trailing edge
5	Turn the 8008A amplitude vernier fully CCW and readjust the 1410 sensitivity control for a 10 div. amplitude pulse	A4 R89	7% overshoot on leading edge.
6	Turn the amplitude vernier fully CW		> 4V Pulse amplitude
7	Turn the amplitude vernier fully CCW		<2V Pulse amplitude
8	Switch the 1410A to 50mV/div. sensitivity and adjust the trace so that zero volts corresponds to the centre line of the graticule.		
9	Switch POS–NEG switch (19) to NEG and monitor OUTPUT A	A4 R73	Centre baseline on graticule centre (0V)
10	Turn amplitude vernier (15) from CCW to CW	A4 R77	Stationary baseline
11	Repeat 10 and 11 as necessary		
12	Using the procedure of step 9 monitor OUTPUT B	A4 R86	Centre baseline on graticule centre (0V)
13	Turn amplitude vernier (15) from CW to CCW	A4 R82	Stationary baseline
14	Repeat 13 and 14 as required.		
15	Measure rise time		≤ 1.2ns
16	Measure fall time		≤ 1.2ns
17	Repeat 15 and 16 at 200 MHz		≤ 1.2ns

Table 5–26. Internal Checks and Adjustments – ECL Amplitude

TEST SET–UP



STEP	INSTRUCTION			ADJUST	RESULT
1	Set the controls of 8008A as follows:				
	PULSE PERIOD	2	5n – 20n		
	PERIOD VERNIER	3	CW		
	DOUBLE PULSE/DELAY	4	DELAY		
	PULSE DELAY	5	2,5n – 10n		
	DELAY VERNIER	6	CCW		
	EXT. INPUT LEVEL	7	—		
	MODE	8	NORM		
	PULSE WIDTH	9	10n – 50n		
	WIDTH VERNIER	10	CCW		
	OFFSET A	11	OFF		
	OFFSET A VERNIER	12	—		
	AMPLITUDE A	13	ECL		
	AMPLITUDE B	14	4,0 – 2,0		
	AMPLITUDE VERNIER	15	CCW		
	OFFSET B	16	OFF		
	OFFSET B VERNIER	17	—		
	POS-NEG	19	POS		
	TRIGGER AMPLITUDE	22	0,2V		
	SLOPE/POLARITY	23	+		
2	Monitor pulse OUTPUT A			A6 R47	0,8V Amplitude
				A6 R49	–1,7V Baseline
3	Switch Amplitude A to 4,0 – 2,0V				
4	Switch Amplitude B to ECL				
5	Monitor OUTPUT B			A6 R48	–1,7V Baseline

PARTS LIST

6–1 INTRODUCTION

6–2 This section contains the circuits, component location diagrams and the lists of replaceable parts. Waveforms shown with the circuits are included for guidance only and failure to observe identical results should not be automatically taken as indication of a fault. Tables 6–1 and 6–2 provide information relating to the replaceable parts lists and the circuit diagrams.

Table 6–1 Reference Designators

A	=	assembly	MC	=	micro-circuit
B	=	motor	P	=	plug
BT	=	battery	Q	=	transitor
C	=	capacitor	R	=	resistor
CP	=	coupler	RT	=	thermistor
CR	=	diode	S	=	switch
DL	=	delay line	T	=	transformer
DS	=	lamp	TB	=	terminal board
F	=	fuse	V	=	vacuum, tube, neon bulb, photocell, etc.
FL	=	filter			
HR	=	heater	VR	=	voltage regulator
J	=	jack	W	=	cable
K	=	relay	X	=	socket
L	=	inductor	Y	=	crystal
M	=	meter	TP	=	test point

Table 6–2 Diagram Notes

Resistance in ohms, capacitance in microfarads, inductance in microhenries unless other noted

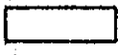
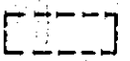
P/O	=	Part of
•		denotes a factory selected value. Values shown are typical.
	=	Screwdriver adjustment
		Encloses front panel nomenclature
		Encloses rear panel nomenclature

Table 6–2. Diagram Notes (cont'd)

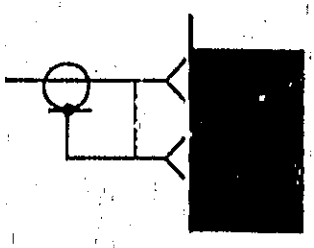
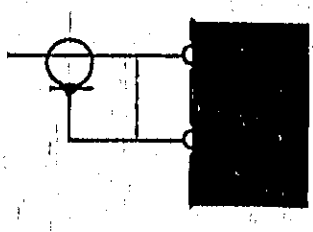
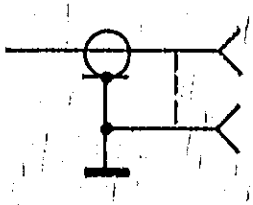
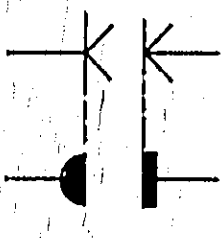
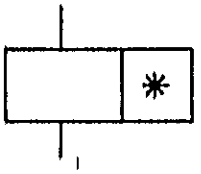
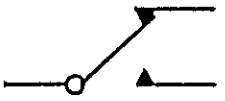
– 9 4 7 –	Denotes wire colour using resistor colour code e.g. 947 = white, yellow and violet (first number is body colour).
	Denotes zener diode.
	Denotes tunner diode.
	Denotes Ground (Chassis)
	Co-axial Connector – on circuit board.
	Co-axial Connector – bolt down cable bush.
	Co-axial connector – bulkhead mounted.
	Edge connector
	Spring contact connector

Table 6–2. Diagram Notes (cont'd)

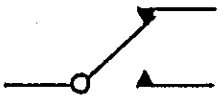
- Soldered connection or single pin and plug connection.

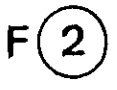


- Relay ; *; number of contact sets



- Relay contacts.





- Denotes the destination of the output from a circuit; in this case Input F of drawing 2.

6–3 ORDERING INFORMATION

6–4 General

6–5 The replaceable parts tableslist parts in alphanumerical order of their reference designaters and indicate the description and HP stock number of each part, together with any applicable notes.

6–6 To order a replacement part, address order of enquiry either to your authorized Hewlett-Packard sales representative or to:

CUSTOMER SERVICE
Hewlett-Packard Company,
333 Logue Avenue,
Mountain View, California 94040

or, in Western Europe, to:

Hewlett-Packard (Schweiz) SA
Rue du Bois-du-Lan 7
1217 Meyrin 2
Geneva

6–7 Specify the following information for each part:

a) Model and complete serial number of instrument.

b) Hewlett-Packard stock number.

c) Circuit reference stock number.

d) Description.

To order a part not listed, give a complete description of the part and include its function and location.

Replaceable Parts-Frame

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM		COMPONENT LAYOUT
			SHEET NUMBER	GRID REFERENCE	
T1	9280-0568	TRANSFORMER PWR			
A1	08608-66501	BOARD-AY TIMING			
A2	08608-66502	BOARD-AY TIMG SW			
A3	08608-66503	BOARD-AY PS			
A4	08608-66504	BOARD AY-OUT AMP			
A5	08608-66505	BOARD AY-CONN			
A6	08608-66506	BOARD AY-OUT SW			
J1	2110-0567	PWR 3 PIN			
J2	2110-0707	PWR 6 PIN			
MP2	9280-0760	ATT PACAMOUT			
MP3	08608-00201	PANEL-FRONT			
MP4	08608-00703	CHSIS-HEAT SINK			
MP5	08608-21101	HEAT *,HW			
U2	1854-0072	XSTR 2N3054 SI			
Q6	1854-0672	SAME AS Q	2		
Q10	1854-0672	SAME AS Q	2		
Q14	1854-0672	SAME AS Q	2		
R1	2100-2290	R-VAR 500 +5%			
R2	2100-3081	R-VAR 50K +25% EC			
R3	2100-2574	R-VAR 1K +25%			
R4	2100-2590	SAME AS R	3		
R5	2100-2492	R-VAR 5K 20% +5%			
R6	2100-2635	R-VAR 50K +5%			
R7	2100-2635	SAME AS R	6		
S2	3101-0092	SW-P-BTN SPST			
S14	3101-1244	SW P-BTN SPDT			
W1	8120-1692	PWR CORD SET			
XQ	5060-1181	MTG HDW-THERMOL			

A1 TIMING BOARD
A2 TIMING SWITCH BOARD
A3 POWER SUPPLY BOARD
A4 OUTPUT AMPLIFIER BOARD
A5 CONNECTOR BOARD
A6 OUTPUT SWITCH BOARD

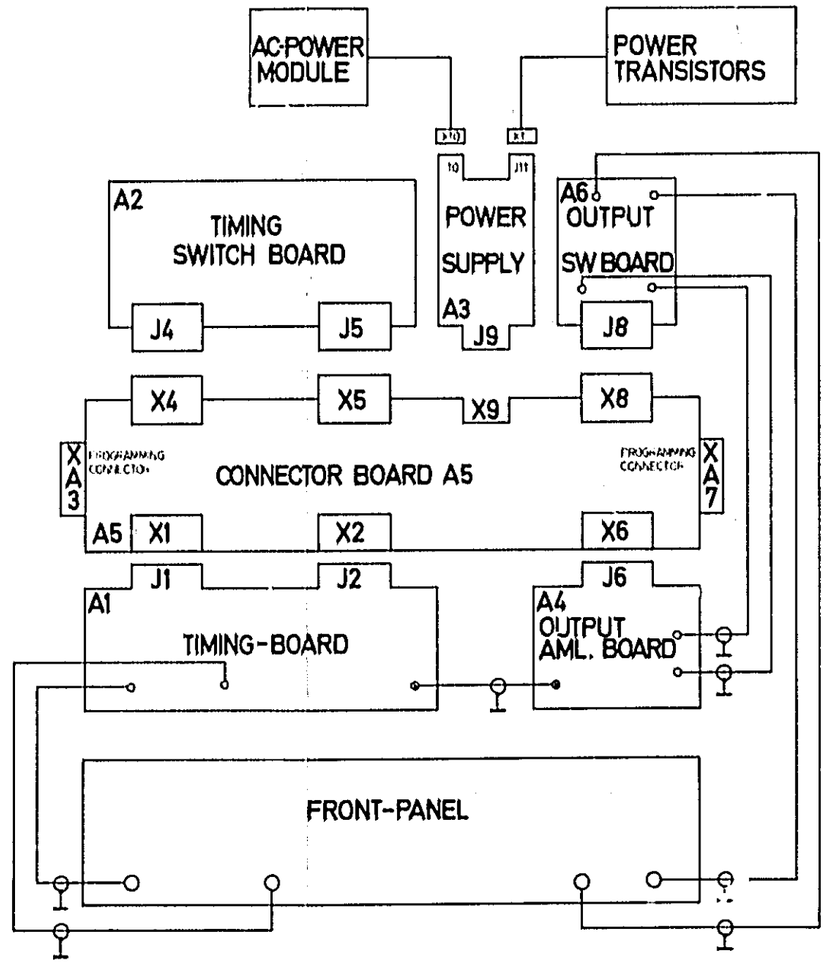
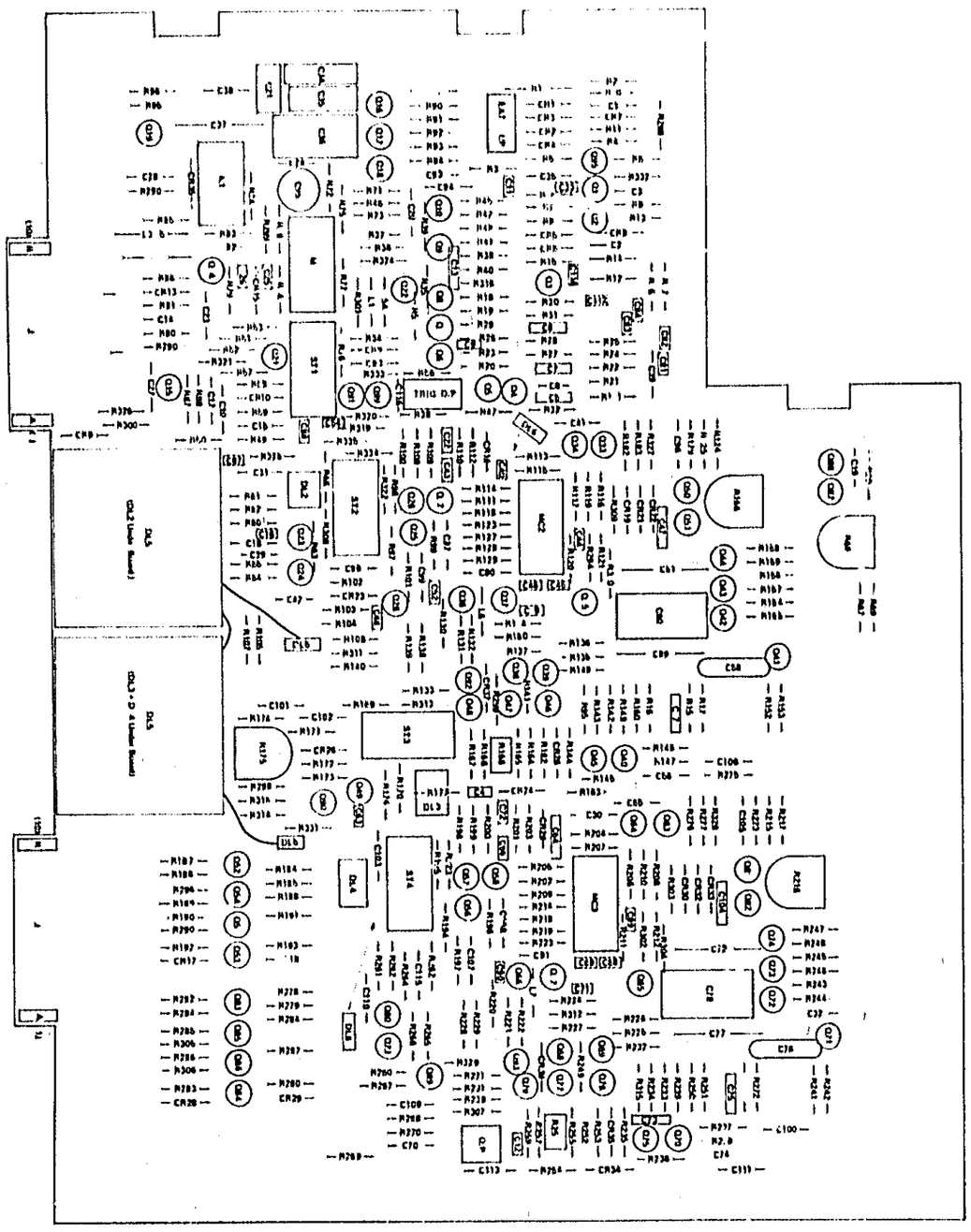


Figure 6-1. Interconnections

A1 Board Layout



A1 Replaceable Parts — Timing Board

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1	[illegible]	[illegible]			
A1	C2	[illegible]			
A1	C3	[illegible]			
A1	C4	[illegible]			
A1	C5	[illegible]			
A1	C6	[illegible]			
A1	C7	[illegible]			
A1	C8	[illegible]			
A1	C9	[illegible]			
A1	C10	[illegible]			
A1	C11	[illegible]			
A1	C12	[illegible]			
A1	C13	[illegible]			
A1	C14	[illegible]			
A1	C15	[illegible]			
A1	C16	[illegible]			
A1	C17	[illegible]			
A1	C18	[illegible]			
A1	C19	[illegible]			
A1	C20	[illegible]			
A1	C21	[illegible]			
A1	C22	[illegible]			
A1	C23	[illegible]			
A1	C24	[illegible]			
A1	C25	[illegible]			
A1	C26	[illegible]			
A1	C27	[illegible]			
A1	C28	[illegible]			
A1	C29	[illegible]			
A1	C30	[illegible]			
A1	C31	[illegible]			
A1	C32	[illegible]			
A1	C33	[illegible]			
A1	C34	[illegible]			
A1	C35	[illegible]			
A1	C36	[illegible]			
A1	C37	[illegible]			
A1	C38	[illegible]			
A1	C39	[illegible]			
A1	C40	[illegible]			
A1	C41	[illegible]			
A1	C42	[illegible]			
A1	C43	[illegible]			
A1	C44	[illegible]			
A1	C45	[illegible]			
A1	C46	[illegible]			
A1	C47	[illegible]			
A1	C48	[illegible]			
A1	C49	[illegible]			
A1	C50	[illegible]			
A1	C51	[illegible]			
A1	C52	[illegible]			
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A1	C56	[illegible]			
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A1	C58	[illegible]			
A1	C59	[illegible]			
A1	C60	[illegible]			
A1	C61	[illegible]			
A1	C62	[illegible]			
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A1	C64	[illegible]			
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A1	C67	[illegible]			
A1	C68	[illegible]			
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A1	C73	[illegible]			
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A1	C85	[illegible]			
A1	C86	[illegible]			
A1	C87	[illegible]			
A1	C88	[illegible]			
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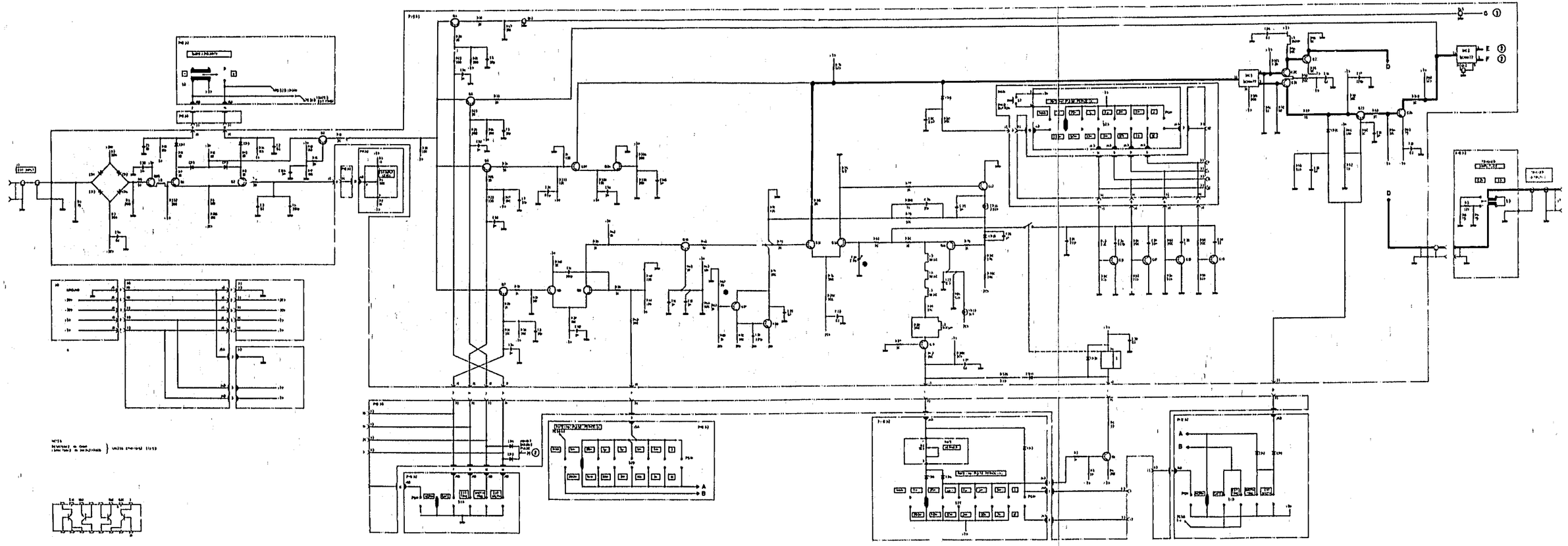
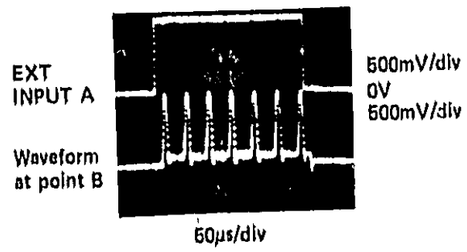
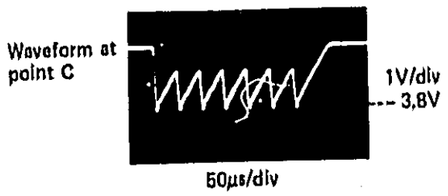
A1	C90	[illegible]			



1a Rep. Rate Generator

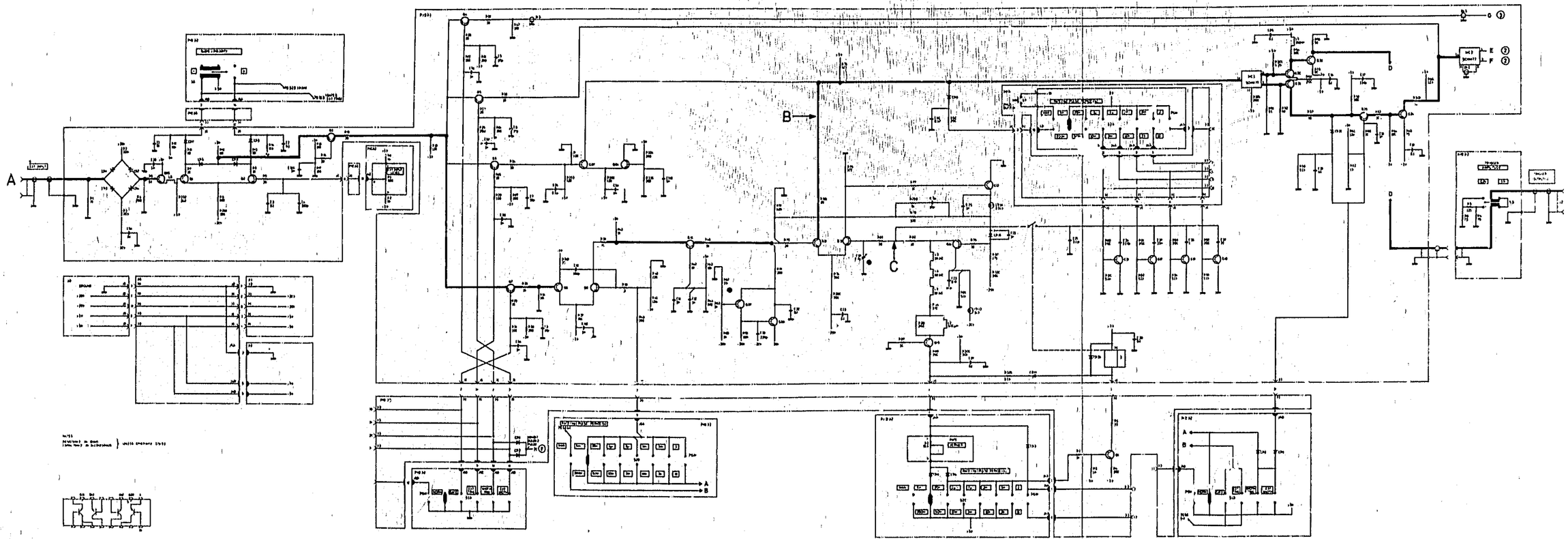




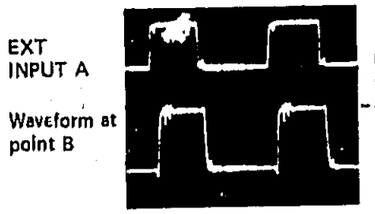
A1 Replaceable Parts (cont'd)

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1 C91	0150-0084	C=P .1UF 100V			
A1 C92	0160-2327	C=P .001UF 100V			
A1 C93	0150-0084	C=P .1UF 100V			
A1 C94	0150-0084	C=P .1UF 100V			
A1 C95	0121-0047	C-VAR 2-8PF			
A1 C96	0150-0084	C=P .1UF 100V			
A1 C97	0150-0084	C=P .1UF 100V			
A1 C98	0150-0084	C=P .1UF 100V			
A1 C99	0150-0084	C=P .1UF 100V			
A1 C100	0150-0084	C=P .1UF 100V			
A1 C101	0150-0084	C=P .1UF 100V			
A1 C102	0150-0084	C=P .1UF 100V			
A1 C103	0150-0084	C=P .1UF 100V			
A1 C104	0160-2139	C=P 270PF 1KV			
A1 C105	0150-0084	C=P .1UF 100V			
A1 C106	0150-0084	C=P .1UF 100V			
A1 C107	0150-0084	C=P .1UF 100V			
A1 C108	0150-0084	C=P .1UF 100V			
A1 C109	0150-0084	C=P .1UF 100V			
A1 C110	0150-0084	C=P .1UF 100V			
A1 C111	0150-0084	C=P .1UF 100V			
A1 C112	0160-2327	C=P .001UF 100V			
A1 C113	0150-0084	C=P .1UF 100V			
A1 C114	0160-2327	C=P .001UF 100V			
A1 C115	0150-0084	C=P .1UF 100V			
A1 C117	0160-2327	C=P .001UF 100V			
A1 CR1	1901-0179	DIO SI 15V .75W5			
A1 CR2	1901-0179	DIO SI 15V .75W5			
A1 CR3	1901-0179	DIO SI 15V .75W5			
A1 CR4	1901-0179	DIO SI 15V .75W5			
A1 CR5	1901-0179	DIO SI 15V .75W5			
A1 CR6	1901-0179	DIO SI 15V .75W5			
A1 CR7	1901-0179	DIO SI 15V .75W5			
A1 CR8	1901-0179	DIO SI 15V .75W5			
A1 CR9	1901-0179	DIO SI 15V .75W5			
A1 CR10	1901-0179	DIO SI 15V .75W5			
A1 CR11	1901-0040	DIO SI 30V .03A			
A1 CR12	1902-0025	DIO MATCH 10.0 V			
A1 CR13	1902-0126	DIO MATCH 7.81 V			
A1 CR14	1901-0040	DIO SI 30V .03A			
A1 CR15	1910-0023	DIO-INL GE			
A1 CR16	1901-0040	DIO SI 30V .03A			
A1 CR17	1901-0040	DIO SI 30V .03A			
A1 CR18	1901-0040	DIO SI 30V .03A			
A1 CR19	1901-0040	DIO SI 30V .03A			
A1 CR21	1901-0040	DIO SI 30V .03A			
A1 CR22	1901-0040	DIO SI 30V .03A			
A1 CR23	1901-0179	DIO SI 15V .75W5			
A1 CR24	1901-0040	DIO SI 30V .03A			
A1 CR26	1901-0179	DIO SI 15V .75W5			
A1 CR27	1910-0023	DIO-INL GE			
A1 CR28	1901-0040	DIO SI 30V .03A			
A1 CR29	1901-0040	DIO SI 30V .03A			
A1 CR30	1901-0040	DIO SI 30V .03A			
A1 CR31	1901-0040	DIO SI 30V .03A			
A1 CR33	1901-0040	DIO SI 30V .03A			
A1 CR34	1901-0040	DIO SI 30V .03A			
A1 CR35	1901-0040	DIO SI 30V .03A			
A1 CR37	1901-0179	DIO SI 15V .75W5			
A1 CR38	1901-0179	DIO SI 15V .75W5			
A1 L1	9100-2264	COIL-EMORE 45UH			
A1 L2	9140-0117	COIL-EMORE 500UH			
A1 L3	9170-0016	BEAD SMLD			
A1 L4	9170-0016	BEAD SMLD			
A1 L5	9170-0016	BEAD SMLD			
A1 L6	9100-2598	COIL-EMORE			
A1 L6	9170-0016	BEAD SMLD			
A1 L7	9100-0346	COIL PRD			
A1 L8	9170-0016	BEAD SMLD			
A1 MC1	1820-0285	IC 280MHZ 16PIN			
A1 MC2	1820-0285	IC 280MHZ 16PIN			
A1 MC3	1820-0285	IC 280MHZ 16PIN			
A1 MC4	1820-0285	IC 280MHZ 16PIN			
A1 MC5	1858-0029	ASTR ARRAY AVCRO			
A1 MC6	1858-0029	ASTR ARRAY AVCRO			
A1 MC7	1858-0029	ASTR ARRAY AVCRO			
A1 Q1	1854-0345	ASTR 2N5179 SI			
A1 Q2	1854-0345	ASTR 2N5179 SI			
A1 Q3	1853-0203	ASTR SI PNP			
A1 Q4	1854-0345	ASTR 2N5179 SI			
A1 Q5	1854-0345	ASTR 2N5179 SI			
A1 Q6	1854-0345	ASTR 2N5179 SI			
A1 Q7	1854-0345	ASTR 2N5179 SI			
A1 Q8	1854-0345	ASTR 2N5179 SI			
A1 Q9	1854-0345	ASTR 2N5179 SI			
A1 Q10	1853-0218	ASTR SI PNP			

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1 Q12	1853-0218	ASTR SI PNP			
A1 Q13	1853-0203	ASTR SI PNP			
A1 Q14	1853-0203	ASTR SI PNP			
A1 Q17	1853-0203	ASTR SI PNP			
A1 Q18	1853-0203	ASTR SI PNP			
A1 Q19	1853-0203	ASTR SI PNP			
A1 Q21	1854-0442	ASTR SI NPN			
A1 Q22	1853-0218	ASTR SI PNP			
A1 Q23	1853-0203	ASTR SI PNP			
A1 Q24	1854-0345	ASTR 2N5179 SI			
A1 Q25	1854-0345	ASTR 2N5179 SI			
A1 Q26	1854-0345	ASTR 2N5179 SI			
A1 Q27	1853-0018	ASTR SI PNP			
A1 Q28	1853-0203	ASTR SI PNP			
A1 Q33	1854-0345	ASTR 2N5179 SI			
A1 Q34	1854-0345	ASTR 2N5179 SI			
A1 Q35	1854-0345	ASTR 2N5179 SI			
A1 Q36	1853-0218	ASTR SI PNP			
A1 Q37	1853-0203	ASTR SI PNP			
A1 Q38	1854-0345	ASTR 2N5179 SI			
A1 Q39	1854-0345	ASTR 2N5179 SI			
A1 Q40	1853-0218	ASTR SI PNP			
A1 Q41	1853-0203	ASTR SI PNP			
A1 Q42	1853-0203	ASTR SI PNP			
A1 Q43	1853-0203	ASTR SI PNP			
A1 Q44	1853-0203	ASTR SI PNP			
A1 Q45	1854-0345	ASTR 2N5179 SI			
A1 Q46	1854-0345	ASTR 2N5179 SI			
A1 Q47	1853-0203	ASTR SI PNP			
A1 Q48	1854-0345	ASTR 2N5179 SI			
A1 Q49	1854-0345	ASTR 2N5179 SI			
A1 Q50	1853-0203	ASTR SI PNP			
A1 Q51	1853-0203	ASTR SI PNP			
A1 Q52	1853-0218	ASTR SI PNP			
A1 Q53	1854-0329	ASTR SI NPN			
A1 Q54	1854-0329	ASTR SI NPN			
A1 Q55	1853-0018	ASTR SI PNP			
A1 Q56	1854-0345	ASTR 2N5179 SI			
A1 Q57	1854-0345	ASTR 2N5179 SI			
A1 Q58	1853-0018	ASTR SI PNP			
A1 Q62	1854-0345	ASTR 2N5179 SI			
A1 Q64	1854-0345	ASTR 2N5179 SI			
A1 Q65	1854-0345	ASTR 2N5179 SI			
A1 Q66	1853-0018	ASTR SI PNP			
A1 Q67	1853-0203	ASTR SI PNP			
A1 Q68	1854-0345	ASTR 2N5179 SI			
A1 Q69	1854-0345	ASTR 2N5179 SI			
A1 Q70	1853-0218	ASTR SI PNP			
A1 Q71	1853-0203	ASTR SI PNP			
A1 Q72	1853-0203	ASTR SI PNP			
A1 Q73	1853-0203	ASTR SI PNP			
A1 Q74	1853-0203	ASTR SI PNP			
A1 Q75	1854-0345	ASTR 2N5179 SI			
A1 Q76	1854-0345	ASTR 2N5179 SI			
A1 Q77	1853-0203	ASTR SI PNP			
A1 Q78	1854-0345	ASTR 2N5179 SI			
A1 Q79	1854-0345	ASTR 2N5179 SI			
A1 Q80	1854-0345	ASTR 2N5179 SI			
A1 Q81	1853-0203	ASTR SI PNP			
A1 Q82	1853-0203	ASTR SI PNP			
A1 Q83	1853-0036	ASTR SI PNP			
A1 Q84	1854-0329	ASTR SI NPN			
A1 Q85	1854-0329	ASTR SI NPN			
A1 Q86	1853-0036	ASTR SI PNP			
A1 Q87	1853-0036	ASTR SI PNP			
A1 Q88	1854-0329	ASTR SI NPN			
A1 Q89	1853-0018	ASTR SI PNP			
A1 Q90	1854-0345	ASTR 2N5179 SI			
A1 Q91	1853-0218	ASTR SI PNP			
A1 Q92	1854-0345	ASTR 2N5179 SI			
A1 Q93	1854-0345	ASTR 2N5179 SI			
A1 Q94	1853-0218	ASTR SI PNP			
A1 Q95	1854-0345	ASTR 2N5179 SI			
A1 R1	0698-0080	R=F 75 5% .25W F			
A1 R2	0698-4261	R=F 2K5% .125W F			
A1 R3	0698-4261	R=F 2K5% .125W F			
A1 R4	0698-4238	R=F 200 5% .125W			
A1 R5	0698-0124	R=F 51 5% .125W			
A1 R6	0698-4252	R=F 820 5% .125W			
A1 R7	0698-8802	R=F 10 5% .125W			
A1 R8	0698-8802	R=F 10 5% .125W			
A1 R9	0698-8744	R=F 20 5% .125W			
A1 R10	0698-4278	R=F 10K5% .125W			
A1 R11	0698-8802	R=F 10 5% .125W			
A1 R12	0698-4232	R=F 110 5% .125W			
A1 R13	0698-8802	R=F 10 5% .125W			
A1 R14	0698-4278	R=F 10K5% .125W			
A1 R15	0698-8744	R=F 20 5% .125W			



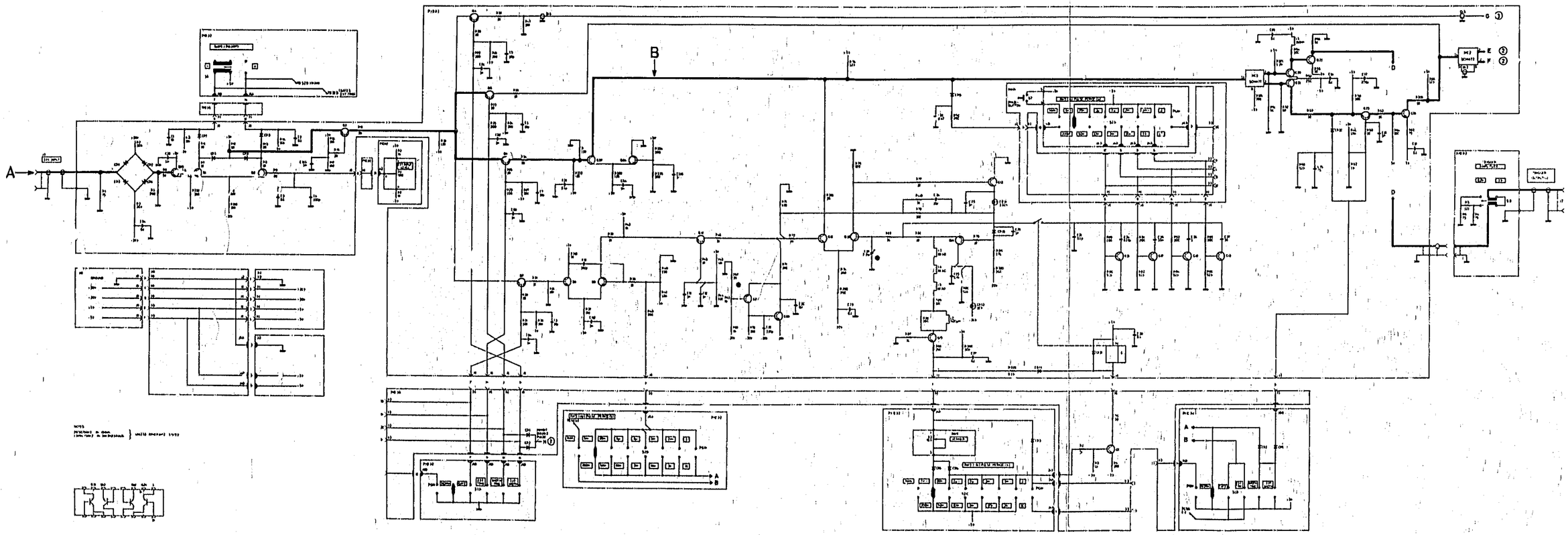
1b Rep. Rate Generator (Gate Mode)



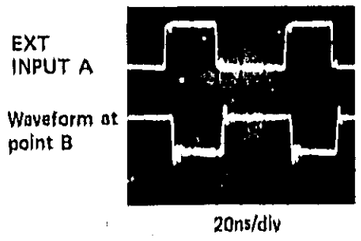
A1 Replaceable Parts (cont'd)

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1 R16	0698-4235	R=F 150 5% .125W			
A1 R17	0698-4235	R=F 150 5% .125W			
A1 R18	0730-0124	R=F 51 5% .125W			
A1 R19	0698-4234	R=F 130 5% .125W			
A1 R20	0698-6744	R=F 20 5% .125W			
A1 R21	0698-4245	R=F 390 5% .125W			
A1 R22	0698-4243	R=F 330 5% .125W			
A1 R23	0698-6744	R=F 20 5% .125W			
A1 R24	0698-4245	R=F 390 5% .125W			
A1 R25	0698-4238	R=F 200 5% .125W			
A1 R26	0698-6744	R=F 20 5% .125W			
A1 R27	0698-4245	R=F 390 5% .125W			
A1 R28	0698-4243	R=F 330 5% .125W			
A1 R29	0698-6744	R=F 20 5% .125W			
A1 R30	0698-4245	R=F 390 5% .125W			
A1 R31	0698-4243	R=F 330 5% .125W			
A1 R32	0698-6744	R=F 20 5% .125W			
A1 R33	0698-6802	R=F 10 5% .125W			
A1 R34	0698-6802	R=F 10 5% .125W			
A1 R35	0698-6802	R=F 10 5% .125W			
A1 R36	0758-0086	R=F 100 5% .125W			
A1 R37	0698-4235	R=F 150 5% .125W			
A1 R38	0698-6802	R=F 10 5% .125W			
A1 R39	0698-6802	R=F 10 5% .125W			
A1 R40	0698-4239	R=F 220 5% .125W			
A1 R41	0698-6760	R=F 1.69K5% .125W			
A1 R42	0698-4231	R=F 91 5% .125W			
A1 R43	0698-4256	R=F 1.28K5% .125W			
A1 R44	0698-4252	R=F 820 5% .125W			
A1 R45	0698-6802	R=F 10 5% .125W			
A1 R46	0758-0124	R=F 51 5% .125W			
A1 R47	0758-0086	R=F 100 5% .125W			
A1 R48	0698-4245	R=F 390 5% .125W			
A1 R49	0698-4278	R=F 10K5% .125W			
A1 R50	0698-4238	R=F 200 5% .125W			
A1 R51	0730-0124	R=F 51 5% .125W			
A1 R52	0698-4226	R=F 82 5% .125W			
A1 R53	0698-4238	R=F 200 5% .125W			
A1 R54	0758-0086	R=F 100 5% .125W			
A1 R55	0698-5701	R=F 27 5% .125W			
A1 R56	0758-0124	R=F 51 5% .125W			
A1 R57	0698-6802	R=F 10 5% .125W			
A1 R58	0758-0086	R=F 100 5% .125W			
A1 R59	0698-4271	R=F 5.11K5% .125W			
A1 R60	0698-6802	R=F 10 5% .125W			
A1 R61	0698-4258	R=F 1.5K5% .125W			
A1 R62	0698-4254	R=F 1K5% .125W F			
A1 R63	0698-6802	R=F 10 5% .125W			
A1 R64	0758-0086	R=F 100 5% .125W			
A1 R65	0698-4229	R=F 75 5% .125W			
A1 R66	0698-4258	R=F 1.5K5% .125W			
A1 R67	0698-4263	R=F 2.43K5% .125W			
A1 R68	2100-2803	R-VAR 1K .5W			
A1 R69	0698-4265	R=F 3K16 .125W F			
A1 R70	0698-6744	R=F 20C 5% .125W			
A1 R71	0698-4247	R=F 500 5% .125W			
A1 R72	0698-6744	R=F 20 5% .125W			
A1 R73	0698-4249	R=F 620 5% .125W			
A1 R74	0698-4244	R=F 360 5% .125W			
A1 R75	0698-4233	R=F 150 5% .125W			
A1 R76	0698-4258	R=F 1.5K5% .125W			
A1 R77	0698-6802	R=F 10 5% .125W			
A1 R78	0758-0086	R=F 100 5% .125W			
A1 R79	0698-6802	R=F 10 5% .125W			
A1 R80	0698-4261	R=F 2.1C 5% .125W			
A1 R81	0698-4231	R=F 9.1K5% .125W			
A1 R82	0698-6802	R=F 10 5% .125W			
A1 R83	0698-5702	R=F 30 5% .125W			
A1 R84	0758-0086	R=F 100 5% .125W			
A1 R85	0698-6744	R=F 20 5% .125W			
A1 R86	0698-6802	R=F 10 5% .125W			
A1 R87	0698-4235	R=F 150 5% .125W			
A1 R88	0698-4238	R=F 200 5% .125W			
A1 R89	0698-4271	R=F 5.11K5% .125W			
A1 R90	0698-4271	R=F 5.11K5% .125W			
A1 R91	0698-4278	R=F 10K5% .125W			
A1 R92	0698-4271	R=F 5.11K5% .125W			
A1 R93	0698-4238	R=F 200 5% .125W			
A1 R94	0698-4271	R=F 5.11K5% .125W			
A1 R95	0698-4238	R=F 200 5% .125W			
A1 R96	0698-4271	R=F 5.11K5% .125W			
A1 R97	0730-0124	R=F 51 5% .125W			
A1 R98	0730-0124	R=F 51 5% .125W			
A1 R99	0698-4242	R=F 300 5% .125W			
A1 R100	0698-4236	R=F 180 5% .125W			
A1 R101	0698-4254	R=F 1K5% .125W F			
A1 R102	0698-4256	R=F 1.28K5% .125W			
A1 R103	0698-4258	R=F 1.5K5% .125W			
A1 R104	0698-4254	R=F 1K5% .125W F			
A1 R105	0698-4258	R=F 1.5K5% .125W			
A1 R106	0698-4263	R=F 2.43K5% .125W			
A1 R107	0698-4247	R=F 500 5% .125W			
A1 R108	0698-4237	R=F 160 5% .125W			
A1 R109	0698-4258	R=F 1.5K5% .125W			
A1 R110	0698-4254	R=F 1K5% .125W F			
A1 R111	0698-6802	R=F 10 5% .125W			

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1 R112	0698-4229	R=F 75 5% .125W			
A1 R113	0698-4251	R=F 750 5% .125W			
A1 R115	0757-0124	R=F 51 5% .125W			
A1 R116	0698-4235	R=F 150 5% .125W			
A1 R117	0758-0124	R=F 51 5% .125W			
A1 R118	0698-6744	R=F 20 5% .125W			
A1 R119	0698-4240	R=F 240 5% .125W			
A1 R120	0698-6744	R=F 20 5% .125W			
A1 R121	0698-4235	R=F 150 5% .125W			
A1 R123	0698-4238	R=F 200 5% .125W			
A1 R124	0698-4265	R=F 3K0 5% .125W			
A1 R125	0758-0086	R=F 100 5% .125W			
A1 R126	2100-2796	R-VAR 100 .5W			
A1 R127	0698-6744	R=F 20 5% .125W			
A1 R128	0698-4237	R=F 180 5% .125W			
A1 R129	0683-0275	R=F 2.7 5% .25W			
A1 R130	0698-6802	R=F 10 5% .125W			
A1 R131	0698-6802	R=F 10 5% .125W			
A1 R132	0698-4227	R=F 68 5% .125W			
A1 R133	0698-4253	R=F 910 5% .125W			
A1 R134	0698-6744	R=F 20 5% .125W			
A1 R135	0698-4258	R=F 1.5K5% .125W			
A1 R136	0698-4254	R=F 1K5% .125W F			
A1 R137	0698-6802	R=F 10 5% .125W			
A1 R138	0698-4258	R=F 1.5K5% .125W			
A1 R139	0698-4254	R=F 1K5% .125W F			
A1 R140	0698-4265	R=F 3K5% .125W F			
A1 R141	0758-0086	R=F 100 5% .125W			
A1 R142	0698-4235	R=F 150 5% .125W			
A1 R143	0698-6744	R=F 20 5% .125W			
A1 R144	0698-6802	R=F 10 5% .125W			
A1 R145	0758-0124	R=F 51 5% .125W			
A1 R146	0698-4244	R=F 360 5% .125W			
A1 R147	0698-6744	R=F 20 5% .125W			
A1 R148	0698-6802	R=F 10 5% .125W			
A1 R149	0698-6744	R=F 20 5% .125W			
A1 R150	0698-4246	R=F 470 5% .125W			
A1 R151	0698-5705	R=F 39 5% .125W			
A1 R152	0698-4238	R=F 200 5% .125W			
A1 R153	0698-4271	R=F 5.11K5% .125W			
A1 R154	0698-4238	R=F 200 5% .125W			
A1 R155	0698-4271	R=F 5.11K5% .125W			
A1 R156	0698-4238	R=F 200 5% .125W			
A1 R157	0698-4271	R=F 5.11K5% .125W			
A1 R158	0698-4238	R=F 200 5% .125W			
A1 R159	0698-4271	R=F 5.11K5% .125W			
A1 R160	0698-4254	R=F 1K5% .125W F			
A1 R161	0698-4258	R=F 1.5K5% .125W			
A1 R162	0698-4238	R=F 200 5% .125W			
A1 R163	0698-4240	R=F 240 5% .125W			
A1 R164	0698-6744	R=F 20 5% .125W			
A1 R165	0698-4229	R=F 75 5% .125W			
A1 R166	0758-0086	R=F 100 5% .125W			
A1 R167	0698-4253	R=F 910 5% .125W			
A1 R168	2100-2787	R-VAR 220 .5W			
A1 R169	0698-4258	R=F 1.5K5% .125W			
A1 R170	0758-0124	R=F 51 5% .125W			
A1 R171	0698-4278	R=F 10K5% .125W			
A1 R172	0698-4237	R=F 180 5% .125W			
A1 R173	0758-0124	R=F 51 5% .125W			
A1 R174	0698-4239	R=F 220 5% .125W			
A1 R175	0698-4245	R=F 390 5% .125W			
A1 R176	2100-2739	R-VAR 220 .5W			
A1 R178	0698-6802	R=F 10 5% .125W			
A1 R179	0758-0086	R=F 100 5% .125W			
A1 R180	0698-4278	R=F 8.25K5% .125W			
A1 R181	0698-4260	R=F 1.96K5% .125W			
A1 R182	0698-4263	R=F 2.43K5% .125W			
A1 R183	0698-4271	R=F 5.11K5% .125W			
A1 R184	0698-4238	R=F 200 5% .125W			
A1 R185	0698-4271	R=F 5.11K5% .125W			
A1 R186	0698-4254	R=F 1K5% .125W F			
A1 R187	0698-4271	R=F 5.11K5% .125W			
A1 R188	0698-4271	R=F 5.11K5% .125W			
A1 R189	0698-4238	R=F 200 5% .125W			
A1 R190	0698-4240	R=F 240 5% .125W			
A1 R191	0698-4271	R=F 5.11K5% .125W			
A1 R192	0698-4254	R=F 1K5% .125W F			
A1 R193	0698-4271	R=F 5.11K5% .125W			
A1 R194	0757-0124	R=F 51 5% .125W			
A1 R195	0758-0124	R=F 51 5% .125W			
A1 R196	0698-4242	R=F 300 5% .125W			
A1 R197	0698-6802	R=F 10 5% .125W			
A1 R198	0698-6802	R=F 10 5% .125W			
A1 R199	0698-4237	R=F 180 5% .125W			
A1 R200	0698-4258	R=F 1.5K5% .125W			
A1 R201	0698-4254	R=F 1K5% .125W F			
A1 R202	0698-6802	R=F 10 5% .125W			
A1 R203	0698-4239	R=F 220 5% .125W			



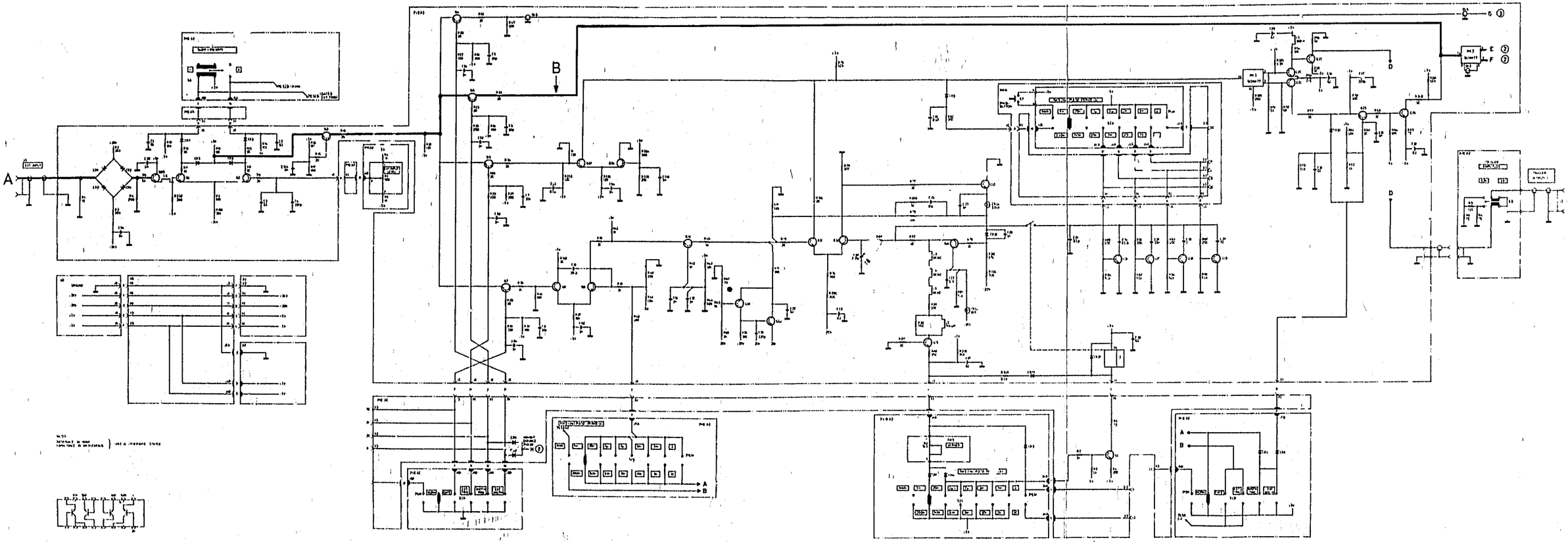
1c Rep. Rate Generator (Ext. Trig. Mode)



A1 Replaceable Parts (cont'd)

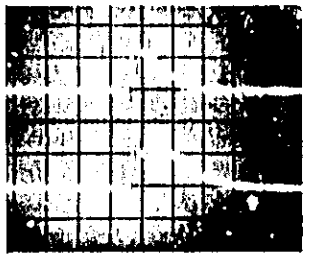
REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1 R264	0698-4231	R=F 390 5% .125W			
A1 R265	0698-8745	R=F 20 5% .125W			
A1 R266	0758-0124	R=F 51 5% .125W			
A1 R267	0758-0124	R=F 51 5% .125W			
A1 R268	0698-4235	R=F 150 5% .125W			
A1 R269	0698-8745	R=F 20 5% .125W			
A1 R270	0698-4240	R=F 249 5% .125W			
A1 R271	0698-8744	R=F 10 5% .125W			
A1 R272	0698-4235	R=F 150 5% .125W			
A1 R273	0698-4238	R=F 200 5% .125W			
A1 R275	0757-0686	R=F 100 5% .125W			
A1 R276	2100-2794	R=VAR 100 .5W			
A1 R277	0698-4245	R=F 390 5% .125W			
A1 R278	0758-0124	R=F 51 5% .125W			
A1 R279	0698-4237	R=F 180 5% .125W			
A1 R280	0698-8402	R=F 10 5% .125W			
A1 R281	0698-8802	R=F 10 5% .125W			
A1 R282	0698-8227	R=F 68 5% .125W			
A1 R283	0683-0275	R=F 2.7 5% .25W			
A1 R284	0698-8744	R=F 20 5% .125W			
A1 R285	0698-4258	R=F 1.96K 1% .125W			
A1 R286	0698-4254	R=F 1K5% .125W F			
A1 R287	0698-8802	R=F 10 5% .125W			
A1 R288	0698-4254	R=F 1.96K 1% .125W F			
A1 R289	0698-4254	R=F 1K5% .125W F			
A1 R290	0698-4265	R=F 3K5% .125W F			
A1 R291	0698-4246	R=F 470 5% .125W			
A1 R292	0698-8744	R=F 20 5% .125W			
A1 R293	0698-4235	R=F 150 5% .125W			
A1 R294	0698-8744	R=F 20 5% .125W			
A1 R295	0698-8802	R=F 10 5% .125W			
A1 R296	0758-0124	R=F 51 5% .125W			
A1 R297	0698-4261	R=F 340 5% .125W			
A1 R298	0698-8744	R=F 20 5% .125W			
A1 R299	0698-8802	R=F 10 5% .125W			
A1 R300	0698-5705	R=F 39 5% .25W			
A1 R301	0698-4238	R=F 200 5% .125W			
A1 R302	0698-4271	R=F 5.11K5% .125%			
A1 R303	0698-4238	R=F 200 5% .125W			
A1 R304	0698-4271	R=F 5.11K5% .125W			
A1 R305	0698-4238	R=F 200 5% .125W			
A1 R306	0698-4271	R=F 5.11K5% .125W			
A1 R307	0698-4238	R=F 200 5% .125W			
A1 R308	0698-4271	R=F 5.11K5% .125W			
A1 R309	0698-4254	R=F 1K5% .125W F			
A1 R310	0698-4258	R=F 1.96K 1% .125W F			
A1 R311	0757-0686	R=F 100 5% .125W			
A1 R312	2100-2787	R=VAR 220 .5W			
A1 R313	0698-4257	R=F 910 5% .125W			
A1 R314	0698-8744	R=F 20 5% .125W			
A1 R315	0698-4240	R=F 249 5% .125W			
A1 R316	0698-8744	R=F 20 5% .125W			
A1 R317	0698-4261	R=F 510 5% .125W			
A1 R318	0698-4268	R=F 3.32K5% .125W			
A1 R319	0698-8744	R=F 20 5% .125W			
A1 R320	0698-8802	R=F 10 5% .125W			
A1 R321	0698-4234	R=F 130 5% .125W			
A1 R322	0698-8744	R=F 20 5% .125W			
A1 R323	0698-8744	R=F 20 5% .125W			
A1 R324	0698-4258	R=F 1.96K 1% .125W F			
A1 R325	0757-0686	R=F 100 5% .125W			
A1 R326	0698-4271	R=F 5.11K5% .125W			
A1 R327	0698-4254	R=F 1K5% .125W F			
A1 R328	0698-4253	R=F 1.82K5% .125W F			
A1 R329	0698-4253	R=F 1.82K5% .125W F			
A1 R330	0698-8802	R=F 10 5% .125W			
A1 R331	0698-4244	R=F 360 5% .125W			
A1 R332	0698-4233	R=F 120 5% .125W			
A1 R333	0698-4242	R=F 300 5% .125W			
A1 R334	0698-4238	R=F 200 5% .125W			

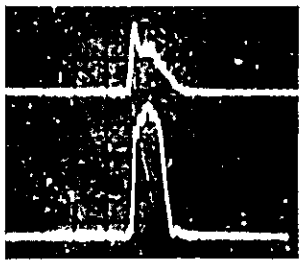
REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A1 R335	0698-4239	R=F 220 5% .125W			
A1 R336	0698-4265	R=F 3.32K5% .125W			
A1 R337	0698-4265	R=F 3.32K5% .125W			
A1 R338	0698-4239	R=F 220 5% .125W			
A1 R339	0698-8744	R=F 20 5% .125W			
A1 R340	0698-8744	R=F 20 5% .125W			
A1 R341	0698-4263	R=F 3.48K5% .125W			
A1 R342	0698-4238	R=F 200 5% .125W			
A1 R343	0698-4238	R=F 200 5% .125W			
A1 R344	0698-4239	R=F 220 5% .125W			
A1 R345	0698-4265	R=F 3.32K5% .125W			
A1 R346	0698-8802	R=F 10 5% .125W			
A1 R347	0698-4238	R=F 200 5% .125W			
A1 R348	0698-4239	R=F 220 5% .125W			
A1 R349	0698-4249	R=F 470 5% .125W			
A1 R350	0698-8802	R=F 10 5% .125W			
A1 R351	0757-0686	R=F 100 5% .125W			
A1 R352	0698-8702	R=F 30 5% .125W			
A1 R353	0698-4236	R=F 150 5% .125W			
A1 R354	0698-4233	R=F 120 5% .125W			
A1 R355	0698-4265	R=F 3.32K5% .125W			
A1 R356	0698-4258	R=F 1.96K5% .125W			
A1 R357	0698-4258	R=F 1.96K5% .125W			
A1 R358	0698-4236	R=F 150 5% .125W			
A1 R359	0698-4238	R=F 200 5% .125W			
A1 R360	0698-4238	R=F 200 5% .125W			
A1 R361	0698-4271	R=F 5.11K5% .125W			
A1 R362	0698-4271	R=F 5.11K5% .125W			
A1 R363	0698-4271	R=F 7.50K5% .125W			
A1 R364	0698-4275	R=F 7.50K5% .125W			
A1 R365	0698-4253	R=F 510 5% .125W			
A1 R366	0698-8802	R=F 10 5% .125W			
A1 R367	0698-4244	R=F 360 5% .125W			
A1 R368	0698-4233	R=F 120 5% .125W			
A1 R369	0698-4242	R=F 300 5% .125W			
A1 R370	0698-4238	R=F 200 5% .125W			

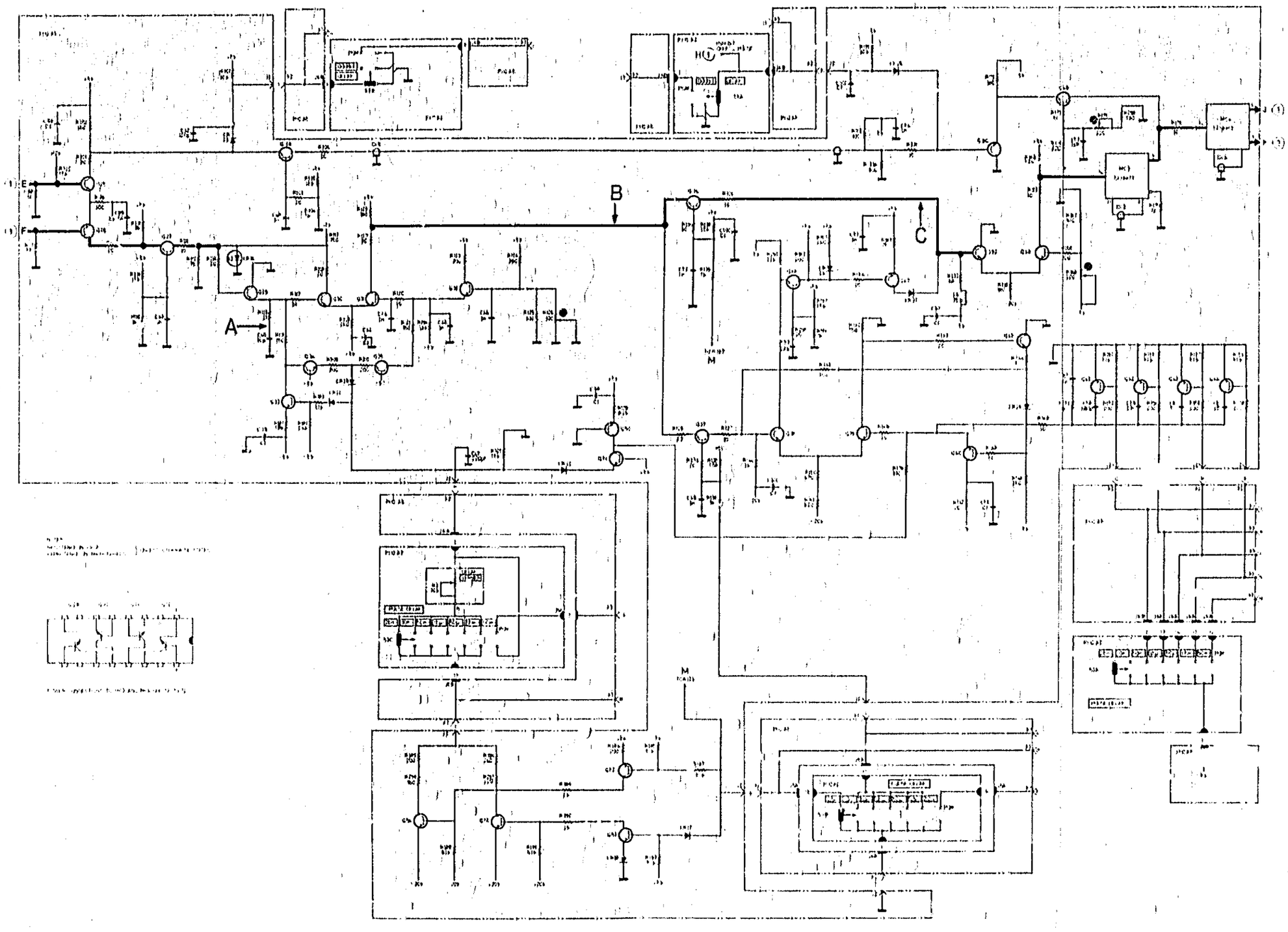


1d Rep. Rate Generator (Width Trig. Mode)

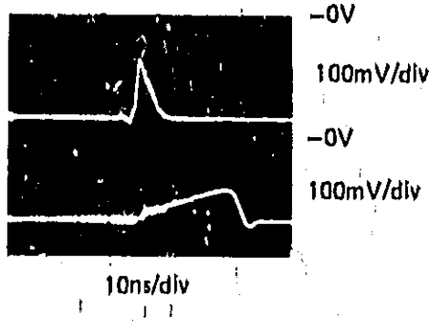
PARTS LIST CON'T

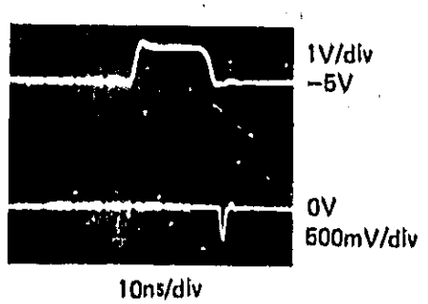

Waveform at point A
Waveform at point B
–0V
200mV/div
+2.3V
10ns/div

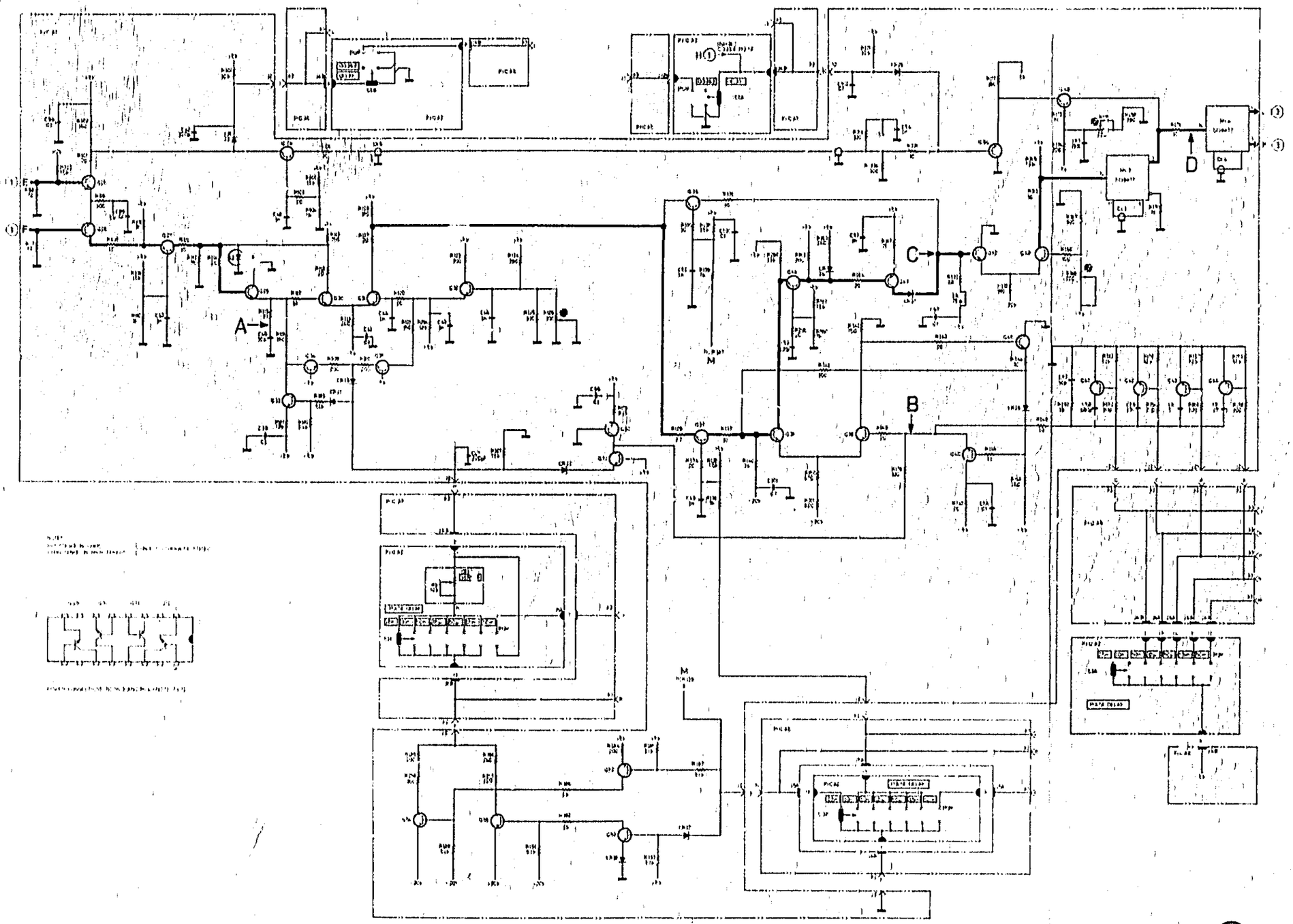

Waveform at point C
Waveform at point D
500mV/div
–5V
–0V
200mV/div
10ns/div



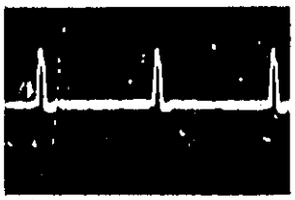
2a Delay Generator (2,5ns — 10ns)


–0V
100mV/div
–0V
100mV/div
10ns/div


1V/div
–5V
0V
500mV/div
10ns/div


A
B
C
D
M

Waveform at point A



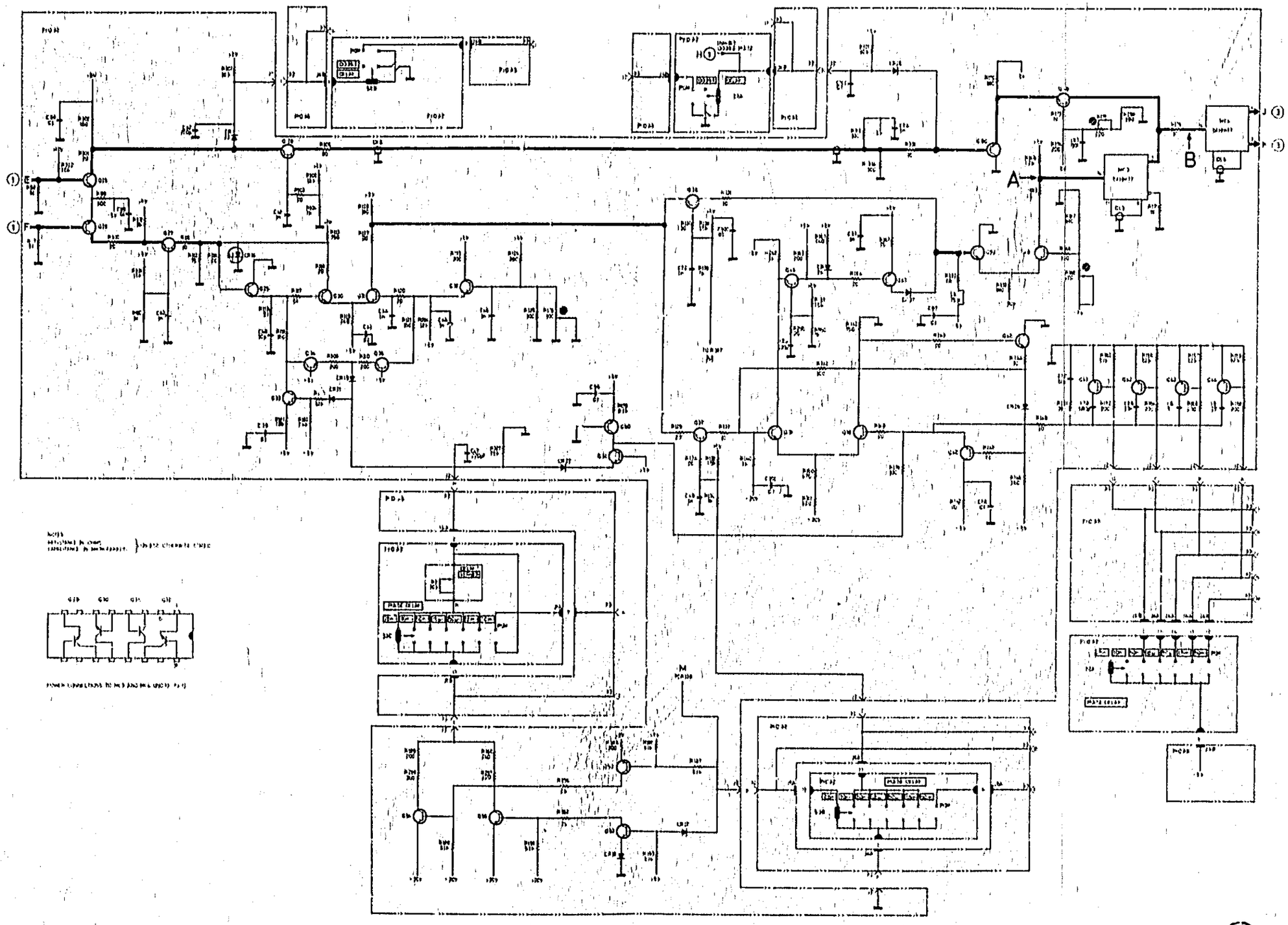
0V
500mV/div

10ns/div

Waveform at point B

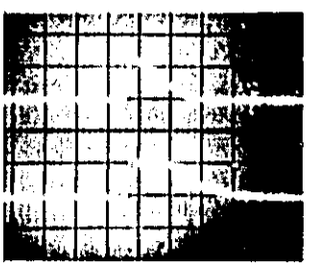
0V (C/L)
200mV/div

10ns/div


A
B

Waveform at point A

Waveform at point B



0V

200mV/div

+2.3V

10ns/div

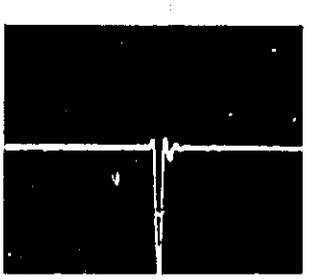
Waveform at point C

500mV/div

−5V

10ns/div

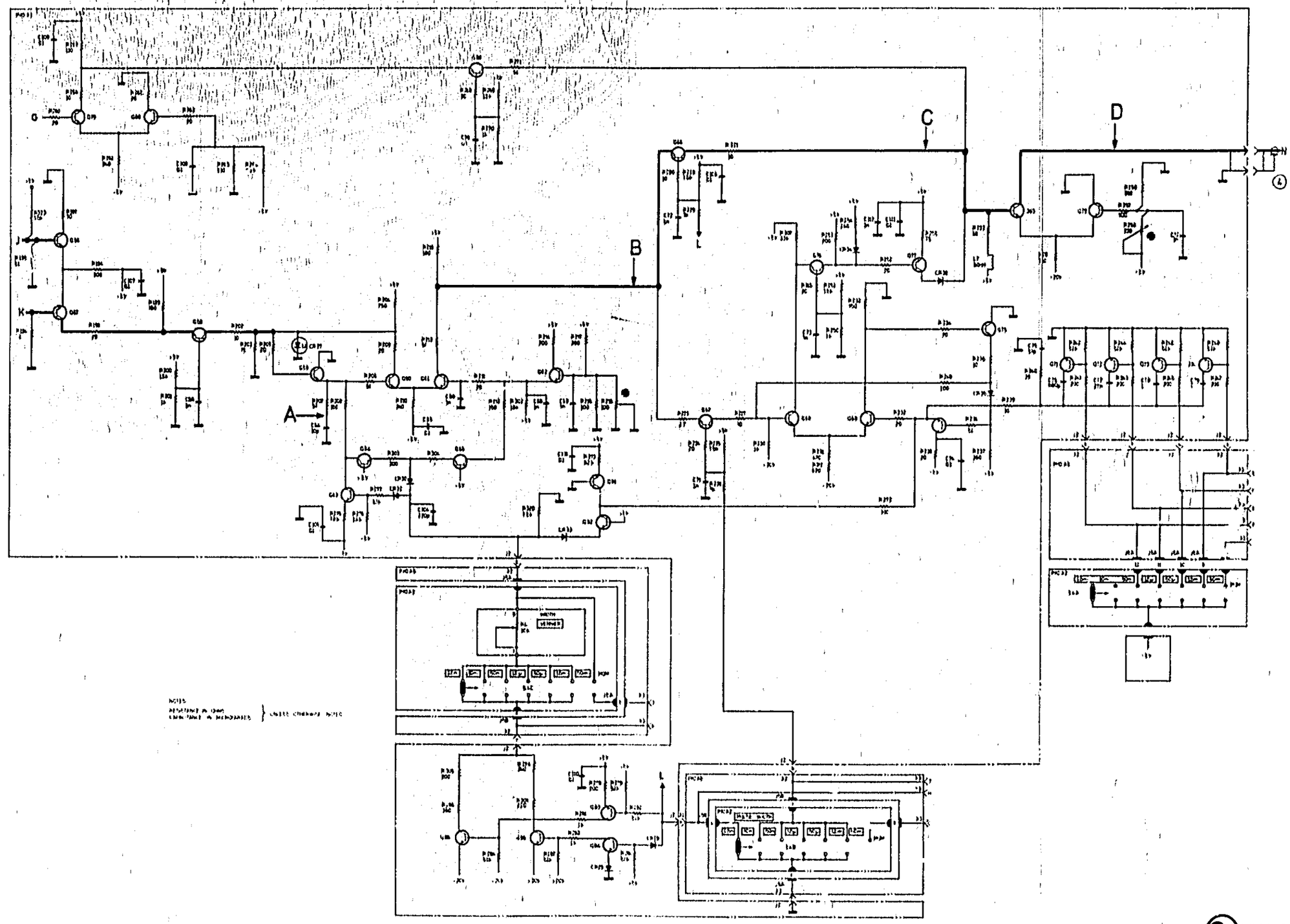
Waveform at point D



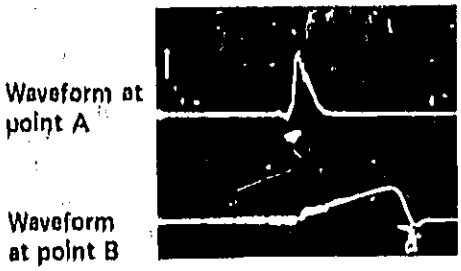
0V

200mV/div

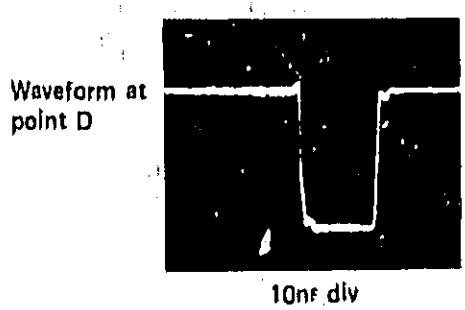
10ns/div

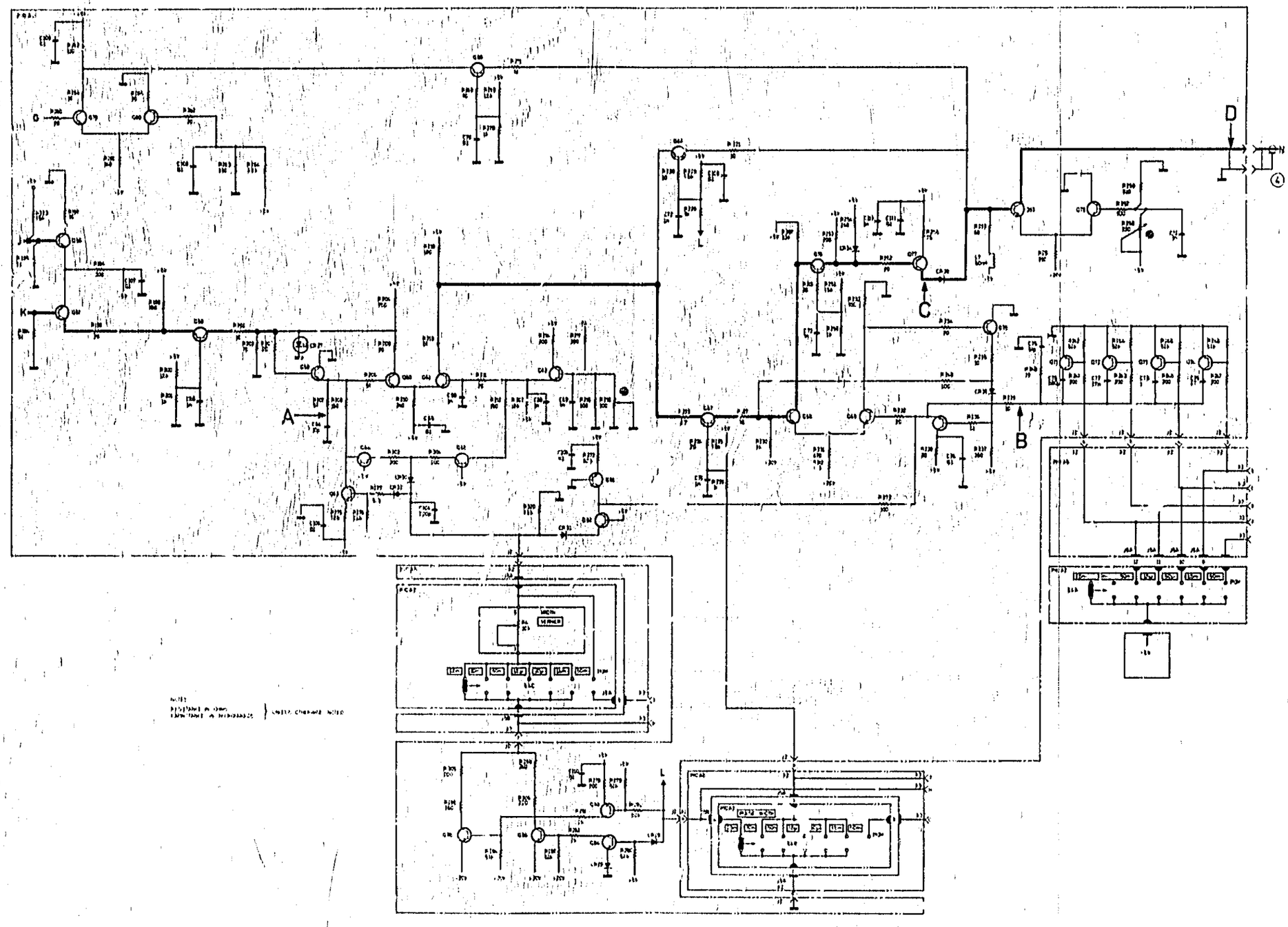


3a Width Generator (2,5ns – 10ns)


Waveform at point A
Waveform at point B
0V
100mV/div
0V
10ns/div

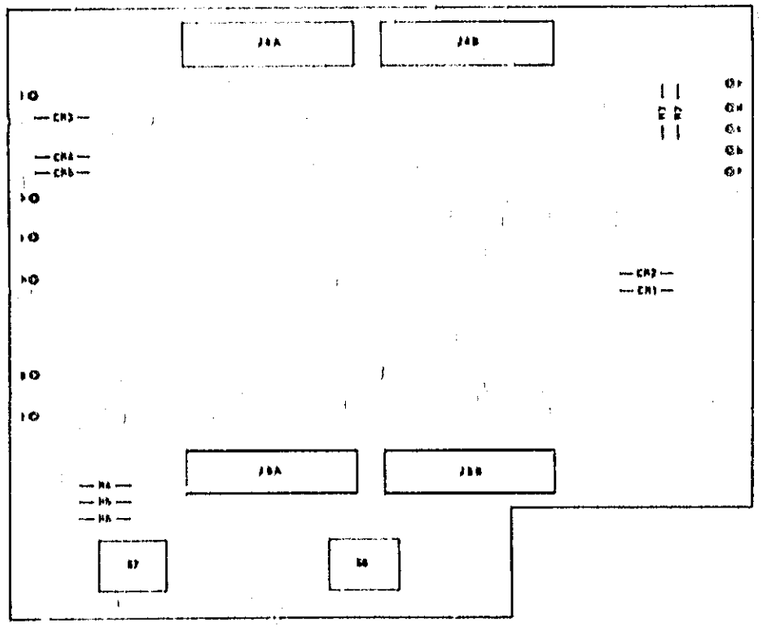

Waveform at point C
–5V
1V/div
10ns/div


Waveform at point D
0V
200mV/div
10ns div



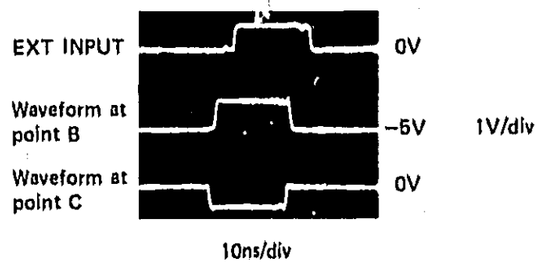
3b Width Generator (10ns – 60ms)

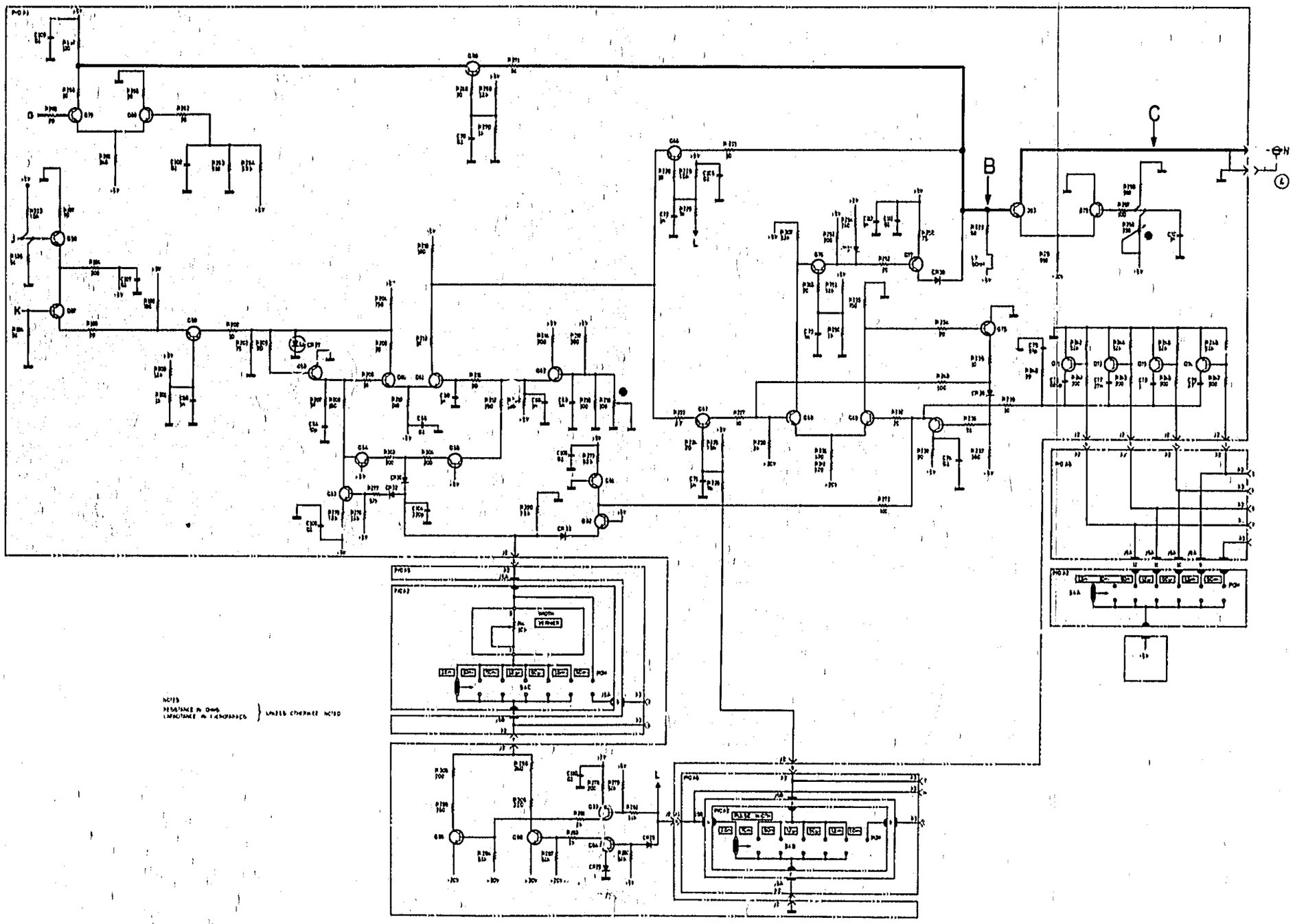
A2 Board Layout



A2 Replaceable Parts–Timing Switch Board

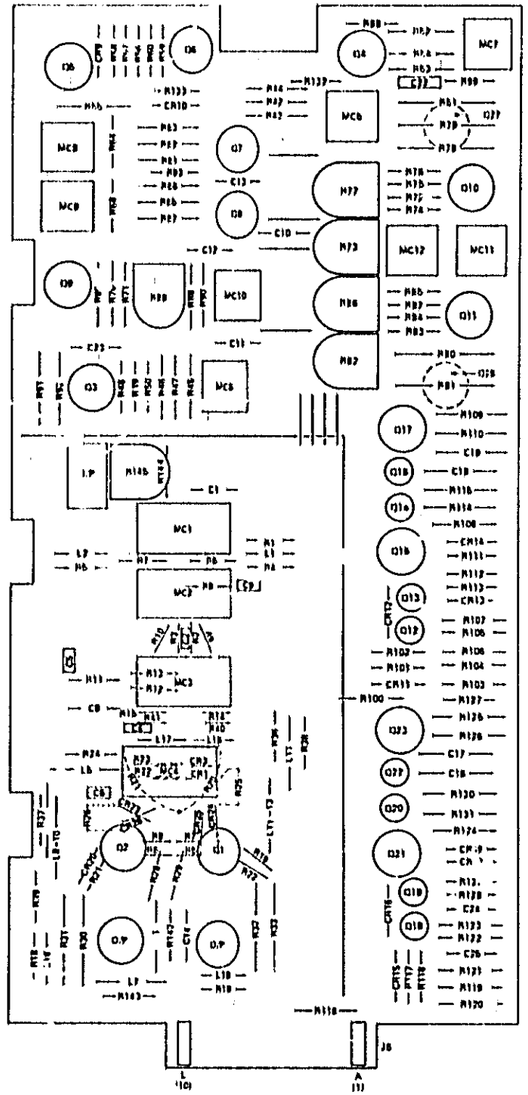
REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A2 CR1	1901-0040	DIO SI 30V .03A			
A2 CR2	1901-0040	DIO SI 30V .03A			
A2 CR3	1901-0040	DIO SI 30V .03A			
A2 CR4	1901-0040	DIO SI 30V .03A			
A2 CR5	1901-0040	DIO SI 30V .03A			
A2 J4	1200-0111	CONN IO CONT			
A2 J5	1200-0111	CONN IO CONT			
A2 R2	0698-4749	R=F 620 1% .1W			
A2 R3	0698-4783	R=F 910 1% .1W			
A2 R4	0757-0398	R=F 1% 1E .1W			
A2 R5	0757-0403	R=F 121 1% .1W			
A2 R6	0757-0398	R=F 1% 1E .1W			
A2 S1	3040-1120	SL IDE AY-PC SW			
A2 S2	3040-1122	SL IDE AY-PC SW			
A2 S3	3040-1121	SL IDE AY-PC SW			
A2 S4	3040-1121	SL IDE AY-PC SW			
A2 S5	3040-1120	SL IDE AY-PC SW			
A2 S6	3101-1111	SW SL IDE DPDT			
A2 S8	3101-1111	SW SL IDE DPDT			





3c Width Generator (Ext. Width Mode)

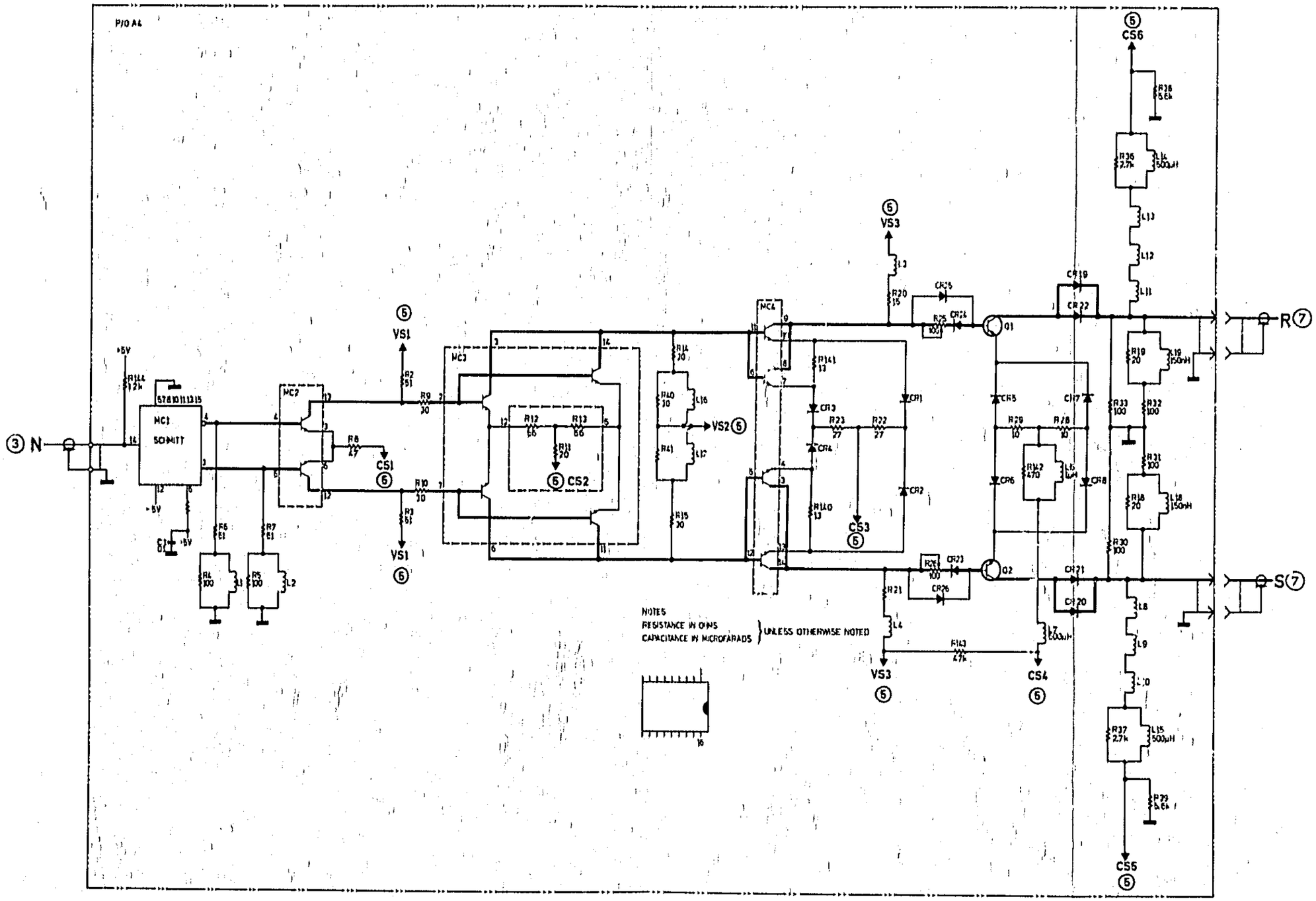
A4 Board Layout



A4 Replaceable Parts – Output Amplifier, Amplifiers Supplies and Offset Amplifiers

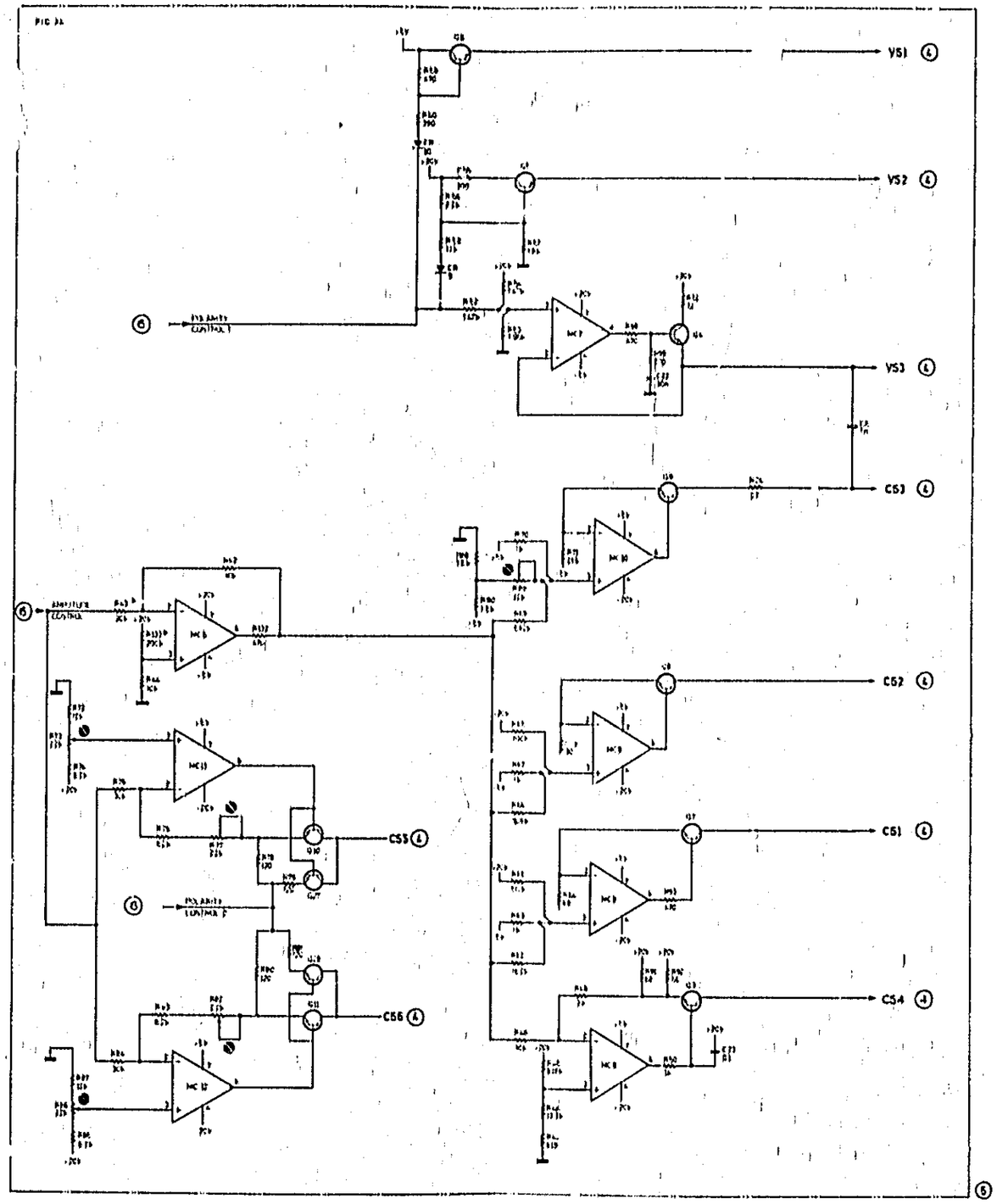
REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A4 C1	0150-0121	C=F ,1UF 50V			
A4 C2	0180-2327	C=F ,22UF +50V			
A4 C3	0180-2327	C=F ,22UF +50V			
A4 C4	0160-2327	C=F ,22UF +50V			
A4 C5	0180-2327	C=F ,22UF +50V			
A4 C6	0180-2327	C=F ,22UF +50V			
A4 C7	0180-0174	C=F ,47UF 25V			
A4 C10	0150-0121	C=F ,1UF 50V			
A4 C11	0150-0121	C=F ,1UF 50V			
A4 C12	0150-0121	C=F ,1UF 50V			
A4 C13	0150-0121	C=F ,1UF 50V			
A4 C16	0180-0197	C=F ,2UF 20V			
A4 C17	0180-0197	C=F ,2UF 20V			
A4 C18	0180-0197	C=F ,2UF 20V			
A4 C19	0180-0197	C=F ,2UF 20V			
A4 C22	0160-2930	C=F ,01UF 10.V			
A4 C23	0150-0121	C=F ,1UF 50V			
A4 C24	0160-0121	C=F ,1UF 50V			
A4 C25	0160-0121	C=F ,1UF 50V			
A4 C26	0150-0121	C=F ,1UF 50V			
A4 CR1	1901-0533	DIO MOT CARR			
A4 CR2	1901-0533	DIO MOT CARR			
A4 CR3	1901-0533	DIO MOT CARR			
A4 CR4	1901-0533	DIO MOT CARR			
A4 CR5	1901-0533	DIO MOT CARR			
A4 CR6	1901-0533	DIO MOT CARR			
A4 CR7	1901-0533	DIO MOT CARR			
A4 CR8	1901-0533	DIO MOT CARR			
A4 CR9	1901-0040	DIO SI 30V ,03A			
A4 CR10	1901-0040	DIO SI 30V ,03A			
A4 CR11	1901-0040	DIO SI 30V ,03A			
A4 CR12	1901-0040	DIO SI 30V ,03A			
A4 CR13	1901-0040	DIO SI 30V ,03A			
A4 CR14	1901-0040	DIO SI 30V ,03A			
A4 CR15	1901-0040	DIO SI 30V ,03A			
A4 CR16	1901-0040	DIO SI 30V ,03A			
A4 CR17	1901-0040	DIO SI 30V ,03A			
A4 CR18	1901-0040	DIO SI 30V ,03A			
A4 CR19	1901-0533	DIO MOT CARR			
A4 CR20	1901-0533	DIO MOT CARR			
A4 CR21	1901-0533	DIO MOT CARR			
A4 CR22	1901-0533	DIO MOT CARR			
A4 CR23	1901-0533	DIO MOT CARR			
A4 CR24	1901-0533	DIO MOT CARR			
A4 CR25	1901-0533	DIO MOT CARR			
A4 CR26	1901-0533	DIO MOT CARR			
A4 L6	9140-1096	COIL-CHOKE 1UH			
A4 L7	9140-0118	COIL-CHOKE 300UH			
A4 L8	9170-0029	CORE FERR BEAD			
A4 L9	9170-0029	CORE FERR BEAD			
A4 L10	9170-0029	CORE FERR BEAD			
A4 L11	9170-0029	CORE FERR BEAD			
A4 L12	9170-0029	CORE FERR BEAD			
A4 L13	9170-0029	CORE FERR BEAD			
A4 L14	9140-0118	COIL-CHOKE 300UH			
A4 L15	9140-0118	COIL-CHOKE 300UH			
A4 L18	9100-2269	COIL-CHOKE ,33UH			
A4 L19	9100-2269	COIL-CHOKE ,33UH			
A4 MC1	1870-0285	IC 280MHZ 18PIN			
A4 MC2	1858-0029	DISC ARRAY RYCRO			
A4 MC3	1858-0029	DISC ARRAY RYCRO			
A4 MC4	1858-0030	DISC ARRAY RYCRO			
A4 MC5	1870-0493	IC LIN OP AMP			
A4 MC6	1870-0493	IC LIN OP AMP			
A4 MC7	1870-0493	IC LIN OP AMP			
A4 MC8	1870-0493	IC LIN OP AMP			
A4 MC9	1870-0493	IC LIN OP AMP			
A4 MC10	1870-0493	IC LIN OP AMP			
A4 MC11	1870-0493	IC LIN OP AMP			
A4 MC12	1870-0493	IC LIN OP AMP			
A4 Q1	1853-0315	DISC PNP TO-5			
A4 Q2	1853-0315	DISC PNP TO-5			
A4 Q3	1705-0011	HT-SINK DISC			
A4 Q3	1853-0027	DISC SI PNP			
A4 Q4	1705-0011	HT-SINK DISC			
A4 Q4	1854-0039	DISC 2N3053 SI			
A4 Q5	1705-0011	HT-SINK DISC			
A4 Q5	1854-0039	DISC 2N3053 SI			
A4 Q6	1854-0039	DISC 2N3053 SI			
A4 Q7	1854-0039	DISC 2N3053 SI			
A4 Q8	1854-0039	DISC 2N3053 SI			
A4 Q9	1705-0011	HT-SINK DISC			
A4 Q9	1854-0039	DISC 2N3053 SI			
A4 Q10	1705-0011	HT-SINK DISC			
A4 Q10	1854-0039	DISC 2N3053 SI			

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A4 Q11	1205-0011	HT-SINK DISC			
A4 Q11	1854-0039	DISC 2N3053 SI			
A4 Q12	1854-0039	DISC 2N3053 SI			
A4 Q13	1853-0039	DISC SI PNP			
A4 Q14	1853-0039	DISC SI PNP			
A4 Q15	1205-0011	HT-SINK DISC			
A4 Q15	1854-0039	DISC 2N3053 SI			
A4 Q16	1854-0107	DISC SI NPN			
A4 Q17	1205-0011	HT-SINK DISC			
A4 Q17	1853-0039	DISC SI PNP			
A4 Q18	1854-0107	DISC SI NPN			
A4 Q19	1853-0039	DISC SI PNP			
A4 Q20	1853-0039	DISC SI PNP			
A4 Q21	1205-0011	HT-SINK DISC			
A4 Q21	1854-0039	DISC 2N3053 SI			
A4 Q22	1854-0107	DISC SI NPN			
A4 Q23	1205-0011	HT-SINK DISC			
A4 Q23	1853-0039	DISC SI PNP			
A4 Q27	1205-0011	HT-SINK DISC			
A4 Q27	1854-0039	DISC 2N3053 SI			
A4 Q28	1205-0011	HT-SINK DISC			
A4 Q28	1854-0039	DISC 2N3053 SI			
A4 R1	0698-4938	RES 499 OHM 1% .125W			
A4 R2	0698-3338	RES 5.11K OHM 1% .125W			
A4 R3	0698-3338	RES 5.11K OHM 1% .125W			
A4 R4	0757-0426	RES 100 OHM 1% .125W			
A4 R5	0757-0426	RES 100 OHM 1% .125W			
A4 R6	0757-0424	RES 82.5 OHM 1% .125W			
A4 R7	0757-0424	RES 82.5 OHM 1% .125W			
A4 R8	0683-4705	RES 47 OHM 5% .25W			
A4 R9	0698-3111	RES 10 OHM 5% .125W			
A4 R10	0698-3111	RES 10 OHM 5% .125W			
A4 R11	0698-6344	RES 20 OHM 5% .125W			
A4 R12	0698-6225	RES 56 OHM 5% .125W			
A4 R13	0698-6225	RES 56 OHM 5% .125W			
A4 R14	0698-3111	RES 10 OHM 5% .125W			
A4 R15	0698-3111	RES 10 OHM 5% .125W			
A4 R16	0698-7459	RES 15 OHM 5% .125W			
A4 R17	0698-7459	RES 15 OHM 5% .125W			
A4 R20	0698-6344	RES 20 OHM 5% .125W			
A4 R21	0698-6344	RES 20 OHM 5% .125W			
A4 R22	0698-3701	RES 27 OHM 5% .125W			
A4 R23	0698-3701	RES 27 OHM 5% .125W			
A4 R24	0683-0375	RES 3.7 OHM 5% .25W			
A4 R25	2100-1984	RES-VAR 100 OHM .5W CE			
A4 R26	2100-1984	RES-VAR 100 OHM .5W CE			
A4 R28	0698-6802	RES 10 OHM 5% .125W			
A4 R29	0698-6802	RES 10 OHM 5% .125W			
A4 R30	0757-0198	RES 100 OHM 1% .5W			
A4 R31	0757-0198	RES 100 OHM 1% .5W			
A4 R32	0757-0198	RES 100 OHM 1% .5W			
A4 R33	0757-0198	RES 100 OHM 1% .5W			
A4 R36	0698-6270	RES 4.75K OHM .125W			
A4 R37	0698-6270	RES 4.75K OHM .125W			
A4 R38	0698-6280	RES 5.23K OHM .125W			
A4 R39	0698-6280	RES 5.23K OHM .125W			
A4 R40	0698-3111	RES 10 OHM 5% .125W			
A4 R41	0698-3111	RES 10 OHM 5% .125W			
A4 R42	0757-0442	RES 261 OHM 1% .125W			
A4 R43	0757-0449	RES 402 OHM 1% .125W			
A4 R44	0757-0442	RES 261 OHM 1% .125W			
A4 R45	0757-0290	RES 6.19K OHM 1% .125W			
A4 R46	0757-0289	RES 5.11K OHM 1% .125W			
A4 R47	0757-0438	RES 619 OHM 1% .125W			
A4 R48	0698-4265	RES 1.65K OHM 1% .125W F			
A4 R49	0698-4278	RES 1.05K OHM 1% .125W			
A4 R50	0698-4254	RES 1.65K OHM 1% .125W F			
A4 R51	0686-0012	RES 2 OHM 5% 2W MO			
A4 R52	0757-1094	RES 1.47K OHM 1% .125W			
A4 R53	0698-0083	RES 1.58K OHM 1% .125W			
A4 R54	0698-3157	RES 19.6K OHM 1% .125W			
A4 R55	0757-0447	RES 196 OHM 1% .125W			
A4 R56	0757-1094	RES 1.47K OHM 1% .125W			
A4 R57	0698-0026	RES 100 OHM 5% .25W			
A4 R58	0698-4262	RES 2.43K OHM 1% .125W			
A4 R59	0698-4260	RES 2.21K OHM 1% .125W			
A4 R60	0698-4795	RES 1.15K OHM 1% .125W			
A4 R61	0698-4744	RES 470 OHM 1% .125W			
A4 R62	0698-4745	RES 390 OHM 1% .125W			
A4 R63	0757-0458	RES 511 OHM 1% .125W			
A4 R64	0757-0447	RES 196 OHM 1% .125W			
A4 R65	0757-0480	RES 1K OHM 1% .125W F			
A4 R66	0698-4215	RES 68 OHM 1% .125W			
A4 R67	0757-0465	RES 100K OHM 1% .125W			
A4 R68	0757-0288	RES 4.99K OHM 1% .125W			
A4 R69	0757-0282	RES 1K OHM 1% .125W F			
A4 R70	0698-3702	RES 10 OHM 5% .125W			

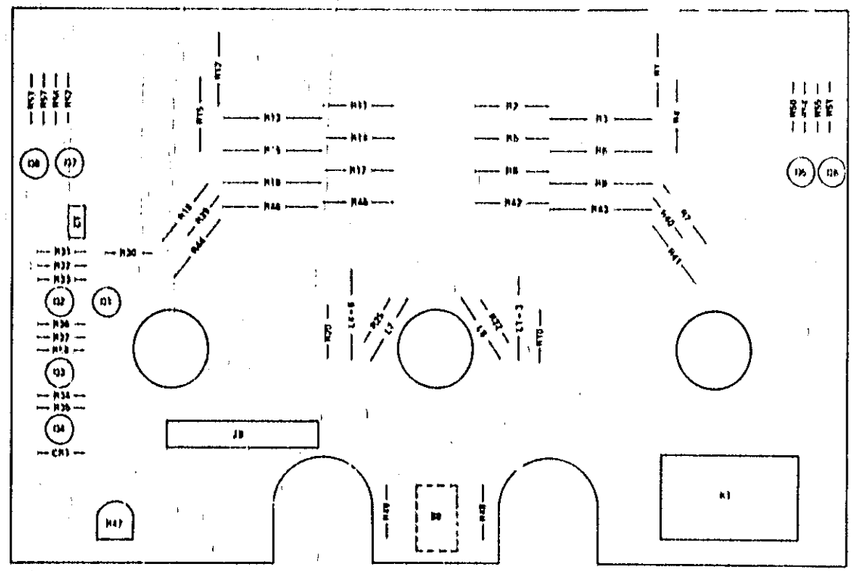

P/O A4
NOTES
RESISTANCE IN OHMS
CAPACITANCE IN MICROFARADS
UNLESS OTHERWISE NOTED
VS1
VS2
VS3
CS1
CS2
CS3
CS4
CS5
CS6
R⑦
S⑦
N③
Q1
Q2
NC1
SCHMITT

A4 Replaceable Parts (cont'd)

REFERENCE DESIGNATOR		HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM		COMPONENT LAYOUT
				SHEET NUMBER	GRID REFERENCE	
A4	R69	0757-0180	R=F 1,1KE 1/8W F			
A4	R70	0757-0280	R=F 10.0E 1/8W F			
A4	R71	0698-3410	R=; ,1			
A4	R72	0698-4280	R=F 1/8W			
A4	R73	2100-2799	R VAR A 5W			
A4	R74	0698-4273	R=F 6,7K5E 1/8W			
A4	R75	0698-4289	R=F 30K5E 1/8W			
A4	R76	0698-4273	R=F 6,7K5E 1/8W			
A4	R77	2100-2799	R=VAR 2,2K 5W			
A4	R78	0760-0074	R=F 100 5E 1W MO			
A4	R79	0760-0074	R=F 100 5E 1W MO			
A4	R80	0760-0074	R=F 100 5E 1W MO			
A4	R81	0760-0074	R=F 100 5E 1W MO			
A4	R82	2100-2799	R=VAR 2,2K 5W			
A4	R83	0698-4271	R=F 6,2K5E 1/8W			
A4	R84	0698-4287	R=F 30K5E 1/8W			
A4	R85	0698-4273	R=F 6,7K5E 1/8W			
A4	R86	2100-2799	R=VAR 2,2K 5W			
A4	R87	0698-4280	R=F 12K5E 1/8W			
A4	R88	0698-4259	R=F 1,5K5E 1/8W			
A4	R89	2100-2740	R=VAR 20K 5W CP			
A4	R90	0698-4298	R=F 1,2K5E 1/8W			
A4	R91	0758-0083	R=F 68 5E 1/8W F			
A4	R92	0758-0091	R=F 56 5E 1/8W F			
A4	R93	0698-4744	R=F 470 5E 1/8W			
A4	R94	0698-4744	R=F 470 5E 1/8W			
A4	R99	0698-4239	R=F 220 5E 1/8W			
A4	R100	0698-3449	R=F 28,7K1E			
A4	R101	0698-4279	R=F 75 5E 1/8W			
A4	R102	0698-4279	R=F 75 5E 1/8W			
A4	R103	0757-0442	R=F 10K1E 1/8W			
A4	R104	0757-0442	R=F 10K1E 1/8W			
A4	R105	0698-3153	R=F 3,83K1E			
A4	R106	0757-0280	R=F 1K1E 1/8W F			
A4	R107	0757-0424	R=F 1,1K1E 1/8W			
A	R108	0698-3153	R=F 3,83K1E			
A4	R109	0758-0023	R=F 240 5E 1/8W			
A4	R110	0758-0023	R=F 240 5E 1/8W			
A4	R111	0698-4744	R=F 470 5E 1/8W			
A4	R112	0698-4744	R=F 470 5E 1/8W			
A4	R113	0698-4272	R=F 6,04K5E 1/8W			
A4	R114	0758-0023	R=F 240 5E 1/8W			
A4	R115	0758-0023	R=F 240 5E 1/8W			
A4	R116	0698-3449	R=F 28,7K1E			
A4	R117	0698-4279	R=F 75 5E 1/8W			
A4	R118	0698-4279	R=F 75 5E 1/8W			
A4	R119	0757-0442	R=F 10K1E 1/8W			
A4	R120	0757-0442	R=F 10K1E 1/8W			
A4	R121	0698-3153	R=F 3,83K1E			
A4	R122	0757-0280	R=F 1K1E 1/8W F			
A4	R123	0757-0424	R=F 1,1K1E 1/8W			
A4	R124	0698-3153	R=F 3,83K1E			
A4	R125	0758-0023	R=F 240 5E 1/8W			
A4	R126	0758-0023	R=F 240 5E 1/8W			
A4	R127	0698-4744	R=F 470 5E 1/8W			
A4	R128	0698-4744	R=F 470 5E 1/8W			
A4	R129	0698-4272	R=F 6,04K5E 1/8W			
A4	R130	0758-0023	R=F 240 5E 1/8W			
A4	R131	0758-0023	R=F 240 5E 1/8W			
A4	R132	0698-4744	R=F 470 5E 1/8W			
A4	R133	0683-2045	R=F 200K5E 1/4W			
A4	R140	0698-3172	R=F 13 5E 1/8W			
A4	R141	0698-3172	R=F 13 5E 1/8W			
A4	R142	0698-4218	R=F 470 5E 1/8W			
A4	R143	0698-4270	R=F 4,7K5E 1/8W			
A4	R144	0698-4249	R=F 390 5E 1/8W			
A4	R145	2100-2799	R VAR 2K 5W			

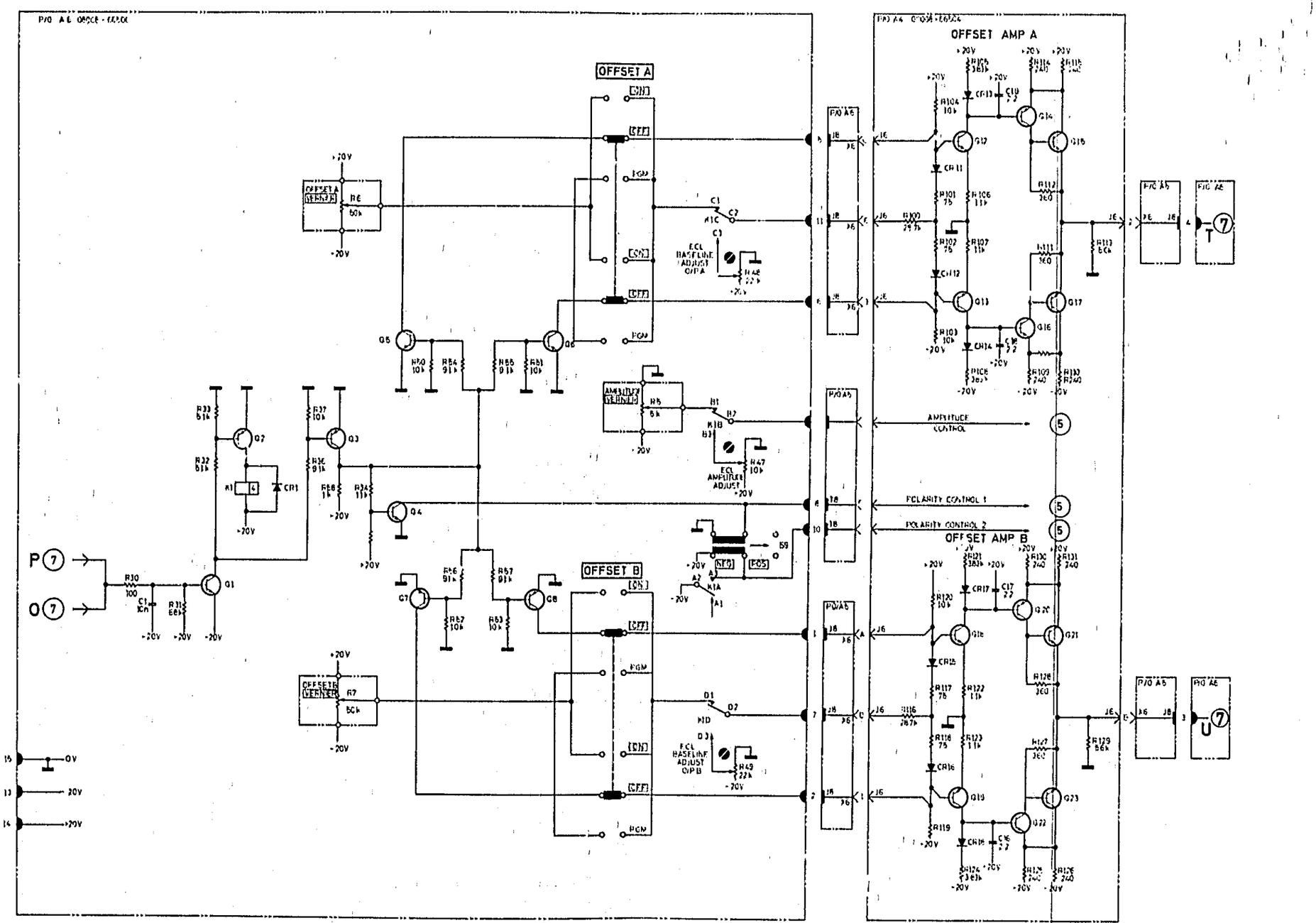

VS1
VS2
VS3
CS3
CS2
CS1
CS4
CS5
CS6

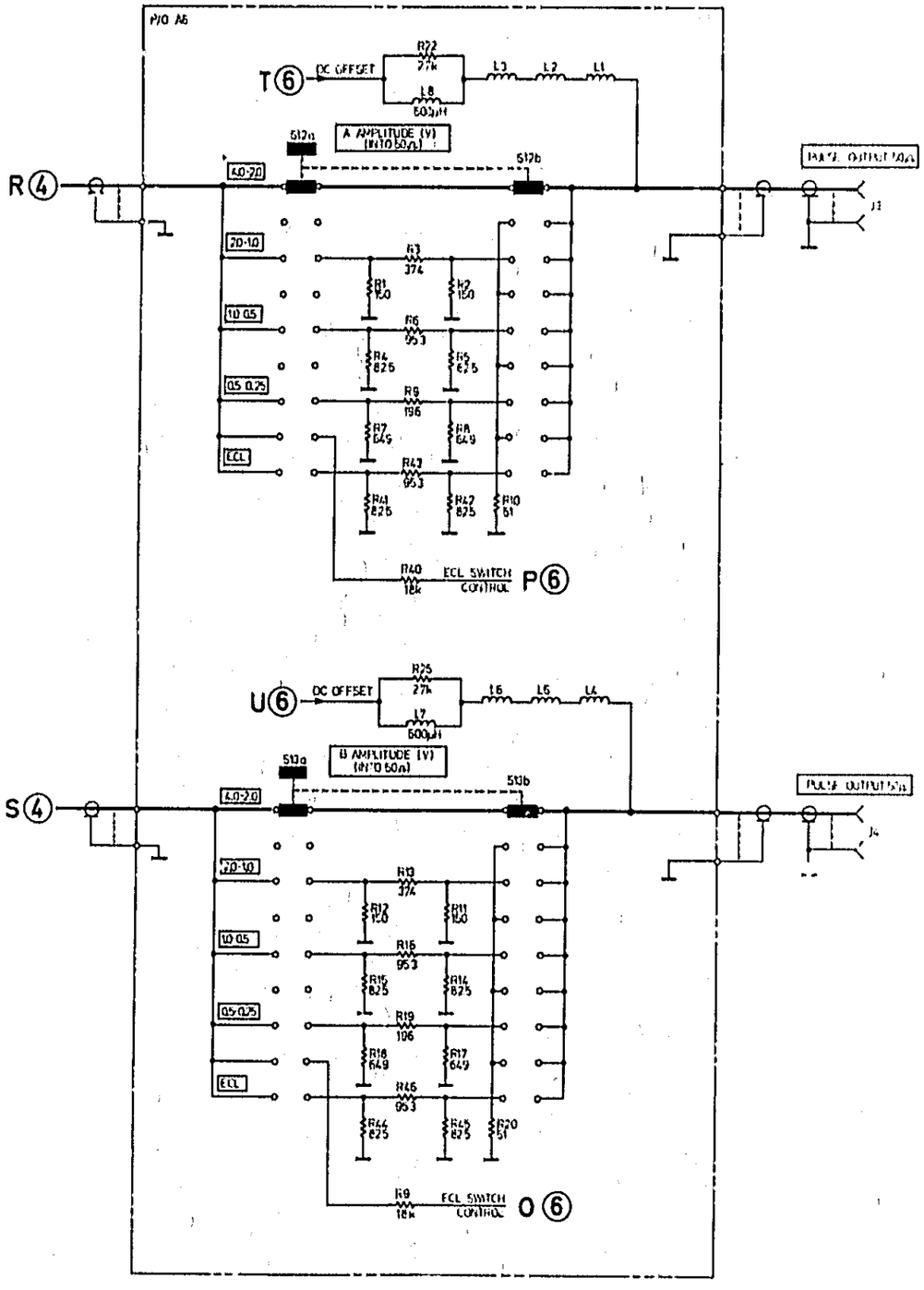
A6 Board Layout



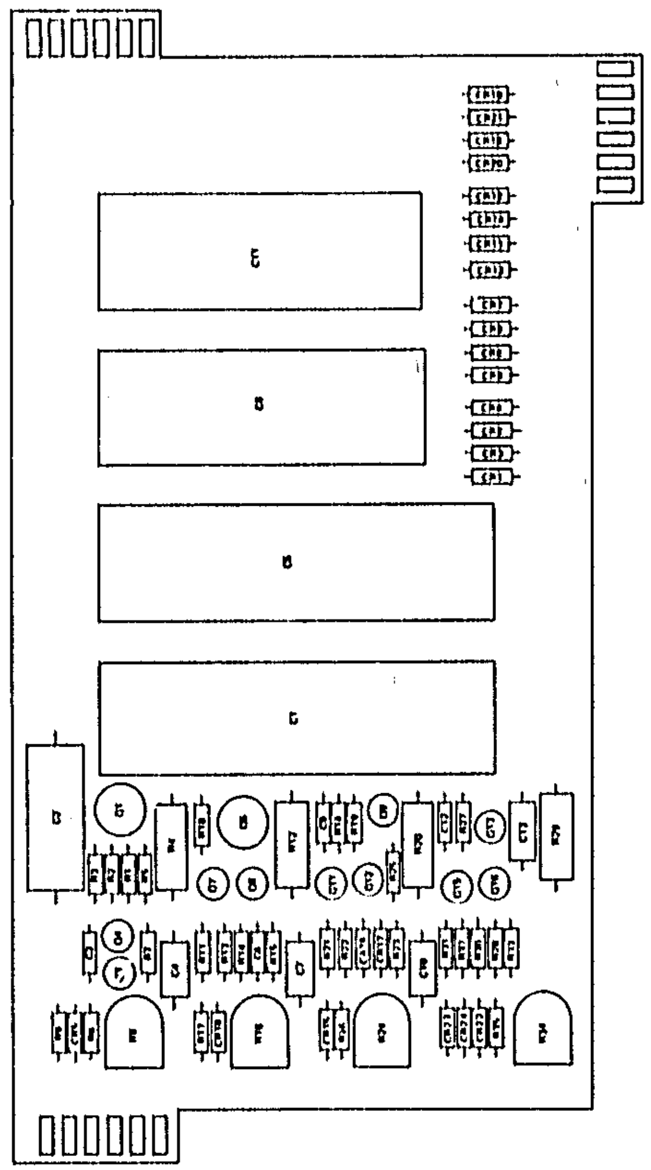
A6 Replaceable Parts — Output Switch Board

REFERENCE DESIGNATOR		HP PART NUMBER	DESCRIPTION	CIRCUIT DIAGRAM SHEET NUMBER	CIRCUIT DIAGRAM GRID REFERENCE	COMPONENT LAYOUT
A6	C1	0160-2930	C=F .01UF 100V			
A6	CR1	1901-0050	DIO SI 40V .2A			
A6	L1	9170-0029	CORE FERR BEAD			
A6	L2	9170-0029	CORE FERR BEAD			
A6	L3	9170-0029	CORE FERR BEAD			
A6	L4	9170-0029	CORE FERR BEAD			
A6	L5	9170-0029	CORE FERR BEAD			
A6	L6	9170-0029	CORE FERR BEAD			
A6	L7	9140-0118	COIL-CHOKE 500UH			
A6	L8	9140-0118	COIL-CHOKE 500UH			
A6	Q1	1854-0367	XSTR SI NPN			
A6	Q2	1853-0090	XSTR SI PNP			
A6	Q3	1853-0090	XSTR SI PNP			
A6	Q4	1854-0367	XSTR SI NPN			
A6	Q5	1853-0090	XSTR SI PNP			
A6	Q6	1853-0090	XSTR SI PNP			
A6	Q7	1853-0090	XSTR SI PNP			
A6	Q8	1853-0090	XSTR SI PNP			
A6	R1	0757-0801	R=F 150 1% .5W			
A6	R2	0757-0801	R=F 150 1% .5W			
A6	R3	0757-0172	R=F 37.4 1% .5W			
A6	R4	0757-0796	R=F 82.5 1% .5W			
A6	R5	0757-0796	R=F 82.5 1% .5W			
A6	R6	0698-0053	R=F 95.3 1% .5W			
A6	R7	0698-4825	R=F 84.9 1% .5W			
A6	R8	0698-4825	R=F 84.9 1% .5W			
A6	R9	0757-1040	R=F 196 1% .5W			
A6	R10	0758-0124	R=F 51 5% .125W			
A6	R11	0757-0801	R=F 150 1% .5W			
A6	R12	0757-0801	R=F 150 1% .5W			
A6	R13	0757-0172	R=F 37.4 1% .5W			
A6	R14	0757-0796	R=F 82.5 1% .5W			
A6	R15	0757-0796	R=F 82.5 1% .5W			
A6	R16	0698-0053	R=F 95.3 1% .5W			
A6	R17	0698-4825	R=F 84.9 1% .5W			
A6	R18	0698-4825	R=F 84.9 1% .5W			
A6	R19	0757-1040	R=F 196 1% .5W			
A6	R20	0758-0124	R=F 51 5% .125W			
A6	R22	0698-4284	R=F 2.74K5% .125W			
A6	R25	0698-4284	R=F 2.74K5% .125W			
A6	R30	0758-0086	R=F 100 5% .125W			
A6	R31	0698-4274	R=F 6.04K5% .125W			
A6	R32	0698-4271	R=F 5.11K5% .125W			
A6	R33	0698-4271	R=F 5.11K5% .125W			
A6	R34	0698-4259	R=F 1.11K5% .125W			
A6	R35	0698-4268	R=F 3.44K5% .125W			
A6	R36	0698-4277	R=F 9.11K5% .125W			
A6	R37	0698-4278	R=F 10K5% .125W			
A6	R39	0698-4284	R=F 2.74K5% .125W			
A6	R40	0698-4284	R=F 2.74K5% .125W			
A6	R41	0757-0796	R=F 82.5 1% .5W			
A6	R42	0757-0796	R=F 82.5 1% .5W			
A6	R43	0698-0053	R=F 95.3 1% .5W			
A6	R44	0757-0796	R=F 82.5 1% .5W			
A6	R45	0757-0796	R=F 82.5 1% .5W			
A6	R46	0698-0053	R=F 95.3 1% .5W			
A6	R47	2100-2742	R-VAR 10K20% .5W			
A6	R48	2100-2778	R-VAR 200K20% .5W			
A6	R49	2100-2778	R-VAR 200K20% .5W			
A6	R50	0698-4278	R=F 10K5% .125W			
A6	R51	0698-4278	R=F 10K5% .125W			
A6	R52	0698-4278	R=F 10K5% .125W			
A6	R53	0698-4278	R=F 10K5% .125W			
A6	R54	0698-4277	R=F 9.11K5% .125W			
A6	R55	0698-4277	R=F 9.11K5% .125W			
A6	R56	0698-4277	R=F 9.11K5% .125W			
A6	R57	0698-4277	R=F 9.11K5% .125W			
A6	R58	0698-4254	R=F 1K5% .125W F			
A6	S9	3101-1311	SW SLIDE DPDT			
A6	S10	5040-1109	SLIDAY			
A6	S11	5040-1106	SLIDAY PC SW			
A6	S12	5040-1119	SLIDE AY-PC SW			
A6	S13	5040-1129	SLIDE AY-PC SW			

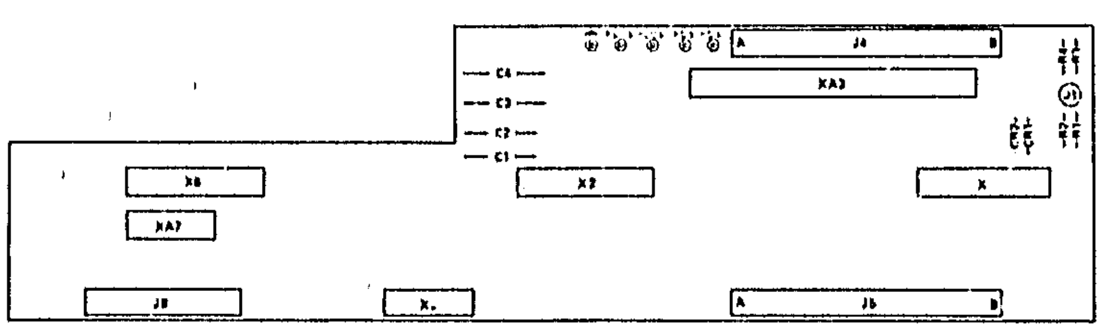

OFFSET A
OFFSET B
OFFSET AMP A
OFFSET AMP B
AMPLITUDE CONTROL
POLARITY CONTROL 1
POLARITY CONTROL 2
ECL BASELINE ADJUST O/P A
ECL BASELINE ADJUST O/P B
ECL AMPLITUDE ADJUST
OFFSET A VERNIER
OFFSET B VERNIER
AMPLITUDE VERNIER
+20V
-20V
0V


P/O A6
T⑥
DC OFFSET
R22
27k
L8
600µH
L3
L2
L1
512a
A AMPLITUDE (V)
INTO 50Ω
512b
R④
40-20
20-10
10 05
05 0.25
ECL
R3
374
R1
150
R2
150
R6
953
R4
825
R5
825
R8
196
R7
649
R8
649
R43
953
R41
825
R42
825
R10
51
R40
18k
ECL SWITCH
CONTROL
P⑥
PULSE OUTPUT 50Ω
J1
U⑥
DC OFFSET
R25
27k
L7
600µH
L6
L5
L4
513a
B AMPLITUDE (V)
INTO 50Ω
513b
S④
40-20
20-10
10 05
05-0.25
ECL
R13
374
R12
150
R11
150
R16
953
R15
825
R14
825
R19
196
R18
649
R17
649
R46
953
R44
825
R45
825
R20
51
R9
18k
ECL SWITCH
CONTROL
O⑥
PULSE OUTPUT 50Ω
J2

A3 Board Layout



A5 Board Layout

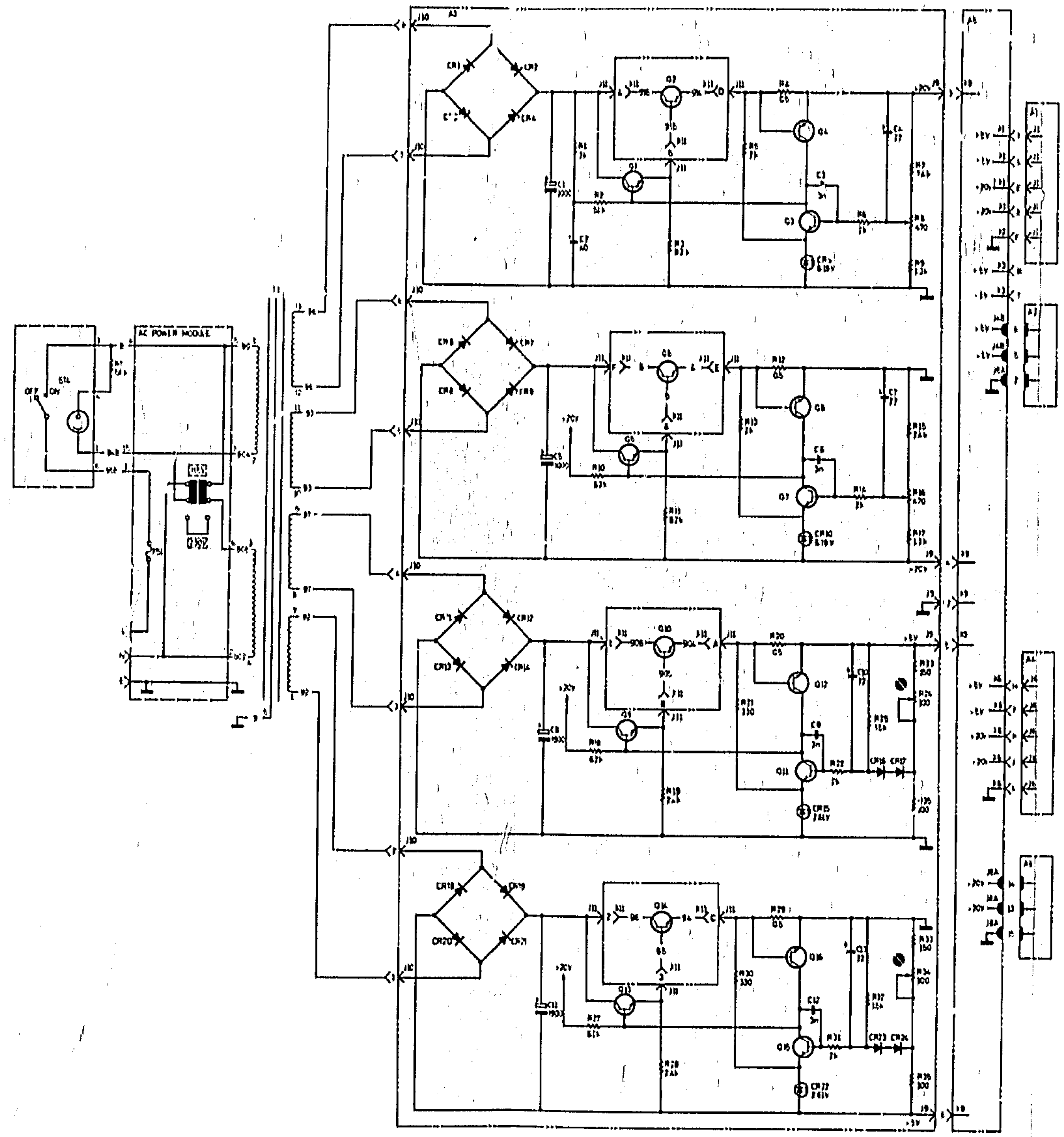


A3 Replaceable Parts – Power Supply

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

A5 Replaceable Parts – Mother Board

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



(8) Power Supply

APPENDIX

A1–1 INTRODUCTION

A1–2 One (Option 001) or two (Option 002) model 15171A risetime converters are delivered with optional versions of model 8008A pulse generator. When plugged on the output of 8008A, the risetime converter adjusts the transition times of pulses to 1.25ns, 1.50ns, 1.75ns, 2.00ns, 2.25ns or 2.50ns as selected by a switch. A feedthrough position is also available additionally, trimmers permit precise adjustment of transition times to any value within a 10% range of the selected value.

Table A–1. Specifications.

INPUT REQUIREMENTS

Pulses having nominal 1.0ns transition times from 50 Ω source.
Maximum input voltage: 50V
Maximum input current: 250mA

OUTPUT (into 50Ω load)

Transition times: seven fixed transition times; Feedthrough, 1.25ns, 1.50ns, 1.75ns, 2.00ns, 2.25ns and 2.50ns, selected by slide switch. Trimmer capacitors permit adjustment to any value within 10% of selected value except feedthrough.

Overshoot: < 3% for all values except feedthrough.

Output impedance: 50Ω (determined by pulse source).

Output mismatch: < 10% reflection when open ended cable connected to output.

Output connector: GR Type 874

GENERAL

Dimensions: 140 mm x 80 mm x 40 mm.

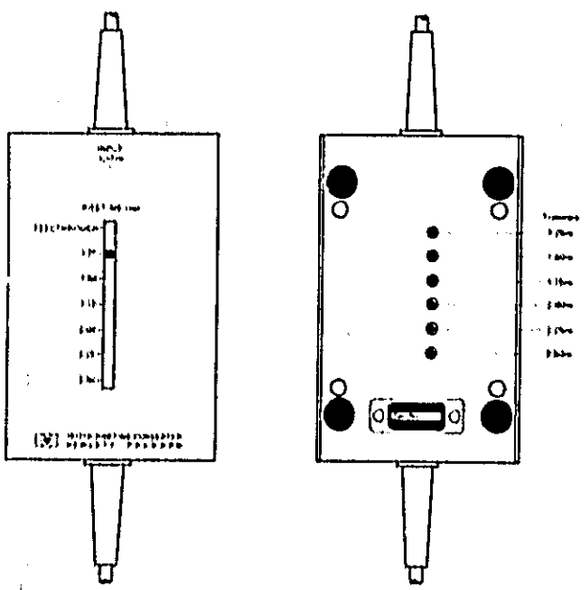


Figure A–1. 15171A Risetime Converter

Table A-2 Replaceable Parts

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION
C1	0160-2236	C-F 1pF 500V
C2	0121-0475	C-VAR 2-22pF
C3	0160-2236	C-F 1pF 500V
C4	0160-2241	C-F 2.2pF 500V
C5	0121-0475	C-VAR 2-22pF
C6	0160-2241	C-F 2.2pF 500V
C7	0160-2244	C-F 3pF 500V
C8	0121-0475	C-VAR 2-22pF
C9	0160-2244	C-F 3pF 500V
C10	0160-2247	C-F 3.9pF 500V
C11	0121-0475	C-VAR 2-22pF
C12	0160-2247	C-F 3.9pF 500V
C13	0160-2250	C-F 5.1pF 500V
C14	0121-0475	C-VAR 2-22pF
C15	0160-2250	C-F 5.1pF 500V
C16	0160-2252	C-F 6.2pF 500V
C17	0121-0475	C-VAR 2-22pF
C18	0160-2252	C-F 6.2pF 500V
R1	0698-4230	R-F 82 OHM 5% .125W
R2 /1	15171-61501	R/LAY
R3	0698-4230	R-F 82 OHM 5% .125W
R4 /2	15171-61501	R/LAY
R5	0698-4230	R-F 82 OHM 5% .125W
R6	0698-4230	R-F 82 OHM 5% .125W
R7 /3	15171-61502	R/LAY
R8	0698-4230	R-F 82 OHM 5% .125W
R9 /4	15171-61502	R/LAY
R10	0698-4230	R-F 82 OHM 5% .125W
R11	0698-4230	R-F 82 OHM 5% .125W
R12/5	15171-61503	R/LAY
R13	0698-4226	R-F 62 OHM 5% .125W
R14/6	15171-61503	R/LAY
R15	0698-4230	R-F 82 OHM 5% .125W
R16	0698-4230	R-F 82 OHM 5% .125W
R17/7	15171-61504	R/LAY
R18	0698-5705	R-F 39 OHM 5% .125W
R19/8	15171-61504	R/LAY
R20	0698-4230	R-F 82 OHM 5% .125W
R21	0698-4230	R-F 82 OHM 5% .125W
R22/9	15171-61505	R/LAY
R23	0698-5705	R-F 39 OHM 5% .125W
R24/10	15171-61505	R/LAY
R25	0698-4230	R-F 82 OHM 5% .125W
R26	0698-4230	R-F 82 OHM 5% .125W
R27/11	15171-61506	R/LAY
R28	0698-5705	R-F 39 OHM 5% .125W
R29/12	15171-61506	R/LAY
R30	0698-4230	R-F 82 OHM 5% .125W

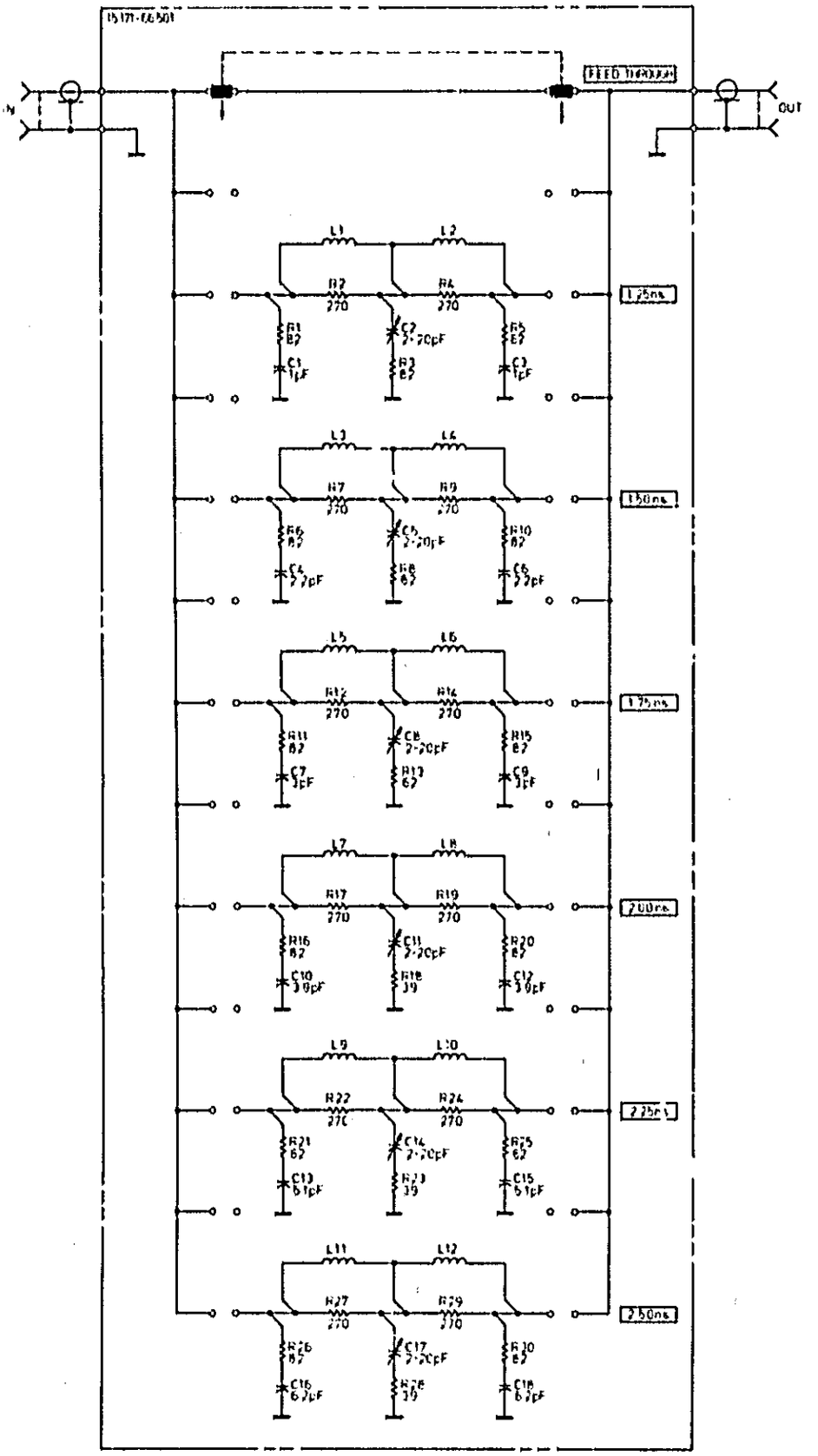


Figure A–2. Rise Time Converter 15171A