#### Errata

Title & Document Type: 8011A Pulse Generator, Operation & Service Manual

Manual Part Number: 08011-90004

**Revision Date: 1990** 

### **HP References in this Manual**

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

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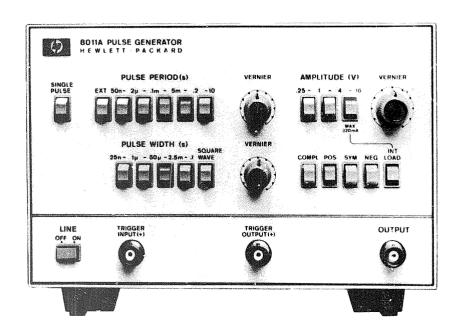
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# 8011A PULSE GENERATOR



HEWLETT hp PACKARD

## CERTIFICATION

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

## WARRANTY AND ASSISTANCE

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

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

## **OPERATING AND SERVICE MANUAL**

## 8011 A PULSE GENERATOR

### **SERIAL NUMBERS**

This manual applies directly to instruments with serial number 1411 G 01136 and higher. Any changes made in instruments having serial numbers higher than the above number will be found in a "Manual Changes" supplement (yellow pages) supplied with this manual. Be sure to examine this supplement for any changes which apply to your instrument and record these changes in the manual.

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FEDERAL REPUBLIC OF GERMANY

MANUAL PART NO. 08011-90004 Microfiche Part No. 08011-95004

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## CONTENTS

Section 1	General Information	Page
1-1 1-6	Description	
Section 2	Installation	
2-1 2-2 2-5 2-6 2-9 2-12 2-14 2-15 2-17	General Initial Inspection Installation Power Source Requirements Power Cord Temperature Requirements Claims and Repackaging Claims for Damage Repackaging for Shipment and Storage	2-1 2-1 2-1 2-1 2-1 2-2 2-2 2-2 2-2
Section 3	Operating Instructions	22
3-1 3-3 3-4 3-5 3-7	General	3-1 3-1 3-1
Section 4	Principles of Operation	
4-1 4-5 4-15 4-19 4-20 4-22 4-25 4-27 4-30	Introduction Rate Generator Width Generator Output Stages Trigger Output Stages Pulse Output Stages Attenuator Power Supply 8011A Option 001 — Pulse Burst	4-1 4-2 4-3 4-3 4-3 4-3 4-3 4-4
Section 5	Maintenance	
5-1 5-3 5-6 5-7 5-9 5-10 Section 6	Introduction Preventive Maintenance Servicing Removal of Assemblies Performance Checks and Adjustment Procedures Troubleshooting Diagrams and Replaceable Paits	5-1 5-1 5-1 5-1
6-1 6-3 6-8 Section 7	Introduction	6-1 6-1 6-3

### ILLUSTRATIONS

	Figure	Title	Page
	2-1	8011A and Delivered Accessories	1-2
	2-2	Power Cords	2-1
	2-3	Switch Settings for the Various Nominal Powerline Voltages	2-1
	3-1	Control and Connectors	3-0
	3-2	8011A Internal Mode	3-1
	3-3	8011A External Mode	3-1
	3-4	External Triggering Timing Sequence	3-1
	3-5	8011A Burst Mode	3-2
	3–6	Examples of Repetitive and Single Burst Output	3-2
	4-1	8011A Block Diagram	4-0
	4-2	Repetition Rate Generator	4-1
	4-3	Width Generator	4-2
	4-4	Output Stages	4-3
	4-5	Voltage Regulator	4-4
	4-6	Fulse Burst Control	4-4
	5-1	Assembly 1, Assembly 2: Troubleshooting Aid	5–20
	5.		
	Diagram	D. A. Carramator	6-5
	1	Rate Generator	6-7
	2		6-9
	3	Output Stage	6-11
	4	Power Supply	6-13
	5	Opt. 001 Burst Board	0-13
ΓΔΕ	SLES		
2 6 4 80	of those those was		
	Table	Title	Page
	Table	Title	Page
	Table	Specifications	1-1
		Specifications	1-1
	1-1	Specifications	1-1
	1-1 5-1	Specifications	1-1 5-2
	1-1 5-1 5-2	Specifications	1-1 5-2 5-3
	1-1 5-1 5-2 5-3	Specifications	1-1 5-2 5-3 5-4
	1-1 5-1 5-2 5-3 5-4	Specifications	1-1 5-2 5-3 5-4 5-5 5-6 5-7
	1-1 5-1 5-2 5-3 5-4 5-5	Specifications	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8
	1-1 5-1 5-2 5-3 5-4 5-5 5-6	Specifications	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Buist (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing Performance Check — Transition Time	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing Performance Check — Transition Time Performance Check — Output Amplitude	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing Performance Check — Transition Time Performance Check — Output Amplitude Performance Check — Trigger Gutput	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing Performance Check — Transition Time Performance Check — Output Amplitude Performance Check — Trigger Output Performance Check — Repetitive Burst (8011A — Opt. 001)	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing Performance Check — Transition Time Performance Check — Output Amplitude Performance Check — Trigger Gutput Performance Check — Repetitive Burst (8011A — Opt. 001) Adjustment Procedure: Power Supplies	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17 5-18 5-19	Specifications	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17 5-18 5-19 5-20
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17 5-18 5-19 5-10	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing Performance Check — Transition Time Performance Check — Output Amplitude Performance Check — Trigger Gutput Performance Check — Repetitive Burst (8011A — Opt. 001) Adjustment Procedure: Power Supplies Adjustment Procedure: Base Line Adjustment Procedure: Amplitude	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17 5-18 5-19 5-20
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17 5-18 5-19 5-20 5-20	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing Performance Check — Transition Time Performance Check — Output Amplitude Performance Check — Trigger Output Performance Check — Repetitive Burst (8011A — Opt. 001) Adjustment Procedure: Base Line Adjustment Procedure: Amplitude Troubleshooting Procedures	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17 5-18 5-19 5-20 5-21
	1-1 5-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-9 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17 5-18 5-19 5-10	Specifications Test Equipment and Accessories Required Performance Check — Repetition Rate Performance Check — Manual Trigger Performance Check — Pulse Width Performance Check — Square Wave Performance Check — Single Burst (8011A — Opt. 001) Performance Check — Duty Cycle Performance Check — Pulse Period Jitter Performance Check — Pulse Width Jitter Performance Check — External Trigger Performance Check — High Frequence Triggering Performance Check — Minimum Width Performance Check — Preshoot, Overshoot and Ringing Performance Check — Transition Time Performance Check — Output Amplitude Performance Check — Trigger Gutput Performance Check — Repetitive Burst (8011A — Opt. 001) Adjustment Procedure: Power Supplies Adjustment Procedure: Base Line Adjustment Procedure: Amplitude	1-1 5-2 5-3 5-4 5-5 5-6 5-7 5-8 5-10 5-11 5-12 5-13 5-14 5-15 5-16 5-17 5-18 5-19 5-20 5-21 5-23

Table	Title	Page
6-1	Reference Designators	6 1
6-2	Diagram Notes	0-1
6-3	List of Manufacturers Codes	6-2
6-4	List of Manufacturers Codes	6-3
• .	Frame (Standard) Replaceable Parts List	6-4
6-5	Board A1 (Standard) Replaceable Parts List	6 6
6-6	Roard A2 (Ontion 001) People cookly Power Line	0-0
	Board A2 (Option 001) Replaceable Parts List	C-18
6-7	Frame (Option 001) Replaceable Parts List	6-19
6-8	Board A1 (Option 001) Replaceable Parts List	6-20

### SAFETY SUMMARY

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

GENERAL — This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

**OPERATION** – **BEFORE APPLYING POWER** comply with the installation section. Additionally, the following shall be observed:

Do not remove instrument covers when operating.

Any interruption of the protective (groundding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal is likely to make this instrument dangerous. Intentional interruption is prohibited.

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use or repaired fuses and the short-circuiting of fuseholders must be avoided.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible, and when inevitable, should be carried out only by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation is present. Do not replace components with power cable connected.

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

Do not install substitute parts or perform any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

### SAFETY SYMBOLS



The apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.



Indicates dangerous voltages.



Earth terminal (sometimes used in manual to indicated circuit common connected to grounded chassis).

### WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice or the like, which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

### CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.



WARNING



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

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### 1-1 DESCRIPTION

- 1-2 The Hewlett-Packard Model 8011A is a 20 MHz pulse source that can be externally and manually triggered. Ease of operation is ensured by logically arranged and clearly identified controls.
- 1-3 Pulse amplitudes up to 16V and selectable output format ensure compatibility with most logic families powered from either positive or negative supplies, and using either positive or negative logic conventions. Pulse width is continuously variable from 25ns to 100ms, or can be 50% of pulse period by selecting square wave mode.
- 1-4 Variable pulse width or square wave operation with up to 16V amplitude and the ability to pro-

duce positive, negative or symmetrical pulses in positive or negative logic make the instrument suitable for driving TTL, DTL, RTL, HTL and CMOS as well as discrete logic and linear circuits.

1-5 Serviceability is enhanced by using high quality components, and stable circuits reduce calibration adjustments to a minimum.

### 1-6 PULSE BURST OPTION 001

1—7 Thumbwheel switches on the front panel permit any number of pulses between 1 and 9999 to be preset. A "burst" starts on receipt of an electrical or manual trigger and ceases when the set number of pulses has been generated.

Table 1-1. Specifications

### **PULSE CHARACTERISTICS**

(50 ohm source and load impedances)

Transition times: < 10ns fixed.

Overshoot, ringing and preshoot:  $<\pm$  5% of pulse amplitude. May increase to 10% at counter-clockwise positions of amplitude vernier.

Pulse width: 25ns to 100ms in four ranges. Vernier provides continuous adjustment within each range.

Width jitter: < 0.1% + 50ps for any width setting.

Maximum duty cycle: > 50% (100% using pulse complement).

Maximum, output: 16V, with internal 50 ohms and external high impedance load or, with internal high impedance and external  $50\Omega$ . 8V with  $50\Omega$  source and load impedances.

Attenuator: three step attenuator provides the ranges 0.25V - 1V - 4V - 16V. Vernier provides continuous adjustment within each range.

Source impedance: 0.25V-1V-4V ranges, 50 ohms  $\pm$  10% shunted by 30pF. 4V-16V range, 50 ohms  $\pm$  10% or high impedance switch selectable.

Polarity: positive, negative or symmetrical switch selectable.

Format: normal or complement switch selectable.

#### REPETITION RATE AND TRIGGER

Repetition rate: 0.1 Hz to 20 MHz.

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

Square wave: 0.05 Hz to 10 MHz.

Trigger output: dc coupled 50 ohm (typ) source de-

livering ≥ +1V across 50 ohm load.

Trigger pulse width: 20ns ± 10ns.

### EXTERNALLY CONTROLLED OPERATION

**External Input** 

Input impedance: 50 ohms ± 10%

Maximum input: ± 5V
Trigger polarity: positive.

### Table 1-1. Specifications (cont'd)

Sensitivity: 1V

Manual: front panel pushbutton for generating single pulse.

External Triggering

Repetition rate: 0 to 20 MHz. In square wave, output frequency is half input frequency.

Trigger source: manual or external signal. Min external signal width, 10ns.

Burst mode (optional): preselected number of pulses generated on receipt of trigger.

Burst trigger source: external signal or manual. Min external signal width, 25ns.

### **GENERAL**

Operating temperature: 0°C to 55°C

Power: 100V, 120V, 220V or 240V, +5%. -10%. 48

Hz to 440 Hz, 70 VA max.

Weight: net 4 kg (9 lbs), shipping 6.5 kg (14.6 lbs).

Dimensions: 200mm wide, 142mm high, 300mm deep

 $(7.9 \text{ in.} \times 5.6 \text{ in.} \times 11.8 \text{ in.}).$ 

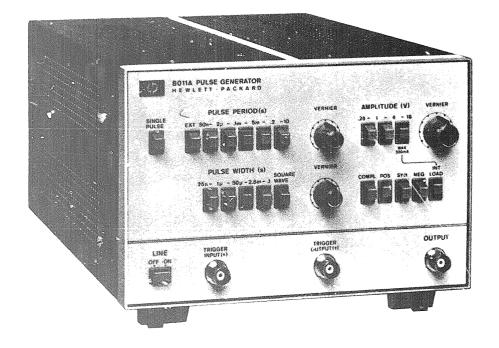




Figure 2-1. 8011A and Delivered Accessories

INSTALLATION

### 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 8011A is supplied with the following items:

Description HP Part Number 300mA fuse (for 220/ 2110-0044 240V operation 600mA fuse (for 110/ 2110-0016 120V operation)
Power Cord (one of those shown in figure 2-2).





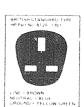




Figure 2-2. Power Cords

### 2-5 INSTALLATION

### CAUTION

Before applying power to the instrument, check that the 8011A is set in accordance with local supply conditions. To gain access to the voltage selector switches and fuse holder remove cover adjacent to the LINE switch.

### 2-6 Power Source Requirements

2-7 The model 8011A will operate from nominal ac line supplies of 100V, 120V, 220V, or 240V (-10%, +5%) at 48 Hz to 440 Hz. Two internally mounted switches allow one of the four voltages to be selected.

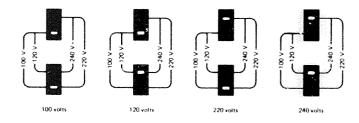


Figure 2–3. Switch Settings for the Various Nominal Powerline Voltages. The power dissipation is 70VA maximum.

2-8 To check the power requirements proceed as follows:

Disconnect the power cable. Remove the fuse and check its value: for 230V operation 300mA for 115V operation 600mA

Check that the line selector switch position corresponds to the local supply voltage. If they do not correspond use a screwdriver to change the switch positions.

Insert the correct fuse into the fuse-holder.

Connect the power cable to the rear connector.

### 2-9 Power Cord

2–10 The 3-wire power cable supplied with the 8011A 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.

2–11 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:

Minimum current rating of 1A. Ground connection Cable clamp

The colour coding used in the cable will depend on the cable supplied (see Figure 2–2 above).

### 2-12 Temperature Requirements

2-13 The model 8011A operates within specifications when the ambient temperature is between  $0^{\circ}$ C (32°F) and 55°C (131°F). The pulse generator may be stored between  $-40^{\circ}$ C ( $-40^{\circ}$ F) and 75°C ( $167^{\circ}$ F).

### 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,

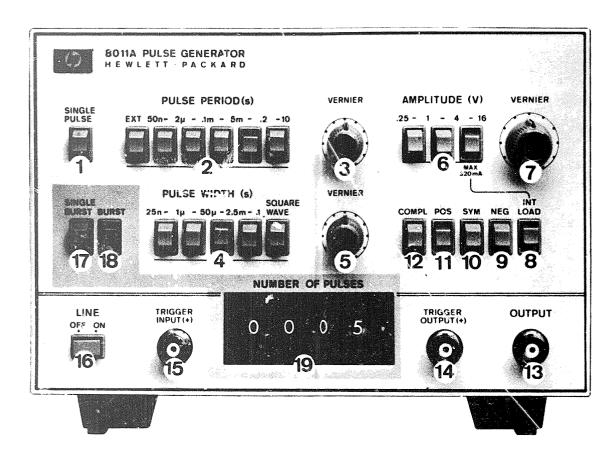
notify the carrier and the nearest Hewlett-Packard Sales/ Service Office. The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

## 2-17 Repackaging for Shipment and 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.

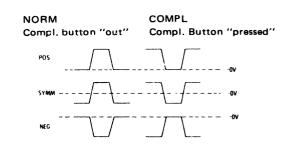
### 2-19 RACK MOUNTING

2-20 To rack mount model 8011A, order model 15179A Adapter for rackmounting 2 units



- 1 SINGLE PULSE: push-button for manually generating a single pulse in the EXTernal and Burst modes.
- 2 PULSE PERIOD: mutually exclusive push-buttons for selecting the range of pulse rate in the internal mode of operation. When EXT is selected rate controls are disabled.
- 3 Rate VERNIER: for continuous adjustment of the repetition rate between the limits of the range selected. Clockwise rotation increases the pulse period (i.e. reduces the rate).
- 4 PULSE WIDTH: mutually exclusive push-buttons for selecting pulse width range.
- Pulse Width VERNIER: for continuous adjustment of pulse width between the limits of the range selected (is inoperative in SQUARE WAVE).
- 6 AMPLITUDE: mutually-exclusive push-buttons for selecting amplitude range. Note that, in the 4–16 Volt range the maximum current available is 320mA (from a current source) and in the other ranges the source impedance is  $50\Omega$ .
- 7 Amplitude VERNIER: for continuous adjustment of the amplitude between the limits of the range selected.
- 8 INT LOAD: push-button switch for connecting (pressed) and disconnecting (released) the  $50\Omega$  internal load in the 4–16 Volt range. In the other ranges the  $50\Omega$  load is always connected.
- 9 NEG: push-button for selecting negative polarity output.
- 10 SYM: push-button for selecting an output which is symmetrical about zero volt.

- 11 POS: push-button for selecting positive polarity output.
- 12 COMPL: push-button for selecting the pulse complement of the set pulse.



- 13 OUTPUT: BNC connector,  $50\Omega$  source (or, on 4–16 Volt range, current source if INT LOAD is released).
- 14 TRIGGER OUTPUT (+): BNC connector, positive trigger pulses from internal rate generator.
- 15 TRIGGER INPUT (+): BNC connector, to which external input signal is applied in EXTernal mode and Burst mode. Maximum input signal +5V.
- 16 LINE ON-OFF: press-for-on-press-for-off switch.

### OPTION 001

- 17 SINGLE BURST: push-button for initiating a pulse burst.
- 18 BURST: push-button switch for selecting pulse burst mode.
- 19 NUMBER OF PULSES: thumbwheel switches on which the required number of pulses in a burst is set.

Figure 3-1. Controls and Connectors

**OPERATING INSTRUCTIONS** 

### 3-1 GENERAL

3–2 The following instructions apply to model 8011A–Option 001. For the standard model, the instructions 3–7 and 3–8 for burst operation should be ignored.

### 3-3 MODES OF OPERATION

### 3-4 Internal

In this mode the 8011A requires no external signal to produce an output. Figure 3–2 shows the control which are effective in this mode.

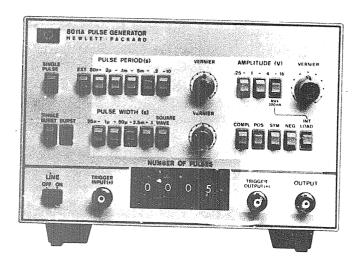


Figure 3-2. 8011A Internal Mode

### 3-5 External

3-6 In EXT 2 mode the repetition rate generator is externally triggered by a signal applied to the TRIGGER INPUT 15 or manually by means of the SINGLE PULSE push button 1 . Figure 3-3 shows the controls which are effective in this mode.

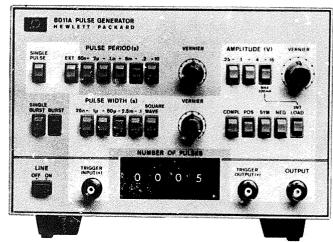


Figure 3-3. 8011A External Mode

Figure 3-4 illustrates the timing sequence between the trigger input and trigger and pulse outputs. Note that in SQUARE WAVE the trigger output frequency is half that of the external input.

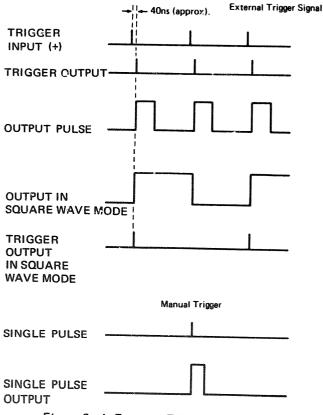


Figure 3-4. External Triggering Timing Sequence

### 3-7 Burst Mode

3-8 To operate the generator in BURST Mode press the BURST push-button 18, set the required NUMBER OF PULSES on the thumbwheel switches 19 and set the pulse parameters (rate, width, etc) on the front panel. A burst is started by pressing the SINGLE BURST button 17 or by applying a signal to the TRIGGER INPUT 15. At the end of a burst, single pulses can be added by pressing the SINGLE PULSE button. Figure 3-5 shows the controls which are effective in this mode and figure 3-6 illustrates examples or repetitive and single burst output.

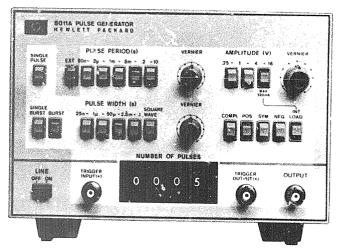


Figure 3-5. 8011A Burst Mode

REP 15	ETITIVE B EXTERNAI TRIGGER INPUT		
14)	TRIGGER OUTPUT		
13) SING	OUTPUT	pressed or 1	t 17 button trigger applied ER INPUT 15
14)	TRIGGER OUTPUT		<u> </u>
(13)	OUTPUT		Single Pulse button pressed

Figure 3-6. Examples of Repetetive and Single Burst Output.

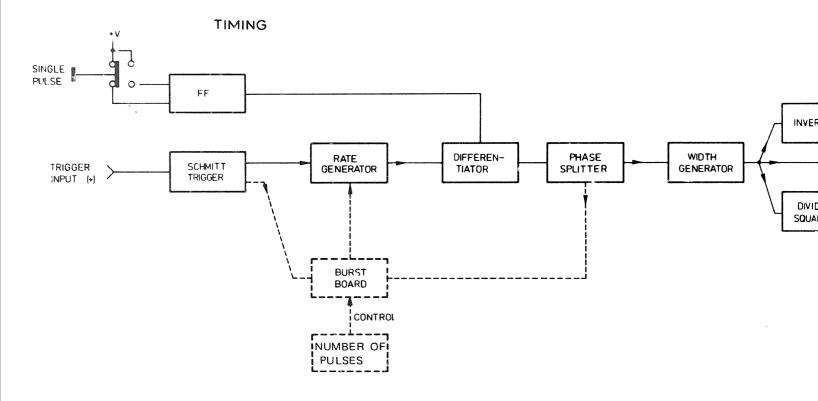
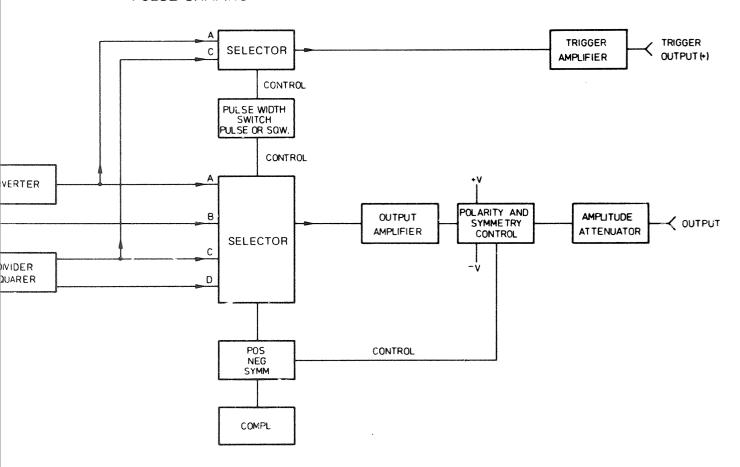


Figure 4-1. 8011A Block Diagram

### PULSE SHAPING



### 4-1 INTRODUCTION (figure 4-1)

- In normal mode operation, the rate generator is free-running at a rate determined by the PULSE PERIOD controls. In the external the disabled rate generator is turned on and off the signal applied to the TRIGGER INPUT connector. The pulse generator can also be manually triggered by means of the SINGLE PULSE button which gives stimulus to the pulse shaping circuits via a flip-flop. When the 8011A has the Burst Option (001) the rate generator can be turned on by an external signal and turned off after a predetermined number of pulses have been generated.
- 4-3 In all modes of operation the pulse shaping circuits define the width (or square wave) and whether the normal or complement of the signal is to be used to drive the output stages. The conditioned signals (A,B,C

- and D) are selected by a series of OR gates. Symmetry and polarity control and baseline correction take place in the output stage.
- 4-4 The trigger amplifier is driven by either signal A, which is the rate signal via an inverter in pulse width mode, or by signal C, which is the Q output from the divider squarer flip-flop in square wave mode.

## 4-5 RATE GENERATOR (Figure 4-2 and Diagram 1)

4-6 In the internal mode of operation the rate generator is free running and produces spikes at a rate determined by a multivibrator under the control of the PULSE PERIOD switch and RATE vernier. Under no-signal conditions in EXT mode, the rate generator is disabled. The pulse rate is then dependent on the frequency of the input signal which turns the multivibrator on and off.

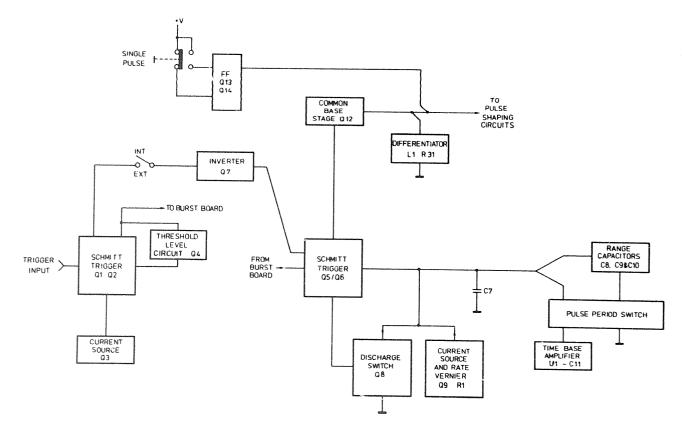


Figure 4-2. Repetition Rate Generator

- 4—7 The rate generator is a Schmitt trigger (Q5 and Q6) which switches when the voltage output of a ramp generator (Q9, vernier R1 and one or more of the range capacitors C7 to C10) reaches its threshold level. When switched it activates a switch (Q8) which rapidly discharges the ramp capacitor(s), causing the voltage to fall and reset the Schmitt trigger. This turns the switch off and the cycle repeats. Each time Q5 is turned off, a positive spike appears at differentiator (L1R31).
- 4-8 In the slowest rep rate range the available ramp current is reduced in order to prolong the charge cycle. That is, the capacitance of C10 is effectively increased during the charge cycle by "bleeding-off" the ramp current and thus increasing the time taken to charge the capacitor. For this purpose, a time base amplifier (U1) is connected in parallel with C10. This results in a division and reduction of the ramp current by an amount proportional to that drawn by the amplifier.
- 4–9 When the 0.2s-10s range switch is closed, the voltage across the ramp capacitors C7 and C10 is amplified by a linear amplifier (U1 A). The resulting signal, which is differentiated by C11, activates an operational amplifier (U1 B) in order to equalize the IR drop across R29 with R30.
- 4-10 During the discharge cycle, the operational amplifier is disabled by the forward biased diode CR26 and the ramp capacitors are rapidly discharged.
- 4-11 The external input circuit comprises a Schmitt trigger (Q1 and Q2) a current source (Q3) and an inverter (Q7). Q4 maintairs a constant voltage at the base of Q2 in spite of the changes in the supply caused by format selection. Refer to paragraph 4-27 for information concerning the power supplies.
- 4-12 The leading edge of a positive signal applied to the TRIGGER INPUT turns Q1 on, Q7 on and Q5 off. Each time Q5 is turned off, a positive spike appears at the differentiator (L1/R31).
- 4—13 When the EXT mode is selected, the Schmitt trigger (Q5/Q6) is disabled. Each time the SINGLE PULSE push button is depressed, a flip-flop (Q13/Q14) rapidly turns on and then off. Each time the flip-flop is turned on, a positive spike appears at the differentiator (L1/R31).

4-14 In all modes of operation, the phase splitter (Q15/Q16) is turned on and off by the positive spikes applied to the base of Q15. When on, it produces a positive pulse to drive the width circuit and a negative pulse which is applied to the burst counter (when fitted).

## 4-15 WIDTH GENERATOR (Figure 4-3 and Diagram 2)

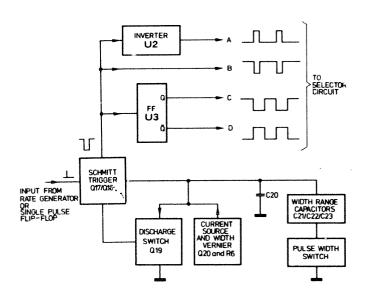
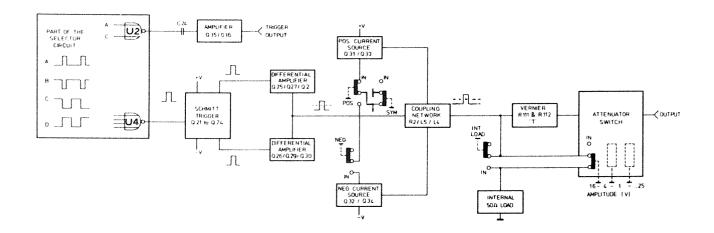


Figure 4-3. Width Generator

- 4–16 In the normal mode, the pulse leading edge occurs when Q17 turns on and Q18 off. The pulse width is determined by the time taken for the selected range capacitor (C20 and C21 or C22 or C23), charged from the variable current source (Q20/vernier R2), to reach the threshold level of the Schmitt trigger. The pulse trailing edge is created when the Schmitt trigger switches and turns on the discharge switch (Q19).
- 4-17 In selecting SQUARE WAVE, the width vernier (R2) is shorted and the narrowest pulse width range is automatically selected. This is in order to deliver a pulse of constant width to a divider-squarrer flip-flop which generates the square wave.



- Figure 4-4. Output Stages

4-18 The Schmitt trigger output is applied directly (signal B) and via an inverter (U2 - signal A) and via the divider squarer (signals C and D) to an array of gates which select the required output as follows:

C	Output Format	Mode			
		Pulse	Square Wave		
	Positive	В	D		
Normal	Symmetrical	В	D		
	Negative	Α	С		
	Positive	Α	С		
Complement	Symmetrical	Α	С		
	Negative	В	D		

## 4-19 OUTPUT STAGES (Figure 4-4 and Diagrams 2 and 3)

### 4-20 Trigger Output Stage (Q35, Q36)

4-21 This is an ac-coupled cascode amplifier which produces a positive output pulse for each input pulse.

### 4-22 Pulse Output Stage

4–23 The function of the pulse output stage is to amplify the selected input signal, to supply the voltages for base line and polarity selection and attenuate the signal voltage to the required output level. The  $50\Omega$  internal load is always connected in the lower ranges but may be switched out in the 4–16 Volt range.

4–24 When POS output is selected, a positive current source (Q31, Q34) drives the output amplifier output above zero volts. For NEG outputs, a negative current source is enabled. Both current sources are disabled when SYMMetrical outputs are selected. The potentiometers R81 and R84 are used for positive (R81) and negative (R84) base line calibration.

### 4-25 Attenuator

4–26 The output attenuator comprises two resistive networks which provide stepped attenuation of the output. A bridged-T vernier provides continuous overlapping adjustment between the settings of the output attenuator. The internal  $50\Omega$ -load can be disconnected in the 4–16 Volt range when the INT LOAD button is released.

## 4-27 POWER SUPPLY (Figure 4-5 and Diagram 4)

4–28 The positive and negative power supplies are identical monolithic voltage regulators (U5 and U6) with external PNP pass transistors (Q37 and Q38). The nominal output voltage with respect to the isolated PC board returns is ± 14V. The voltage levels with respect to zero volts, however, are dependent on the polarity and format switches:

POS switch closed +22.3V/-5.7V NEG switch closed -22.3V/+5.7V SYMM switch closed ± 14V.

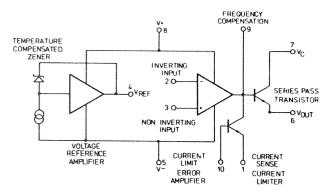


Figure 4-5. Voltage Regulator

4–29 A portion of the output voltage developed across the potential divider (R127, R129) is applied to an error amplifier which compares this with an internally developed reference voltage. If the difference between these voltages varies, the amplifier varies the base voltage of a series pass transistor which regulates the flow through Q37. Current limiting is accomplished by sensing the voltage drop across R123 by means of a current limiting device.

## 4-30 8011A Option 001 - Pulse Burst (Figure 4-6 and Diagram 5)

- 4—31 The Burst Control essentially consists of a counter which is loaded with numbers from front panel thumbwheel switches. When a burst is started, pulses from the rate generator decrement the counter until it is empty. This condition (all zeroes) is detected and generates a BURST COMPLETE signal which disables the rate generator.
- 4-32 The following description, in conjunction with figure 4-6, divides the burst operation into four successive stages:
  - 1. Loading the Burst Counter
  - 2. Start Burst
  - 3. Zero Detection
  - 4. Burst Complete

### 4-33 Loading the Burst Counter

4-34 When 3URST mode is selected, the BURST ENABLE line goes high (0V) and 'clears' U19 (via Q7, C6, U13, U12), setting the Q output low. A low on this output then enables data to be loaded from the thumbwheel switches into the counter.

As data is being loaded, a comparator (U1, U2, U7 and U8) checks for equivalence between the counter inputs and outputs. When equivalence is detected, input pin 11 of U12d goes high, and the LOAD line (from output pin 13 of U12d) goes low thus preventing further loading of the counter.

4-35 Throughout this load process, the high on the  $\overline{Q}$  output of U19 disables the repetition rate generator (via AND gate CR11, CR12 and OR gate Q2, Q3), and therefore prevents the counter from counting.

#### 4-36 Start Burst

4–37 When the START BURST signal is received, U19 is 'preset' (via NAND gate Q5, Q6) causing the Q and  $\overline{Q}$  outputs to change state. The low on the  $\overline{Q}$  output starts the repetition rate generator, and the counter begins to count down from the preset number. The high on the Q output of U19 ensures that the LOAD line remains disabled, thus preventing a re-load of the counter (e.g. by thumbwheel switch change) before the end of the burst.

### 4-38 Zero Detection

4-39 Throughout the count-down process, all outputs of the counter are monitored by two 'zero detect' configurations, one consisting of U9 and U11, and the other consisting of U9 and CR2+CR10. The significance of the two configurations is explained in the following Burst Complete description.

### 4-40 Burst Complete

- 4–41 When the counter reaches the 'all zero' condition, the fast 'zero detect' circuit (U9, CR2 → CR10) generates a BURST COMPLETE signal, which disables the repetition rate generator via OR gate Q2, Q3. This fast zero detection is achieved by using a 'hot carrier' diode for CR10, which monitors the final zero state, C1, of the counter. Fast detection then ensures that the repetition rate generator is switched off after the correct number of pulses have been output.
- 4-42 The other 'zero detect' circuit (U9, U11) clears U19, setting the Q output low again, and thus allowing the counter to be loaded once more from the thumbwheel switches.

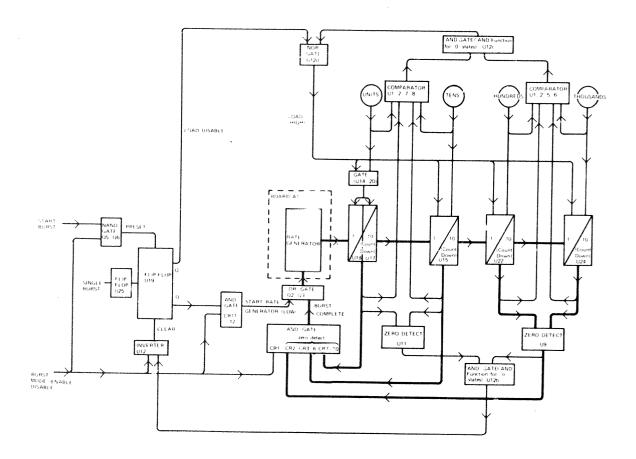


Figure 4-6. Pulse Burst Control

**MAINTENANCE** 

### 5-1 INTRODUCTION

5–2 The Model 8011A contains reliable components mounted on gold plated PC boards. These are subjected to a series of tests and calibration procedures which ensure accuracy and long life. In addition, maintenance and servicing is made easy by a non-complicated design and a simple "all on one board" construction.

### 5-3 Preventive Maintenance

- 5-4 The inherent reliability and accuracy of the pulse generator can be maintained by periodic cleaning and mechanical inspections. To gain access to the interior of the instrument remove the two panel covers. These are removed by releasing the four screws in the respective cover and sliding it away from the side of the instrument.
- 5–5 Remove dust from the interior and check that all fittings, connectors and boards are firmly in place. Check that the wiring and cables especially those of power supply and line voltage are in good condition. Ensure correct function of the controls by checking that the switch push rods and vernier knobs are able to move freely.

### 5-6 SERVICING

5-7 The following service information is only for servicing down to component level. When servicing the 8011A, if a fault cannot be localised within two hours, the complete instrument should be sent to the nearest repair centre.

NOTE: There is no board-exchange program for the 8011A.

### 5-8 Removal of Assemblies

5-9 The PC board should only be removed in extreme circumstances e.g. burnt board.

If necessary, however, the board can be removed as follows:

- 1. Remove AMPLITUDE vernier knob.
- 2. Remove the four screws that fix the rear panel to the frame.
- 3. Unsolder the TRIGGER IN cable, the TRIGGER OUT cable and the OUTPUT cable.
- 4. Unsolder WIDTH and RATE vernier cables.
- 5. Pull the 'rear panel/board' assembly out of the frame.
- 6. Unsolder transformer wires, power switch cables and power lamp cables.
- 7. Remove the two heat-sink screws from the rear panel.

## 5-10 Performance Checks and Adjustment Procedures

5-11 After completion of a repair or periodic inspection, verify that the instrument is working to specification by carrying out the performance checks (Table 5-2 to 5-17). Rigid observance to the sequence in which the checks appear is unnecessary. Table 5-18 and 5-19 give the procedures for checking and adjusting the power supplies and pulse base line.

### 5-12 Troubleshooting

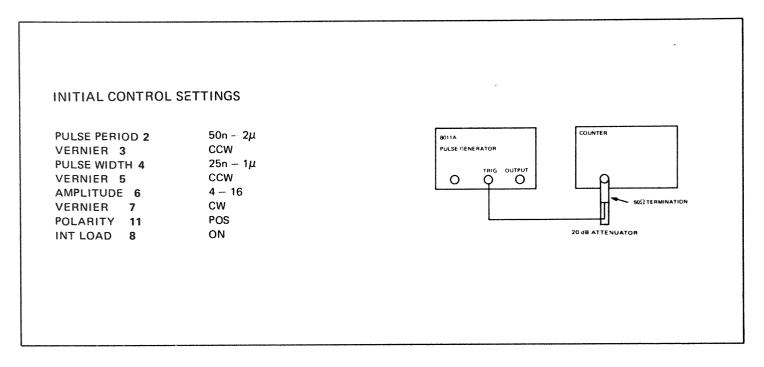
5-13 When a fault symptom is evident, try to locate the fault to a functional block using figure 4-1. Then use table 5-21, the first page of which will indicate the direction in which troubleshooting is to proceed. The most convenient test point for the waveforms and voltages presented in the table can be located on figure 5-1.

Table 5-1. Test Equipment and Accessories Required

INSTRUMENT	BRIEF SPECIFICATION	RECOMMENDED MODEL	
Oscilloscope	Dual Channel, 50 MHz bandwidth, sweep speeds 0.1µs/div. to 2 s/div. with sweep delay, 10mV/div. to 10 V/div. sensitivity.	HP 180C with plug-ins 1801A and 1821A	
Sampling Oscilloscope	Dual Channel, 1 GHz bandwidth, 10mV/div. to 0.2 V/div. sensitivity, sweep speeds 1ns/div. to 10ms/div.	HP 180C with plug-ins 1810A	
Counter	Frequency Range 0 to > 20 MHz	HP 5245L	
VHF Test Oscillator	Frequency Range > 20 MHz	HP 3200B	
Test Oscillator	Frequeny Range 10 Hz to 10 MHz	HP 651B	
Pulse Source	Frequency Range up to 20 MHz	HP 8011A	
Digital Voltmeter	Sensitivity 0.1 V to 100 V	HP 34740A with plug-on HP 34702A	
AC Voltmeter	Sensitivity 0.1 mV to 100mV	HP 3400A	

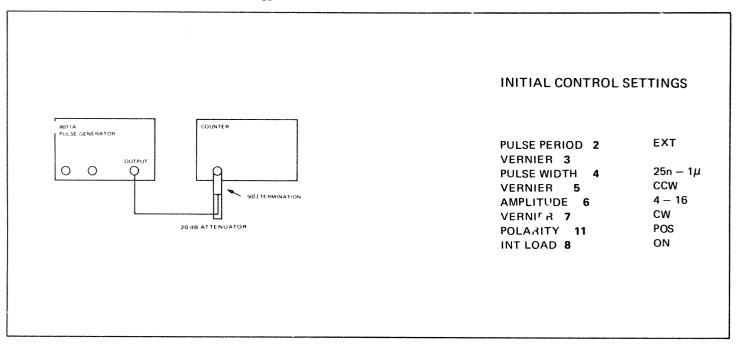
RECOMMENDED MODEL
HP 10502A
HP 10503A
HP 11033A
HP 8491A
HP 1250-0077
HP 1250-0780
HP 1250-0781
HP 11048C
HP 15104A

Table 5-2. Performance Check - Repetition Rate



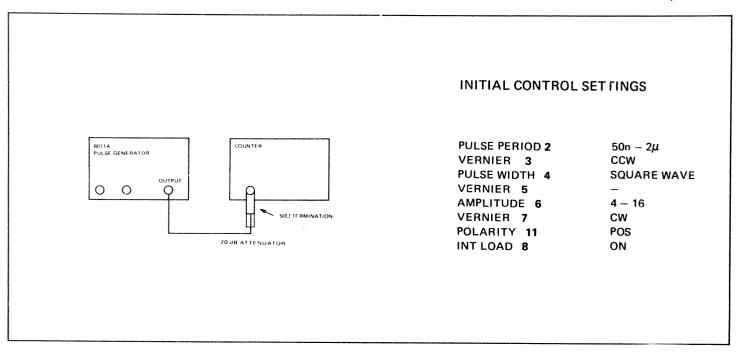
#### **RESULT** STEP INSTRUCTION 1 Check the repetition rate for each setting of the controls listed below. PULSE PERIOD 2 **VERNIER 3** >20MHz $50n - 2\mu$ **CCW** CW <500kHz >500kHz $2\mu - 0.1m$ CCW CW <10kHz 0.1m - 5m**CCW** >10kHz CW <200Hz 2 For the following ranges set the counter for period measurement: 5m - 0.2CCW <5ms CW >200ms 0.2 - 10CCW <200ms CW >10s.

Table 5-3. Performance Check - Manual Trigger



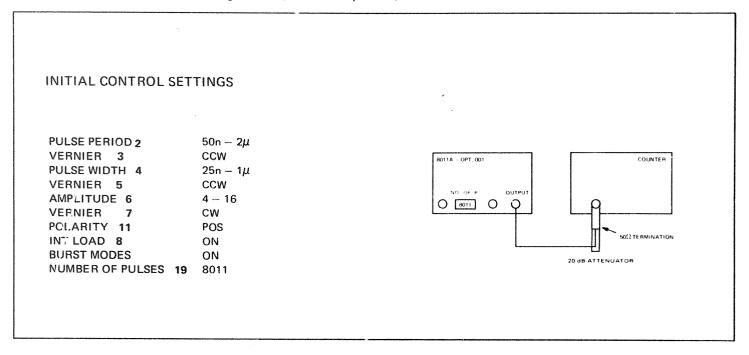
STEP	INSTRUCTION	RESULT
1	Set the counter for manual start.	
2	Press the SINGLE PULSE button once only:	1 pulse

Table 5-4. Performance Check - Square Wave



STEP	INSTRUCTION	RESULTS
1	Set the counter function to measure frequency.	
2	Check the square wave pulse for each control setting listed below:	
	PULSE PERIOD 2	
	$50n-2\mu$	> 10 MHz
	$2\mu - 0.1$ m	> 250 kHz
	0.1m — 5m	> 5 kHz
3	Set counter function to period average	
	5m — 0.2	< 10ms
	0.2 - 10	< 400ms

Table 5-5. Performance Check - Single Burst (8011A - Opt. 001)

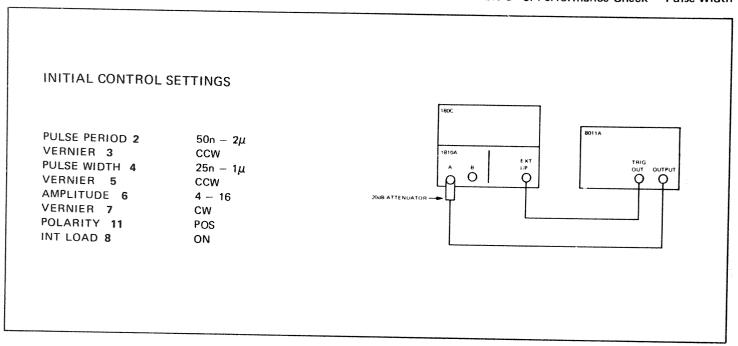


RESULTS

1 Press SINGLE BURST button:

8011 pulses

Table 5-6. Performance Check - Pulse Width



### **RESULTS**

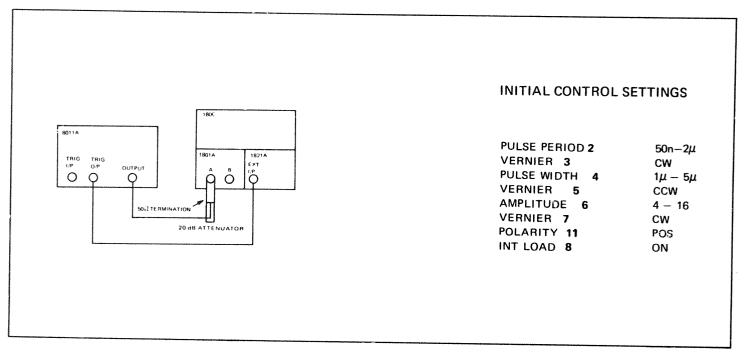
1 Check the pulse width for each of the control settings listed below.

PULSE PERIOD 2	VERNIER 3	PULSE WIDTH 4	VERNIER 5	
50n – 2μ	CCW	25n – 1μ	CCW	< 25ns
$2\mu$ – .1m	CCW	$1\mu - 50\mu$	CCW	< 1μ
.1m — 5m	CCW	$50\mu - 2.5m$	CCW	< 50µ
5m2	CCW	2.5m1	CCW CW	< 2.5m > .1s

### - CAUTION -

Output power when  $4-16\ V$  range selected can destroy scope's internal 50 ohm load. Use a 20 dB power attenuator.

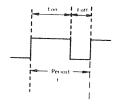
Table 5-7. Performance Check - Duty Cycle



### RESULTS

- By means of the pulse width VERNIER 5. Set the pulse leading edge on the first line of the oscilloscope screen and the trailing edge on the centre line (5 cm).
- Turn the pulse period VERNIER 3 slowly CCW until the trailing edge moves and/or the pulse is divided.
- Measure the distance between the both pulse leading edges for each setting of the controls listed below:

PULSE PERIOD 2	PULSE WIDTH 4	VERNIE	R <b>5</b>
$50n - 2\mu$ $2\mu - 0.1m$ 0.1m - 5m	$1\mu - 50\mu$ $50\mu - 2.5m$ 2.5m - 0.1	as in step 1	Divisions < 10 = > 50% < 10 = > 50% < 10 = > 50%

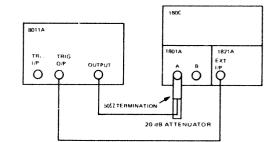


Duty cycle formula is 
$$\frac{t \text{ on } \times 100}{t \text{ (period)}}$$
 % = % Duty Cycle

Table 5-8. Performance Check - Pulse Period Jitter

### INITIAL CONTROL SETTINGS

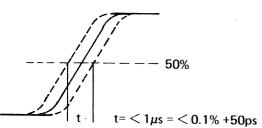
'PULSE PERIOD 2 0.1m - 5m**VERNIER** see below PULSE WIDTH 4  $50\mu - 2.5m$ VERNIER 5 CCW AMPLITUDE 6 4 - 16 VERNIER CW POLARITY 11 POS INT LOAD



### STEP INSTRUCTIONS

**RESULTS** 

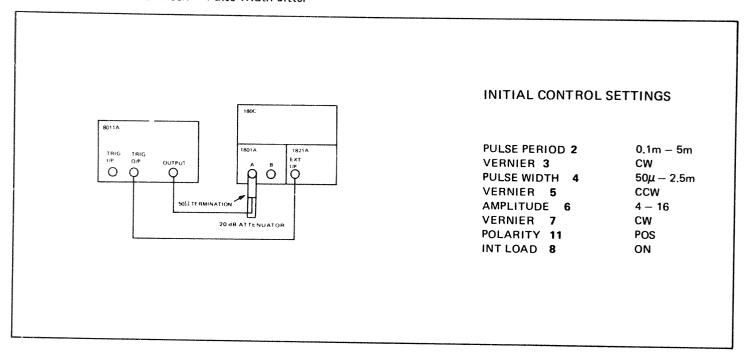
- 1 Main Sweep .1ms/div
  Delayed Sweep 10μs/div
  Sweep Display MAIN
  Magnifier X 1
- Adjust the pulse period VERNIER (3) to obtain a 1ms pulse period.
- Adjust the oscilloscope delay (div.) until the intensified Spot coincides with the leading edge of the second pulse on the display.
- 4 Switch to Delayed sweep display on oscilloscope and Magnifier X 10
- 5 Measure pulse period jitter t.



### - CAUTION -

Output power when 4-16~V range selected can destroy an ordinary 50 ohm load. Use a 20 dB power attenuator or a 50 ohm power termination.

Table 5-9. Performance Check - Pulse Width Jitter



### RESULTS

1 Set the controls of the oscilloscope as follows

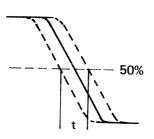
Main Sweep .1ms/cm
Delayed Sweep 10μs/cm

Delayed Sweep  $10\mu s/cm$ Sweep Display MAIN

Magnifier X

X 1

- 2 Adjust the pulse width vernier to obtain a 1ms pulse width.
- Adjust the Delay (Div.) until the intensified spot coincides with the trailing edge of the first pulse
- 4 Switch to Delayed sweep display on oscilloscope and Magnifier X 10
- 5 Measure width jitter t

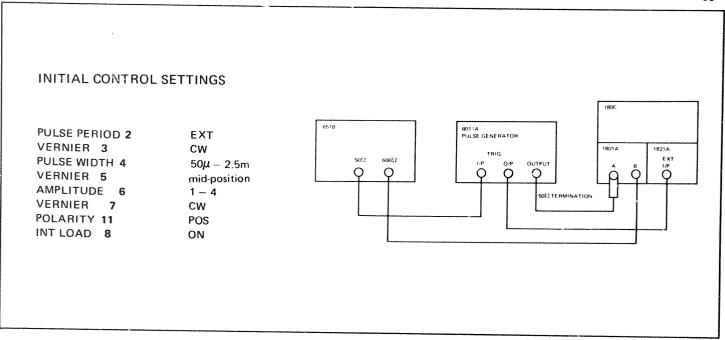


 $t = < 1\mu = < 0.1\% +50ps$ 

### - CAUTION -

Output power when 4–16 V range selected can destroy an ordinary 50 ohm load. Use a 20 dB power attenuator or a 50 ohm power termination.

Table 5-10. Performance Check - External Trigger



- Adjust the oscillator output amplitude to 2.0Vpp and frequency to 1 kHz.
- 2 On the oscilloscope, center both channels vertically.
- Observe pulse, ensure that pulse occurs during positive slope of the input sine wave.

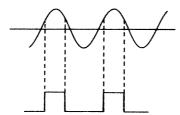
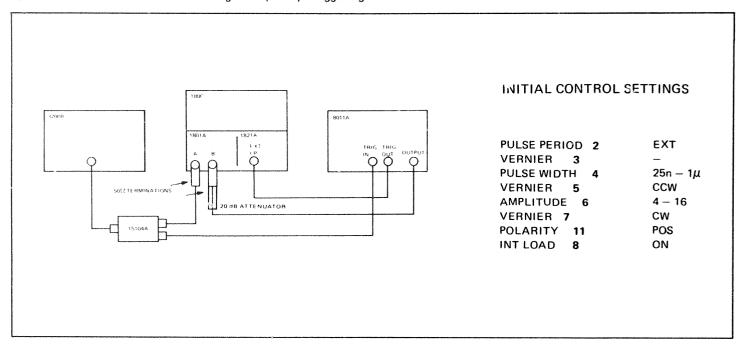


Table 5-11. Performance Check - High Frequency Triggering



Adjust the oscillator output amplitude for 2.0Vpp at 8011A TRIG IN. Set Frequency to 20 MHz.

(NOTE: Peturbation delay of typically 50ns)

- 2 Check that the 8011A output pulse has the same pulse period as the external signal.
- 3 Set the 8011A to NEG and repeat steps 2 and 3.

Set the 8011A to SYMM and repeat steps 2 and 3.

### - CAUTION ----

Output power when 4-16~V range selected can destroy an ordinary 50 ohm load. Use a 20 dB power attenuator or a 50 ohm power termination.

Table 5–12. Performance Check – Minimum Width

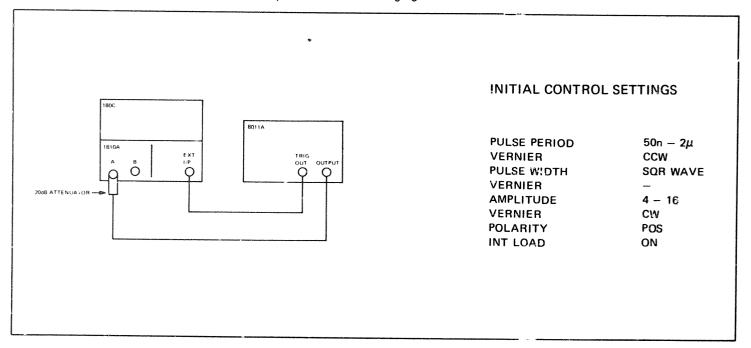
### INITIAL CONTROL SETTINGS 8011A PULSE PERIOD 2 $50n - 2\mu$ Ö Q VERNIER 3 MIDDLE $25n - 1\mu$ PULSE WIDTH 4 20d8 ATTENUATOR -VERNIER 5 CCW AMPLITUDE 6 4 - 16VERNIER 7 CW POS POLARITY 11 INT LOAD 8

STEP	INSTRUCTIONS	RESULTS
1	Set the oscilloscope to obtain a full-screen pulse amplitude display.	
2	Measure pulse width at 50% of amplitude	< 25ns
3	Set 8011A controls to NEG and repeat steps 2 and 3	< 25ns

### - CAUTION -

Output power when  $4-16\ V$  range selected can destroy scope's internal 50 chm load. Use a 20 dB power attenuator.

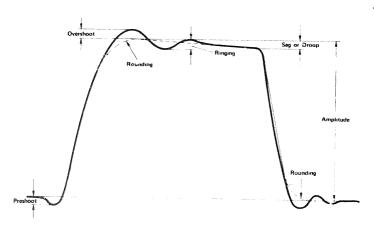
Table 5-13. Performance Check - Preshoot, Overshoot and Ringing



- Set the oscilloscpe to obtain a full-screen amplitude display.
- With reference to the diagram below, measure preshoot, overshoot and ringing. All should be

RESULTS

≤ 5% of pulse\* amplitude



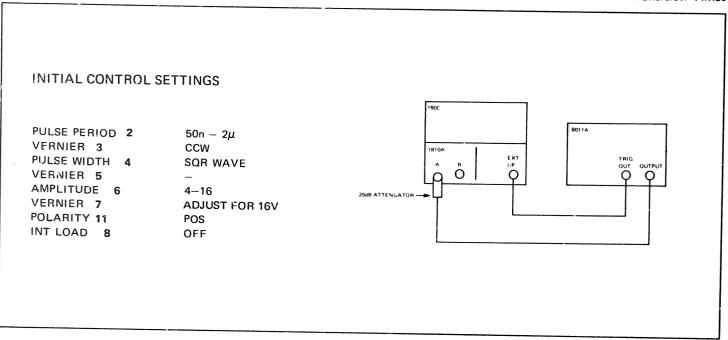
- \*Overshoot may increase to 10% with Amplitude vernier CCW.
- 3 Set INT LOAD to OFF. Verify preshoot, overshoot and ringing.

≤ 10 % of pulse amplitude

#### - CAUTION -

Output power when 4-16~V range selected can destroy scope's internal 50 ohm load. Use a 20 dB power attenuator.

Table 5-14. Performance Check - Transition Times

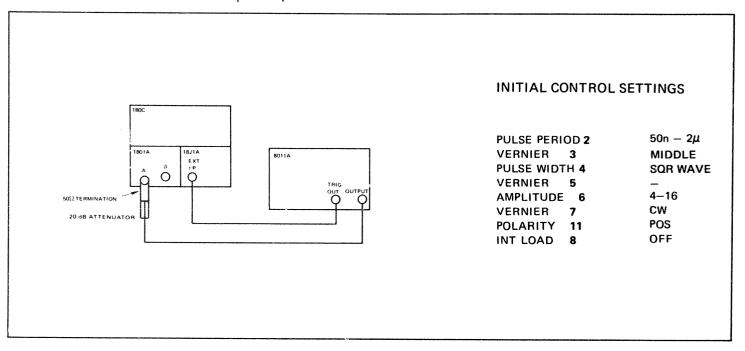


STEP	INSTRUCTIONS	RESULTS
1	Set the oscilloscope to obtain the following: (1) full screen amplitude display (2) expanded sweep (3) leading edge of pulse at centre of screen	
2	Measure leading edge between 10% and 90% of amplitude	< 10ns
3	Centralize trailing edge on screen	
4	Measure trailing edge betwen 10% and 90% of amplitude.	< 10ns

# - CAUTION -

Output power when  $4-16\ V$  range selected can destroy scope's internal 50 ohm load. Use a 20 dB power attenuator.

Table 5-15. Performance Check - Output Amplitude



STEP	INSTRUCTIONS		RESULTS
1	Check the amplitude for listed below	each setting of the controls	
	AMPLITUDE 6	VERNIER 7	
	4 – 16	CW (with INT. LOAD OFF)	> 16V
		CW (with INT. LOAD ON)	>8V
		CCW	< 4V
	1 – 4	CW	> 4V
		CCW	< 1V
	0.25 - 1	CW	> 1V
		CCM	< 0.25V

### - CAUTION ----

Output power when 4–16 V range selected can destroy an ordinary 50 ohm load. Use a 20 dB power attenuator or a 50 ohm power termination.

Table 5–16. Performance Check — Trigger Output

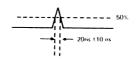
# INITIAL CONTROL SETTINGS 180C PULSE PERIOD 2 $50n - 2\mu$ 8011A VERNIER 3 CCW οl PULSE WIDTH 4 $25n - 1\mu$ VERNIER 5 CCW AMPLITUDE 6 0.25 - 1VERNIER 7 CW POLARITY 11 POS INT LOAD 8 ON

### STEP INSTRUCTIONS

**RESULTS** 

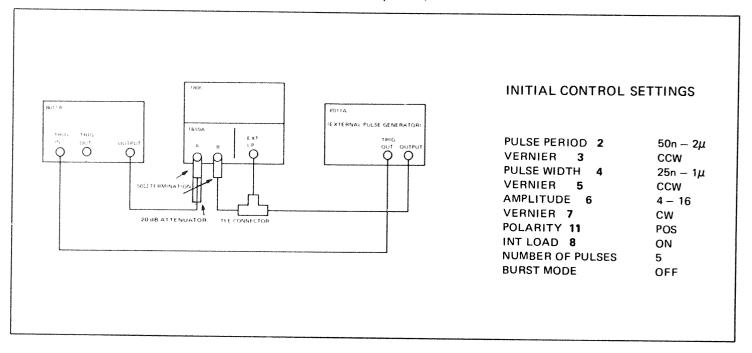
- 1 Check trigger output
  - (1) Amplitude:
  - (2) Width:

≥ 1 V> 10ns < 30 ns</li>



- Turn 8011A pulse period vernier slowly clockwise and check that trigger output is as above
- 3 Set the 8011A to SQR WAVE and repeat step 2.

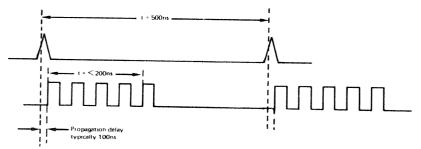
Table 5-17. Performance Check - Repetitive Burst (8011A - Opt. 001)



# STEP INSTRUCTIONS

**RESULTS** 

1 Set rep. rate of external signal to 2 MHz:



Select BURST MODE and observe pulses on the oscilloscope

### — CAUTION —

Output power when  $4{-}16\,\mathrm{V}$  range selected can destroy an ordinary 50 ohm load. Use a 20 dB power attenuator or a 50 ohm power termination.

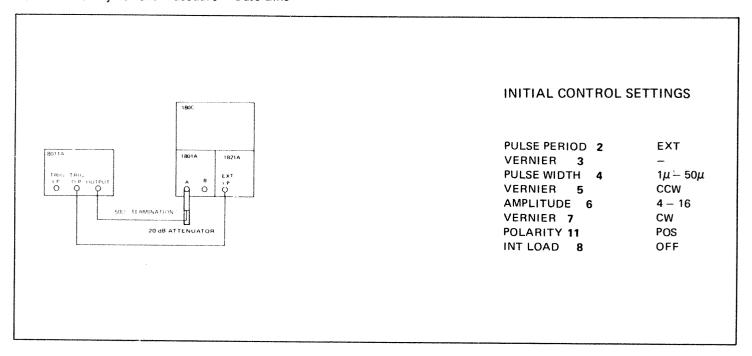
Table 5-18. Adjustment Procedure: Power Supplies

# **INITIAL CONTROL SETTINGS**

PULSE PERIOD 2 EXT VERNIER 3 CW PULSE WIDTH 4  $1\mu - 50\mu$ VERNIER 5 CCW AMPLITUDE 6 1 - 4 VERNIER 7 CW POLARITY 11 SYMM INT LOAD 8 ON BURST MODE OFF (if fitted)

STEP	INSTRUCTIONS	ADJUST	RESULTS
1	The following measurement are with respect to zero volts using a digital voltmeter.		
2	Measure voltage at the +14V test point	A1R125	+14V± 100mV
3	Measure voltage at the -14V test point	A1R128	-14V ± 100mV
4	If the Burst option (001) is fitted measure voltage at the +5V test pin on assembly 1		+5V ± 200mV
5	The following measurements are with respect to zero volts using an AC voltmeter.		
6	Measure the ripple on the following supplies +14V -14V +5V		<1mV rms <1mV rms <1mV rms

Table 5-19. Adjustment Procedure - Base Line



#### STEP INSTRUCTIONS

1 With the oscilloscope set to Ground, center the trace on the graticule.

--- Baseline

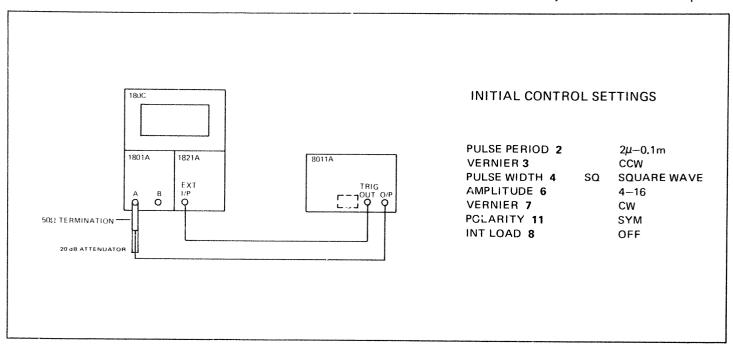
2 Switch to DC operation and check that the pulse base remains center of the graticule.

- 3 If necessary, adjust R81 accordingly.
- 4 Select NEG on the 8011A.
- 5 Repeat step 2.
- 6 If necessary, adjust R84 accordingly.

#### - CAUTION -

Output power when  $4-16\,V$  range selected can destroy an ordinary 50 ohm load. Use a 20 dB power attenuator or a 50 ohm power termination.

Table 5-20. Adjustment Procedure-Amplitude

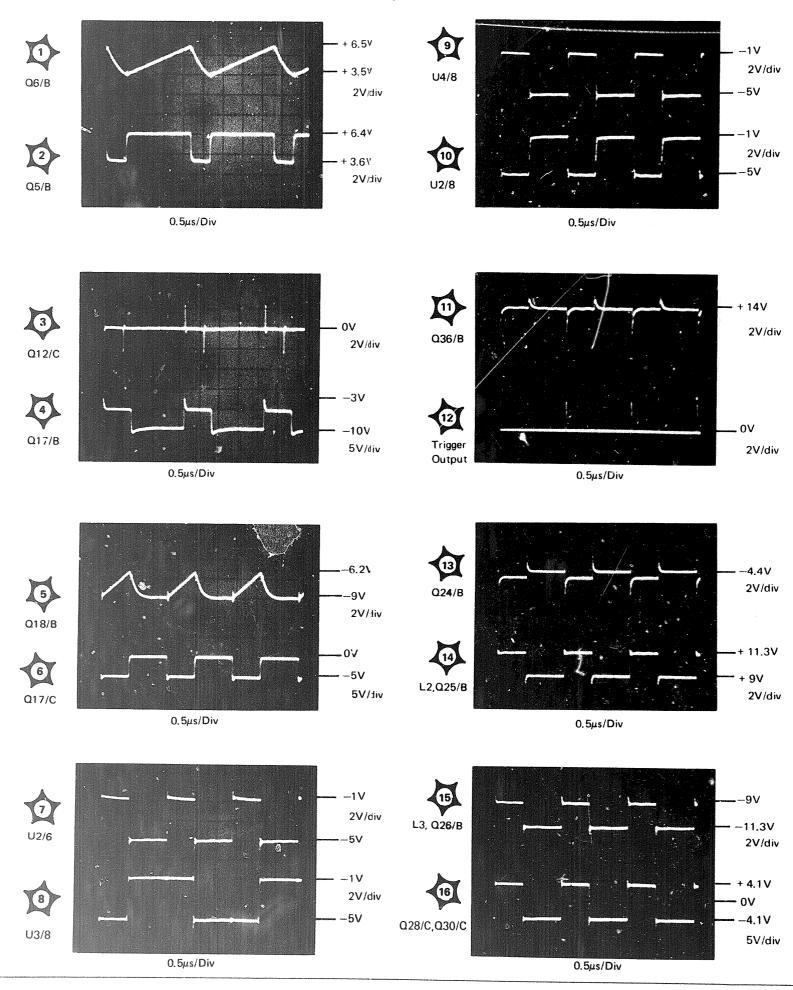


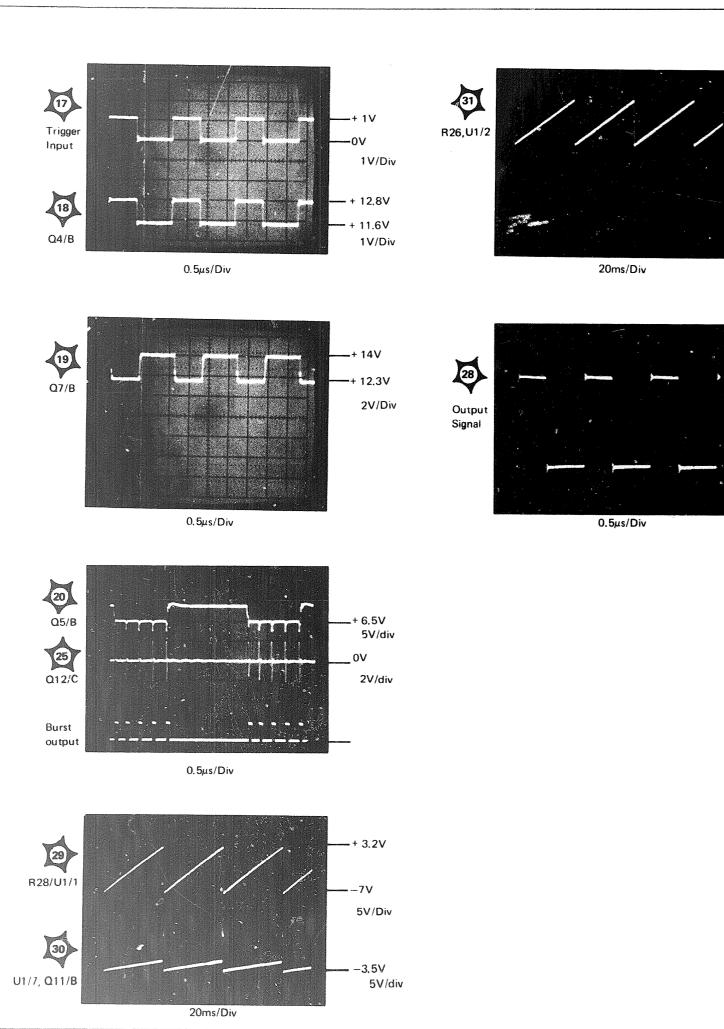
STEP	INSTRUCTIONS
1	With the oscilloscope set to ground, center the trace on the graticule.
2	Adjust A1R131 for a positive amplitude of 8.1 V
3	Adjust A1R133 for a negative amplitude of 8.1 V
4	Re-check Base Line Table 5-19
	8 1 V 3 V 4 V 5 V 7 V 7 V 7 V 7 V 7 V 7 V 7 V 7 V 7

### - CAUTION -

Output power when  $4-16\,\mathrm{V}$  range selected can destroy an ordinary 50 ohm load. Use a 20 dB power attenuator or a 50 ohm power termination.

Figure 5-1. Assembly 1, Assembly 2 - Troubleshooting Aid





+ 6.3V

1V/div

0V

-2.1V

180C 8011A 1801A 1821A TRIG O/P OUTPUT P P EXT. I/P **Q** 0 50Ω TERMINATION 10:1 PROBE INITIAL CONTROL SETTINGS PULSE PERIOD 50n – 2μ VERNIER Mid-range PULSE WIDTH  $25n - 1\mu$ VERNIER Mid-range AMPLITUDE 1 - 4VERNIER CW SYMM ON COMPL OFF

Table 5-21. Troubleshooting Procedures

# STEP INSTRUCTIONS

- 1. Set the oscilloscope as follows: EXT TRIGGER 0.5µs/Div
- 2. Start the troubleshooting procedure by checking all functions
- 3. For Burst troubleshooting see page 6-23
- 4. For checking the EXT Function apply a Pulse Generator with the same settings and 1V Amplitude
- The illustrated waveforms and voltages can be readily located by refering to Figure 5-1.

Note: All voltages are referenced to floating ground.

Table 5-21. cont'd.

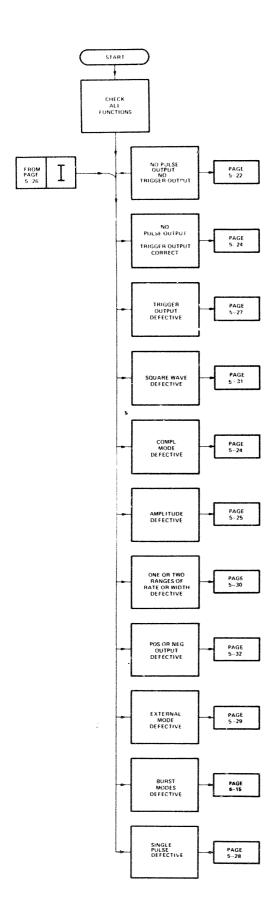
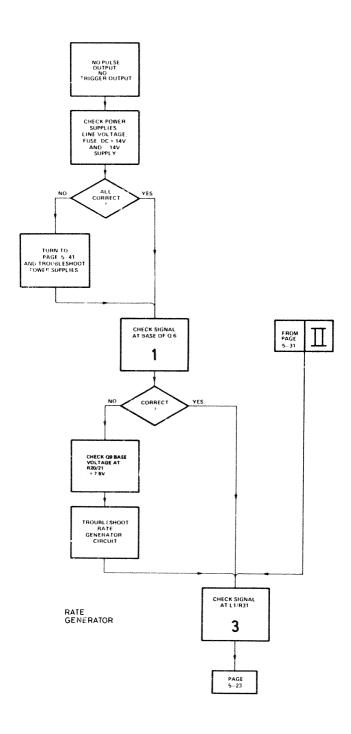


Table 5-21. cont'd.



Numbers in the boxes identify waveforms illustrated in Figure 5–1. For example

CHECK SIGNAL AT BASE OF Q6

the signal at the base of Q6 is to be found at photograph 1 on Figure 5-1.

Table 5-21. cont'd.

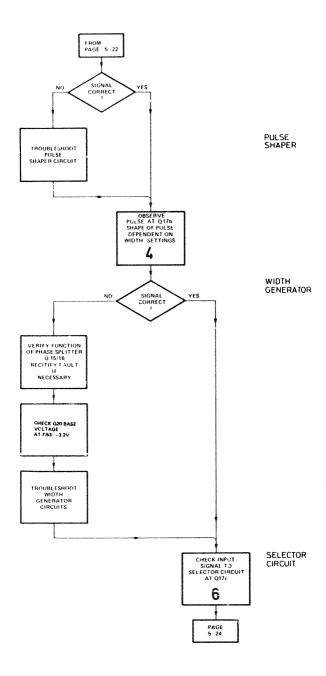


Table 5-21. cont'd.

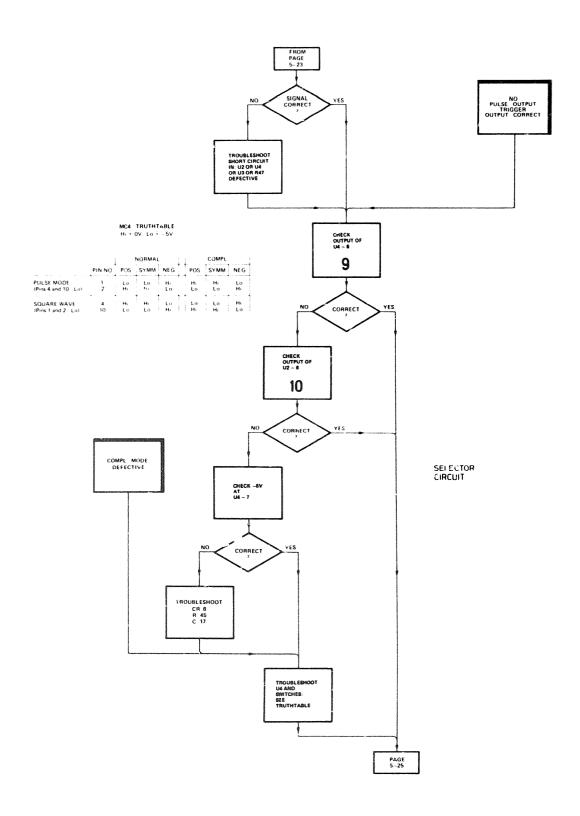


Table 5-21. cont'd.

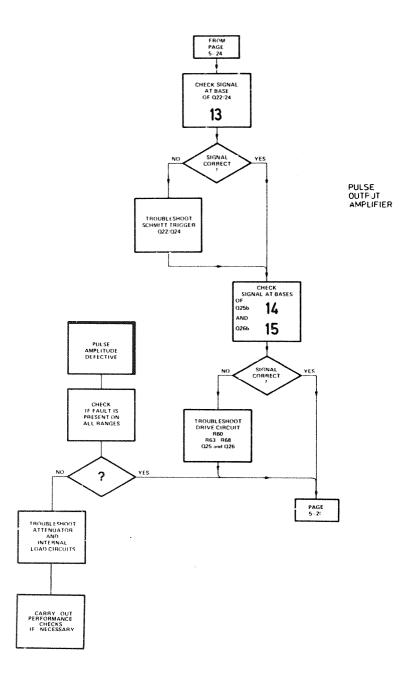


Table 5-21. cont'd.

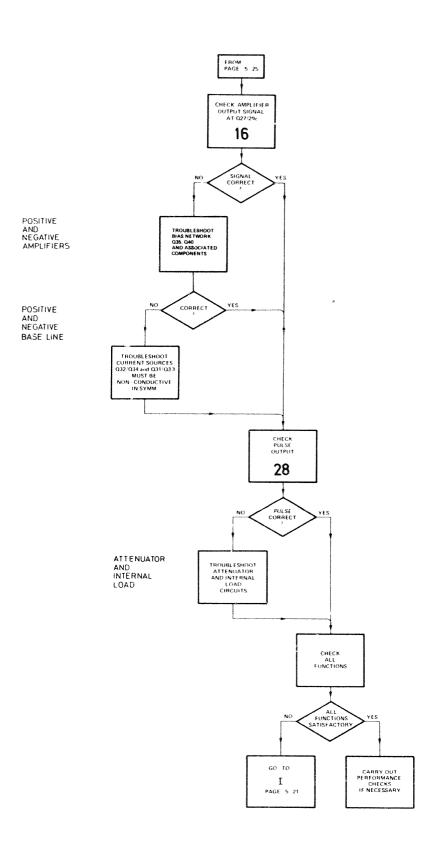


Table 5-21. cont'd

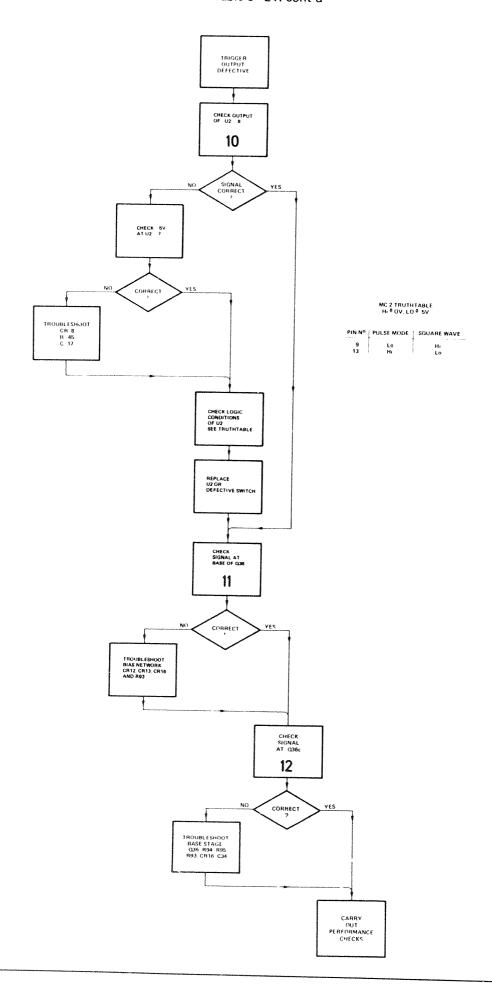


Table 5-21, cont'd.

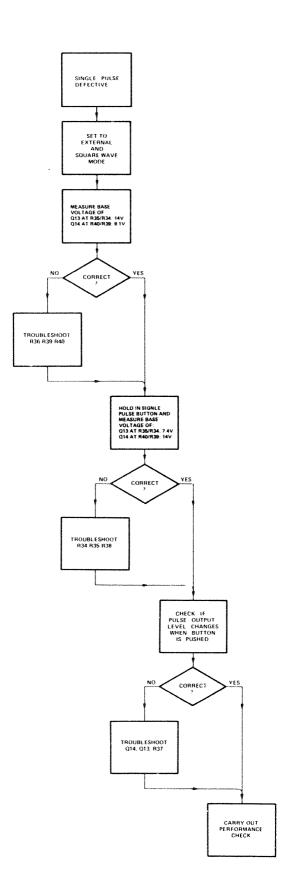


Table 5-21. cont'd.

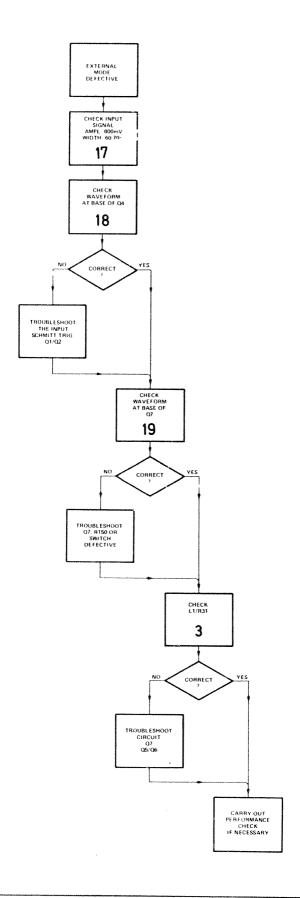


Table 5-21, cont'd.

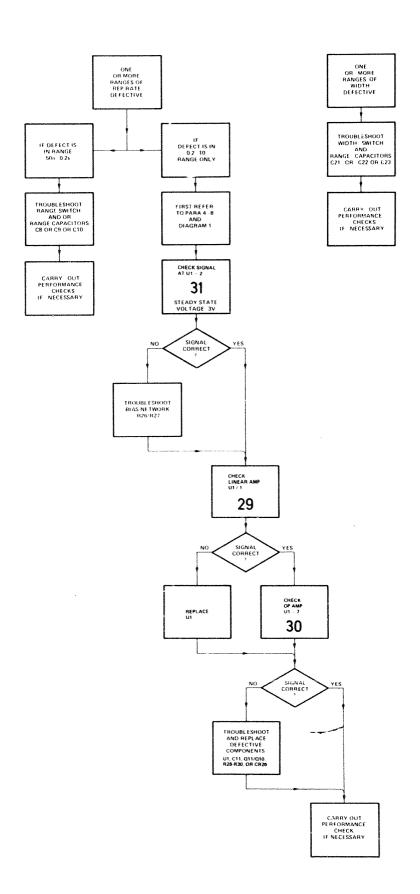


Table 5-21. cont'd.

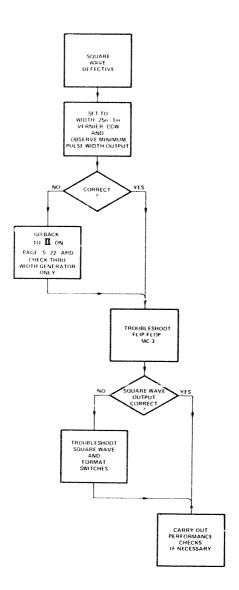


Table 5-21. cont'd.

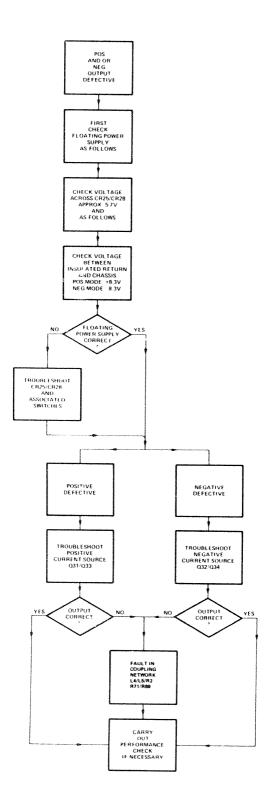


Table 5-21. cont'd.

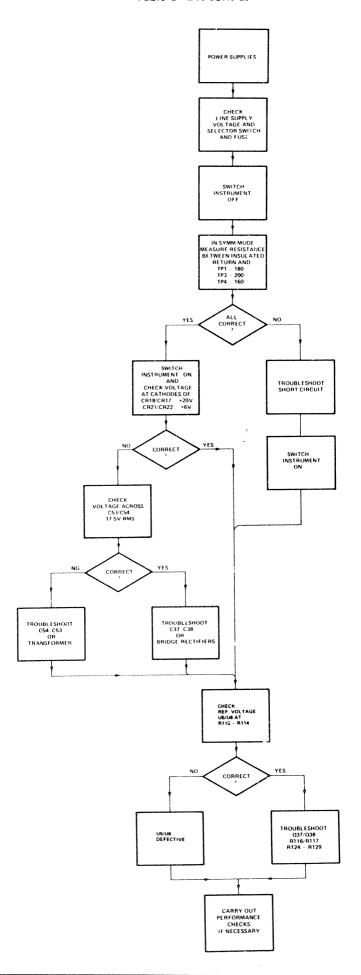


Table 5-22. Performance Test Record

Model 8 Pulse Ge Serial N	enerator		Tested by				
Table No.		Test Description	Results Min Actual Max				
5-2	Repitition Rate $50n - 2\mu$ $2\mu - 0.1m$ $0.1m - 5m$ $5m - 0.2$ $0.2 - 10$	CCW CW CCW CCW CCW CCW CCW CCW CW	20MHz 500kHz 10kHz 200ms 10s		500kHz 10kHz 200Hz 5ms 200ms		
5–3	Manual Trigger Satisfactory		105	Yes/No.			
5–4	Square Wave $50m - 2\mu$ $2\mu - 0.1m$ $0.1m - 5m$ $5m - 0.2$ $0.2 - 10$		10MHz 250kHz 5kHz		10ms 400ms		
5–5	Single Burst (Op Satisfactory	otion 001 only)		Yes/No			
5-6	Pulse Width $25n - 1\mu$ $1\mu - 50 \mu$ $50\mu - 2.5m$ $2.5m - 0.1$	CCW CW CCW CCW CW CCW CW	1μs 50μs 2.5ms 0.1s		25ns 1μs 50μs 2.5ms		
5–7	Duty Cycle $1\mu - 50\mu$ $50\mu - 2.5m$ $2.5m - 0.1$		50 % 50 % 50 %				
58	Pulse Period Jitt Jitter	er			1μs (0.1% + 50 ps)		

Table 5-22. (cont'd.) Performance Test Record

Hewlett-Packard Company Model 8011A Pulse Generator Serial Number		Tested by  Date			
Table No. Test Description		Results			
5–9	Pulse Width Jitter Jitter	Min	Actual	Max 1μs (0.1% + 50 ps)	
5–10	External Trigger Satisfactory		Yes/No		
5–11	<b>HF Triggering</b> Satisfactory		Yes/No		
5–12	Minimum Width Pos Neg			25ns 25ns	
5–13	Preshoot, Overshoot, Ringing Int load on Int load off			5 % 10 %	
5-14	<b>Transition Times</b> Leading edge Trailing edge			10ns 10ns	
5–15	Output Amplitude 4-16V CW (Int load off)	16V 8V 4V 1V		4V 1V 0.25V	
5–16	<b>Trigger Output</b> Amplitude Width	1 V 10ns		30ns	
5–17	Repetitive Burst Satisfactory		Yes/No		
5–23	Safety Check Interior inspection Resistance cabinet to power plug gnd Resistance cabinet to line Line fuse Line fuse safety cover Heatsinks secure	2ΜΩ		1Ω	

#### Table 5-23

### Safety Check

- Disconnect power cord from line. Visually inspect interior for any sign of abnormal internally generated heat, such as discolored printed circuit borads or components, damaged insulation, or evidence of arcing. Determine cause and remedy.
- 2. Check resistance from cabinet to ground pin on power plug with suitable ohmmeter. The reading must be less than one ohm. Flex the power cord while making the measurement to detect any intermittent discontinuity. Check internal ground connections on boards and frame. Also check resistance of any front or rear panel ground terminals marked
- 3. Check resistance from cabinet to line and neutral (tied together) with the power switch on and the

- power source disconnected. The minimum acceptable resistance is two megohms. Replace any component which results in a failure or refer to production Memo or Service Note issued by product division for alternate action.
- 4. Check line fuse to verify that the proper value is installed.
- 5. Check that the plastic safety cover for the line fuse is installed.
- 6. Check that all coaxial and flat cables inside are properly connected. Check that all boards and the heatsink on the chassis are properly connected.
- 7. Inform Hewlett-Packard (internally, the responsible product division) of any repeated failures in the above tests or any other safety features.

# DIAGRAMS AND REPLACEABLE PARTS

### 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.

# 6-3 ORDERING INFORMATION

### 6-4 General

- 6-5 The replaceable parts tables list parts in alphanumerical order of their reference designators 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 Wester 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:
  - 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.

- Table 6-1. Reference Designators

Α	=	assembly	P	=	plug
В	=	motor	Q	=	transistor
BT	=	hattery	R	=	resistor
С	==	pacitor	RT	=	thermistor
CP	=	coupler	S	=	switch
CR	=	diode	T	==	transformer
DL	****	delay line	TB	72	terminal board
DS	=	Іапір	U	=	micro-circuit
F	=	fuse	V	=	vacuum, tube, neon
FL	===	filter			bulb, photocell, etc.
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, inducatance in microhenries unless other noted -All voltages are referenced to floating ground. Part of P/O denotes a factory selected value. Values shown are typical. Screwdriver adjustment Encloses front panel nomenclature Encloses rear panel nomenclature Zener diode Chassis ground (0 volts) Floating ground Wire colour e.g. white, black, brown. - 901 -Part of push-button switch Signal input/output connectors

# 6-8 CIRCU!T DIAGRAM WAVEFORMS

6-9 Waveforms shown on the circuit diagrams 1 to 3 were taken with the 8011A set as follows, changes in time base and sensitivity are noted on the waveform concerned:

PULSE PERIOD	$50n2\mu$
VERNIER	Mid-range
PULSE WIDTH	$25n - 1\mu$
VERNIER	Mid-range
AMPLITUDE	1V – 4V
VERNIER	CW
SYM	ON
COMPL	OFF
BURST	OFF

To obtain waveforms shown on diagram **5** select BURST MODE.

Table 6-3. List of Manufacturers Codes (to be used in conjunction with Replaceable Parts Lists)

MFR. NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
FR009 00501 0.121 01295 02114 04713 07203 11502 12697 16249 19701 23880 24226 24546 27167 28480 56289 71400 72136 75915 76381 90949 91637	GAM  ILLUMINATED PRODUCTS INC  ALLEN BRADLEY CO  TEXAS INSTR INC SEMICOND CMPNT DIV  FERROXCUBE CORP  MOTORULA SEMICONDUCTOR PRODUCTS  FAIRCHILD SEMICONDUCTOR DIV  TRW INC BOUNE DIV  CLARDSTAT MFG CO INC  CORNING GL WK ELEC CMPNT DIV  MEPCD/ELECTRA CORP  STANFORD APPLIED ENGINEERING INC  GOWANDA ELECTRUNICS CORP  CORNING GLASS WORKS (BRADFORD)  CORNING GLASS WORKS (WILMINGTON)  HEWLETT-PACKARD CO CORPORATE HU  SPRAGUE ELECTRIC CO  BUSSMAN MFG DIV OF MCGRAW-EDISON CO  ELECTRO MUTIVE MFG CO INC  LITTELFUSE INC  3M COMPANY  AMPHENOL SALES DIV OF BUNKER-RAMO  DALF ELECTRONICS INC	MEAUX FRANCE ANAHEIM CA MILWAUKEE WI GALLAS TX SAUGERTIES NY PHOENIX AZ MOUNTAIN VIEW CA BOONE NC DOVER NH RALEIGH NC MINERAL WELLS TX SANTA CLARA CA GOWANDA NY BRADFORD PA WILMINGTON NC PALG ALTO CA NORTH ADAMS MA ST LOUIS MO WILLIMANTIC CT DES PLAINES IL ST. PAUL MN. HAZELWOOD MO COLUMBUS NE	77 92803 53212 75231 12477 85008 54040 28607 03620 27604 76067 95050 14070 16701 28401 94304 01247 63017 66226 66016 55101 63042 68601

NOTE 1 OPTION 001 ONLY

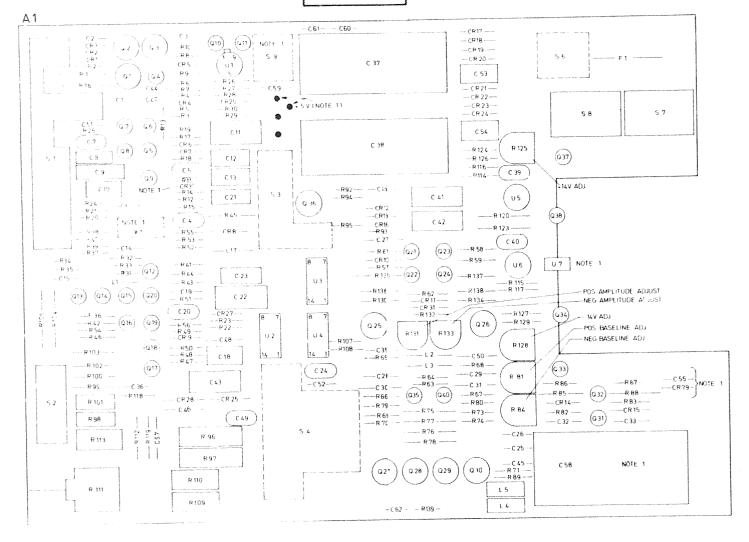
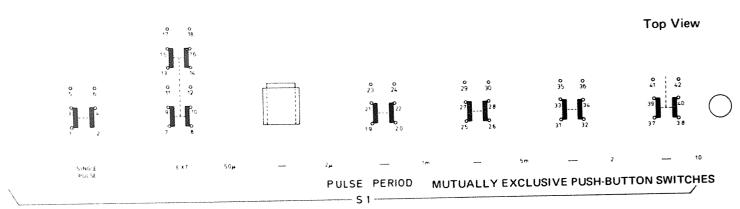
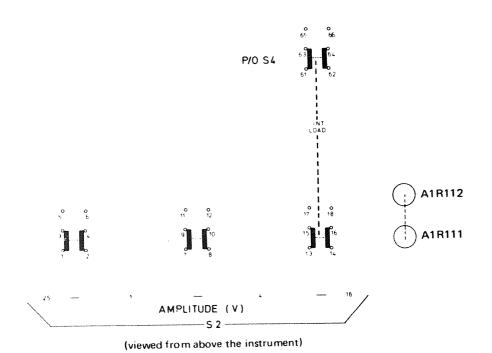


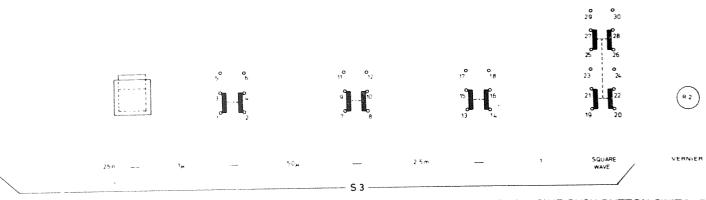
Table 6-4. Frame (Standard) Replacable Parts List

Reference Designation	HP Part Number	Qty	Description	ív/fr Code	Mfr Part Number
COMMINE TO A SECRETARY CONTRACTOR OF THE PROPERTY OF THE PROPE				1 1	
n 1	J8J11-665J1		BOARD ASSEMBLY, PULSE GENERATOR	28480	08011-66501
0.51	2140-0016	1	LAMP-INCAND T-1 BUL3 5V	00501	11-AS25
f 1	2110-6020 2110-034)	1 1	FUSE .8A 250V SLD-8.U 1.25X.25 UL FUSE .4A 250V SLD-8.0 1.25X.25 UL	71400 75915	MDL 8/10 313-4005
rtl	9100-3121	1	FILTER-ELEC 2A (EUROPE)	28480	9100-3121
J1 J2 J3	1251-2357 1250-0118 1250-0118 1250-0113	1 3	POWER LINE CONNECTOR (USA)  CONNECTOR—RE BNC FEM SGL HOLE FR  CONNECTOR—RE BNC FEM SGL HOLE FR  CONNECTOR—RE BNC FEM SGL HOLE FR	9)949 9)949 9)949	31-2221-1022 31-2221-1022 31-2221-1022
MP1 MP2 MP3 MP4 MP5	0370-1035 0370-1697 0370-2486 08011-00205 08011-00202	2 1 20 1	PERIOD AND WIDTH VERNIER KNOBS AMPLITUDE VERNIER KNOB PUSHBUTTON (SOLID GRAY) PANEL, FRONT PANEL, REAR	28480 28480 28480 28480 28480	0370-1005 0370-1097 0370-2486 08011-00205 08011-00202
MPU MP7 MP1U MP11	08011-64101 5040-1124 5040-0475 1460-1300 1450-0404	1 1 1 1 1 1 1 1	CUVER, SAFETY KNOB, PUSHBUTTON, POWER FUOT ASSEMBLY STAND, TILT LENS, PILOT LIGHT	28480 28480 28480 28480 28480	08011-04101 5040-1124 5040-0443 1460-1300 1450-0404
MP13 MP14 MP15	08011-43701 08012-04101 08011-43702	1	ROD, POWEP SWITCH COVER ASSEMBLY ROD, AMPLIFIER SWITCH	28480 28480 28480	08611-43701 08012-04101 08011-43702
R1	2100-2590 2100-2590	2	RESISTOR-VAR CONTROL CC 19K 10% 10CW RESISTOR-VAR CONTROL CC 10K 10% 10CW	12697 12697	SERIES 63M SERIES 63M
F 2	5080-0973	1	TRANSFORMER, PJWEP	28480	5080-0978

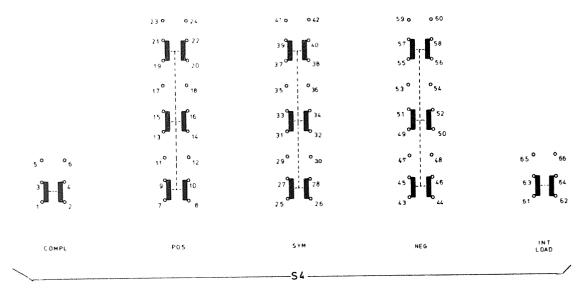


(viewed from above the instrument)





PULSE WIDTH MUTUALLY EXCLUSIVE PUSH-BUTTON SWITCHES



(viewed from above the instrument)

# BURST SWITCHES: (OPTION 001)

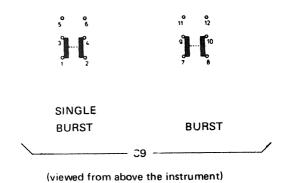


Table 6-5. Board A1 (Standard) Replaceable Parts List

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
Al	08011-66501	1	BOARD ASSEMBLY. PULSE GENERATOR	28480	08011-65501
41C1 A1C2 A1C3 A1C4 A1C5	0160-2208 0160-4210 0160-4210 0140-0210 0160-2150	2 16 1	CAPACITOR-FXD 330PF +-5% 300WVDC MICA CAPACITOR-FXD -022UF +-20% 50WVDC POLYE CAPACITOR-FXD -022UF +-20% 50WVDC POLYE CAPACITOR-FXD 270PF +-5% 300WVDC MICA CAPACITOR-FXD 33PF +-5% 300WVDC MICA	26480 28480 28480 72136 28480	0160-2208 0160-4210 0160-4210 DM15F271J0300WV1CR 0160-2150
A1C6 A1C7 A1C8 A1C9 A1C13	0160-4210 0140-0195 0160-3715 0160-3725 0180-0229	1	CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD 130PF +-5% 300WVDC MICA CAPACITOR-FXD .015UF +-10% 250WVDC MET CAPACITOR-FXD .68UF +-10% 40WVDC MET CAPACITOP-FXD; 33UF+-10% 10VOC TA-SOLID	28480 72136 28480 28480 56289	0160-4210 DM15F131J0300wV1CR 0160-3715 0160-3725 150D336X9010B2
A1C11 A1C12 A1C13 A1C14 A1C15	0160-3839 0160-4213 0160-4213 0160-4210 0160-4210	1 5	CAPACITOR-FXD 2-2UF +-10% 40MVDC MET CAPACITOR-FXD .1UF +-20% 50MVDC POLYE CAPACITOR-FXD .1UF +-20% 50MVDC POLYE CAPACITOR-FXD .022UF +-20% 50MVDC POLYE CAPACITOR-FXD .022UF +-20% 50MVDC POLYE	28480 28480 28480 28480 28480	0160-3839 0160-4213 0160-4213 0160-4210 0160-4210
61C16 A1C17 A1C18 A1C19 A1C20	0160-4210 0160-0127 0160-4213 0160-4210 0140-0193	2	CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD 1UF +-20% 25WVDC CER CAPACITOR-FXD .1UF +-20% 50WVDC POLYE CAPACITOR-FXC .022UF +-20% 50WVDC POLYE CAPACITOR-FXD 82PF +-5% 300WVDC MICA	28480 28480 28480 28480 72136	0160-4210 0160-0127 0160-4213 0160-4210 DM15E820J0300WV1CR
A1C21 A1C22 A1C23 A1C24 A1C25	0160-3220 0160-3723 0180-1746 0160-2209 0160-4210	1 1	CAPACITOR-FXD 6800PF +-5% 250WVDC MET CAPACITOR-FXD .33UF +-10% 40WVDC MET CAPACITOR-FXD: 15UF-10% 20VDC TA-SOLID CAPACITOR-FXD 330PF +-5% 300WVDC MICA CAPACITOR-FXD .0 22UF +-20% 50WVDC POLYE	FR 009 28480 56289 28480 28480	CKB-68 0160-3723 150D156X9020B2 0160-2208 0160-4210
A1C26 A1C27 A1C28 A1C29 /1C30	0160-4210 0140-0193 0160-0174 0160-0174	7	CAPACITOR-FXD -0.22UF +-20% 50WVDC POLYE CAPACITOR-FXD 82PF +-5% 300WVDC MICA CAPACITOR-FXD -47UF +80-20% 25WVDC CER CAPACITOR-FXD -47UF +80-20% 25WVDC CER CAPACITOR-FXD -47UF +80-20% 25WVDC CER	28480 72136 28480 28480 28480	0160-4210 DN15E820J0300WV1CR 0160-0174 0160-0174 0160-0174
# 10 31 # 10 32 # 10 33 # 10 34 # 10 35	0160-0174 0160-4210 0160-4210 0160-4210 0160-2959	2	CAPACITOR-FXD .47UF +80~20% 25WVDC CER CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXC .022UF +-20% 50WVDC POLYE CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD 1000PF +80~20% 1000WVDC	28480 28480 28480 28480 28480	0160-0174 0160-4210 0160-4210 0160-4210 0160-2959
#1036 A1037 A1038 A1039 A1040	0163-0127 0180-2240 0180-2240 0160-4204 0160-4209	2	CAPACITOR-FXD 1UF +-20% 25WVDC CER CAPACITOR-FXD: 2400UF+75-10% 25VDC AL CAPACITUR-FXD: 2400UF+75-10% 25VDC AL CAPACITOR-FXD -01UF +-20% 50WVDC PULYE CAPACITOR-FXD -01UF +-20% 50WVDC PULYE	28480 56289 56289 28480 28480	0160-0127 390248G025JL2 390248G025JL2 0160-4209 0160-4209
A1C41 A1C42 A1C43 A1C44 A1C45	0180-0061 0180-0061 0180-0061 0160-2305 0160-0174	3	CAPACITOR-FXD: 100UF+75-10% 16VDC AL CAPACITOR-FXD: 100UF+75-10% 16VDC AL CAPACITOR-FXD: 100UF+75-10% 16VDC AL CAPACITOR-FXD 27PF +-5% 300WDC MICA CAPACITOR-FXD -47UF +80-20% 25WVDC CER	56289 56289 56289 28480 28480	300107G016DC2 300107G016DC2 300107G016DC2 0160-2306 0160-0174
A1C47 A1C48 A1C49 A1C50 A1C51	0160-4210 0160-4210 0160-2259 0160-2959 0160-4210	L.	CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD 12PF +-5% 500WVDC CER CAPACITOR-FXD 1000PF +80-20% 1000WVDC CAPACITOR-FXC .022UF +-20% 50WVDC POLYE	28480 28480 28480 28480 28480	0160-4210 0160-4210 0160-2259 0160-2959 0160-4210
A1C52 A1C53 A1C54 A1C57 A1C57	0160-4210 0160-4213 0160-4213 0160-0134 0160-2205	T P	CAPACITOR-FXD .G22UF +-20% 50WVDC POLYE CAPACITOR-FXD .1UF +-20% 50WVDC POLYE CAPACITOR-FXC .1UF +-20% 50WVDC POLYE CAPACITOR-FXD 220PF +-5% 300WVDC WYCA CAPACITOR-FXD 120PF +-5% 300WVDC MICA	28480 28480 28480 28480 28480	0160-4210 0160-4213 0160-4213 0160-0134 0160-2205
A1C60 A1C61 A1C62 A1CR1 A1CR2 A1CR3	0160-0174 0160-0174 0160-3470 1901-0040 1901-0040	13	CAPACITOR-FXD -47UF +80-20% 25MVDC CER CAPACITOR-FXD -47UF +80-20% 25MVDC CER CAPACITOR FXD .01UF +80-20% 50MVDC CER DIODE-SWITCHING 30V 50NA 2NS D0-35 DIODE-SWITCHING 30V 50NA 2NS D0-35 DIODE-SWITCHING 30V 50NA 2NS D0-35	28480 28480 28480 28480 28480	0160-0174 0160-0174 1901-0040 1901-0040 1901-0040
A1CR4 A1CR5	1901-0040 1901-0040	secinda quantita de la compania del compania del compania de la compania del la compania de la c	DIODE-SWITCHING 30V 50NA 2NS 00-35 DIODE-SWITCHING 30V 50NA 2NS 00-35 DIODE-ZNR 5.11V 5% 00-7 PD=.4W TC=009%	28480 28480	1901-0040 1901-0040 SZ 10939-98
A1CR6 A1CR7 A1CR8 A1CR9 A1CR10	1902-0041 1901-0040 1902-0041 1902-0041 1902-3104	2	DIODE-SWITCHING 30V 50NA 2NS DG-35 DIODE-ZNR 3.11V 5% DO-7 PD=.4H TC=009% DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=009% DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	28480 04713 04713	1902-0040 SZ 10939-98 SZ 10939-98 SZ 10939-110
AICR11 AICR12 AICR13 AICR14 AICR15	1902-3104 1901-0040 1901-0040 1901-0040 1901-0040	Distriction of the Control of the Co	DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016% DIODE-SWITCHING 30V 50NA 2NS DO-35	04713 28480 28480 28480 28480	SZ 10939-110 1901-0040 1901-0040 1901-0040 1901-0040

Table 6-5. (cont'd) Board A1 (Standard) Replaceable Parts List

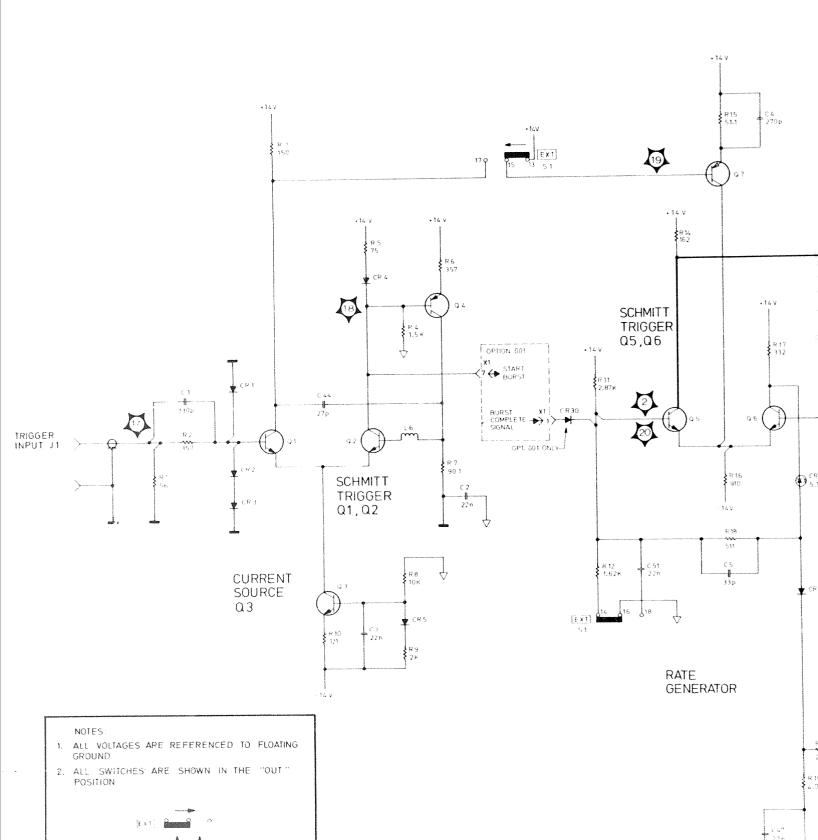
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
AICR16 AICR17 AICR18 AICR19 AICR20	1901-0040 1901-0159 1901-0159 1901-0159 1901-0159	9	DIODE-SWITCHING 30V 50NA 2NS DO-35 DIGDE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41	28480 04713 04713 04713 04713	1901-0040 SR1358-4 SR1358-4 SR1358-4 SR1358-4
A1CR21 A1CR22 A1CR23 A1CR24 A1CR25	1901-0159 1901-0159 1901-0159 1901-0159 1902-1291	1	DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 759NA DO-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-ZNR 1N5338B 5.1V 5% PD=5W IR=1UA	04713 04713 04713 04713 04713	SR1358-4 SR1358-4 SR1358-4 SR1358-4 IN53388
A1CR26 A1CR27 A1CR28 A1CR31	1901-0040 1901-0040 1901-0159 1902-0041		DIODE-SWITCHING 30V 50NA 2NS DO-35 DIGDE-SWITCHING 30V 50NA 2NS DO-35 DIODE-PWR RECT 400V 750NA DO-41 DIODE-ZNR 5-11V 5% DO-7 PD=-4W TC=009%	28480 28480 04713 04713	1901-0040 1901-0040 SR1358-4 SZ 10939-98
A1L1 A1L2 A1L3 A1L4 A1L5	9140-0096 9140-0096 9100-1612 9100-1657 9100-1657	1 2 2	COIL-FXD MOLDED RF CHOKE 1UH 10% COIL-FXD MOLDED RF CHOKE 1UH 20% COIL-FXD MOLDED RF CHOKE -33UH 20% COIL-FXD MOLDED RF CHOKE 1.5MH 5% COIL-FXD MOLDED RF CHOKE 1.5MH 5%	24226 24226 24226	15/330 22/154 22/154
All6 All7 All8 AlMP1	9170-0029 9170-0029 9170-0629 08011-01101	3 1 1	CORE-SHIELDING BEAD CORE-SHIELDING BEAD CORE-SHIELDING BEAD HT-SINK FOR 033, Q34, Q37, Q38 HT-SINK FOR 027, Q28, Q29, Q30	02114 02114 02114 28480 28480	56-590-65A2/4A 56-590-65A2/4A 56-590-65A2/4A 08011-01101 08011-01102
A1MP2 A1Q1 A1C2 A1C3 A1C4 A1U5	08011-01102 1854-0053 1854-0053 1854-0053 1853-0089 1854-0215	3 7 5	TRANSISTOR NPN 2N2218 SI TO-5 PD=800MW TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713 04713 04713 04713 07263 04713	2N2218 2N2218 2N2218 2N4917 SPS 3611
A106 A107 A108 A109 A1010	1854-C215 1853-0089 1853-0089 1853-0036 1854-0215	7	TRANSISTOR NPN SI PD=350MW FT=300MHZ TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR PNP SI PD=310MW FT=250MHZ TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713 07263 07263 28480 04713	SPS 3611 2N4917 2N4917 1853-0036 SPS 3611
A1011 A1012 A1013 A1014 A1015	1853-0036 1853-0089 1853-0036 1853-0036 1853-0089		TRANSISTUR PNP SI PD=310MW FT=25CMHZ TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR PNP SI PD=310MW FT=250MHZ TRANSISTOR PNP SI PD=310MW FT=250MHZ TRANSISTOR PNP SI PD=310MW FT=250MHZ TRANSISTOR PNP 2N4917 SI PD=200MW	28480 07263 28480 28480 07263	1853-0036 2N4917 1853-0036 1853-0036 2N4917
A1Q16 A1Q17 A1Q18 A1Q19 A1Q20	1653-0089 1854-0630 1854-0630 1853-0089 1853-0036	4	TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR NPN SI TO-52 PD=360MW TRANSISTOR NPN SI TO-52 PD=360MW TRANSISTOR NPN 2N4917 SI PD=200MW TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR PNP SI PD=310MW FT=250MHZ	07263 04713 04713 07263 28480	2N4917 SS2077 SS2077 2N4917 1853-0036
A1021 A1022 A1023 A1024 A1025 A1025	1854-0630 1854-0630 1853-0357 1853-0357 1853-0315 1205-0061	2 1 2	TRANSISTOR NPN SI TO-52 PD=360MW TRANSISTOR NPN SI TO-52 PD=360MW TRANSISTOR PNP SI TO-18 PD=360MW TRANSISTOR PNP SI TO-18 PD=360MW TRANSISTOR PNP SI TO-39 PD=1W FT=1GHZ HEAT-DISSIPATOR SGL TO-5/TO-39 PKG	04713 04713 28480 28480 28480 28480	SS2077 SS2077 1853-0357 1853-0357 1853-0315 1205-0061
A1Q26 A1Q26 A1Q27 A1Q28 A1Q29	1854-0498 1205-0361 1853-0012 1853-0012 1854-0213	1 3 2	TRANSISTOR TO-39 PD=1W HEAT-DISSIPATOR SGL TO-5/TO-39 PKG TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW TRANSISTOR NPN 2N2538 SI TO-5 PD=800MW	28480 28480 01295 01295 28480	1854-0498 1205-0061 2N2904A 2N2904A 1854-0213
A1Q30 A1Q31 A1Q32 A1Q33 A1Q34	1854-0213 1853-0036 1854-0215 1854-0402 1853-0254	1	TRANSISTOR NPN 2N2538 SI TU-5 PD=800MW TRANSISTOR PNP SI PD=310MM FT=250MHZ TRANSISTOR NPN SI PD=350MW FT=300MHZ TRANSISTOR NPN SI PD=30M FT=3MHZ TRANSISTOR PNP SI PD=30M FT=3MHZ	28480 28480 04713 28480 28480	1854-0213 1853-0036 SPS 3611 1854-0402 1853-0254
A1Q35 A1Q36 A1Q37 A1Q38 A1Q40	1854-0215 1853-0012 1853-0356 1853-0356 1853-0036	2	TRANSISTOR NPN SI PD=350MW FT=300MHZ TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW TRANSISTOR PNPSIPD=65W FT=3MHZ TRANSISTOR PNPSIPD=65W FT=3MHZ TRANSISTOR PNP SI PD=310MW FT=250MHZ	04713 01295 28480 28480 28480	SPS 3611 2N2904A 1853-0356 1853-0366 1853-0036
A1R1 A1R2 A1R3 A1R4 A1R5	0758-0093 0698-3242 0757-0284 0757-0427 0757-0398	1 4 2 1 1	RESISTOR 56 5% -25M F TC=0+-100 RESISTOR 357 1% -125W F TC=0+-100 RESISTOR 150 1% -125W F TC=0+-100 RESISTOR 1.5K 1% -125W F TC=0+-100 RESISTOR 75 1% -125W F TC=0+-100	24546 16299 24546 24546 24546	C5-1/4-T0-56R0-J C4-1/8-T0-357R-F C4-1/8-T0-151-F C4-1/8-T0-1501-F C4-1/8-T0-75R0-F
A1R6 A1R7 A1R8 A1R9 A1R10	0698-3242 0757-0400 0757-0442 0757-0283 0757-0403	2 2 2 1	RESISTOR 357 1% -125W F TC=0+-100 RESISTOR 90.9 1% -125W F TC=0+-100 RESISTOR 10K 1% -125W F TC=0+-100 RESISTOR 2K 1% -125W F TC=0+-100 RESISTOR 121 1% -125W F TC=0+-100	16299 24546 24546 24546 24546	C4-1/8-T0-357R-F C4-1/8-T0-90R9-F C4-1/8-T0-1002-F C4-1/8-T0-2001-F C4-1/8-T0-121R-F
A1R11 A1R12 A1R13 A1R14 A1R15	0698-3151 0757-0428 0757-0407 0757-0405 0757-0394	1 7 4 3 2	RESISTOR 2. '% 1% .125W F TC=0+-100 RESISTOR 1.62K 1% .125W F TC=0+-100 RESISTOR 200 1% .125W F TC=0+-100 RESISTOR 162 1% .125W F TC=0+-100 RESISTOR 51.1 1% .125W F TC=0+-100	16299 24546 24546 24546 24546	C4-1/8-T0-2871-F C4-1/8-T0-1621-F C4-1/8-T0-201-F C4-1/8-T0-162R-F C4-1/8-T0-51R1-F

Table 6-5. (cont'd) Board A1 (Standard) Replaceable Parts List

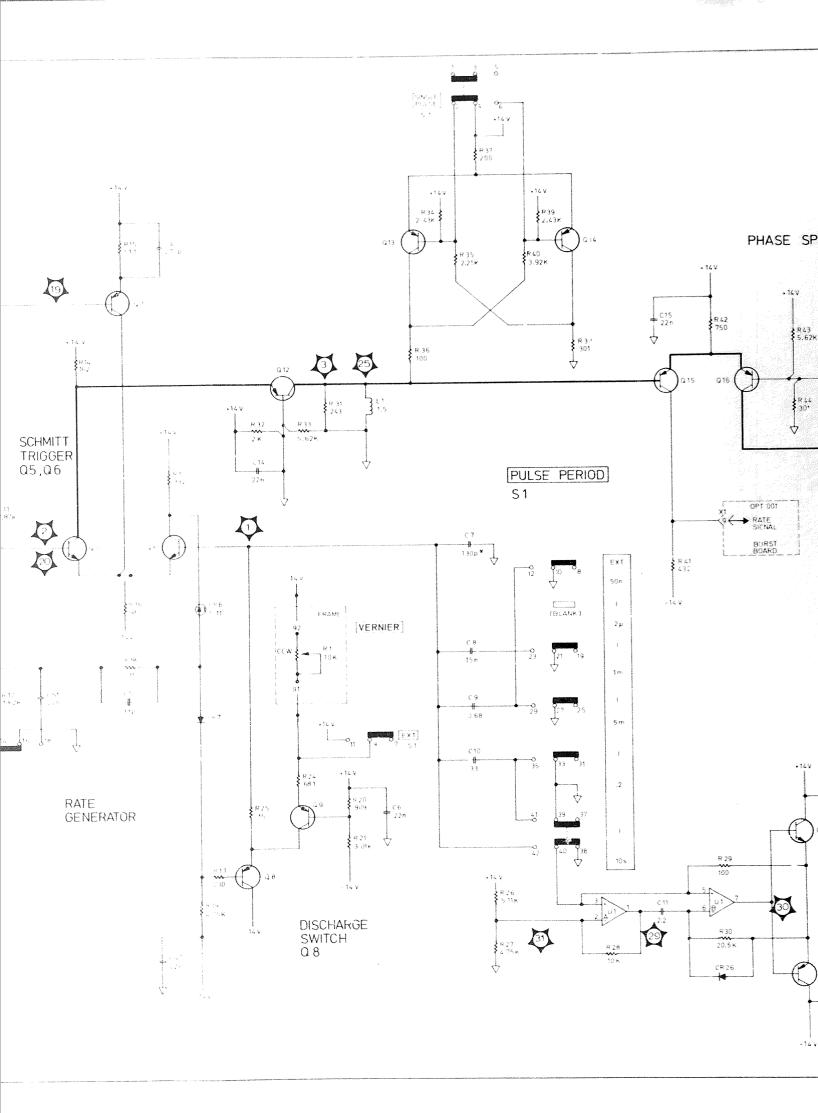
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1R16 A1R17 A1R18 A1R19 A1R20	0758-0068 0757-0411 0757-0416 0757-0437 0757-0422	1 3 3 2 2	RESISTOR 910 5% .25W F TC=0+-100 RESISTOR 332 1% .125W F TC=0+-100 RESISTOR 511 1% .125W F TC=0+-100 RESISTOR 4.75K 1% .125W F TC=0+-100 RESISTOR 909 1% .125W F TC=0+-100	24546 26546 24546 24548 24546	C5-1/4-TO-911-J C4-1/8-TO-332R-F C4-1/8-TO-511R-F C4-1/8-TO-4751-F C4-1/8-TO-909R-F
A 1 R 2 1 A 1 R 2 2 A 1 R 2 3 A 1 R 2 4 A 1 R 2 5	0757-0273 0757-0273 0757-0428 0757-0397 0757-0381	3 3 1	RESISTOR 3-0/K 1% -125W F TC=0+-100 RESISTOR 3-01K 1% -125W F TC=0+-100 RESISTOR 1-62K 1% -125W F TC=0+-100 RESISTOR 68-1 1% -125W F TC=0+-100 RESISTOR 15 1% -125W F TC=0+-100	24546 24546 24546 24546 19701	C4-1/8-T0-3011-F C4-1/8-T0-3011-F C4-1/8-T0-1621-F C4-1/8-T0-68R1-F MF4C1/8-T0-15R0-F
A1R 26 A1R 27 A1R 28 A1R 29 A1R 30	0757-0438 0757-0437 0757-0442 0757-0401 0698-3245	5 7 1	RESISTOR 5.11K 1% .125W F TC=0+.100 RESISTOR 4.75K 1% .125W F TC=0100 RESISTOR 10K 1% .125W F TC=0+-100 RESISTOR 100 1% .125W F TC=0+-100 RESISTOR 20.5K 1% .125W F TC=0+-100	24546 24546 24546 24546 16299	C4-1/8-T0-5111-F C4-1/8-T0-4751-F C4-1/8-T0-1002-F C4-1/8-T0-101-F C4-1/8-T0-2052-F
A1R 31 A1R 32 A1R 33 A1R 34 A1R 35	0757-0408 0757-0283 0757-0200 0757-0431 0757-0430	2 2 4 1	RESISTOR 243 1% -125W c TC=0+-100 RESISTOR 2K 1% -125W F TC=0+-100 RESISTOR 5-62K 1% -125W F TC=0+-100 RESISTOR 2-+5m 1% -125W F TC=0+-100 RESISTOR 2-21K 1% -125W F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-T0-243R-F C4-1/8-T0-2001-F C4-1/8-T0-562L-F C4-1/8-T0-2431-F C4-1/8-T0-2211-F
A1R36 A1R37 A1R38 A1R39 A1R40	0757-0401 0757-0407 0757-041J 0757-0431 0757-0435	2	RESISTOR 100 1% -125W F TC=0+-100 RESISTOR 200 1% -125W F TC=0+-100 RESISTOR 301 1% -125W F TC=0+-100 RESISTOR 2-43W 1% -125W F TC=0+-100 RESISTOR 3-92W 1% -125W F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-TO-101-F C4-1/8-TO-201-F C4-1/8-TO-301R-F C4-1/8-TO-2431-F C4-1/8-TO-3921-F
A1R41 A1R42 £1R43 A1R44 A1R45	0757-0414 0757-0420 0757-0200 0757-0410 0757-0799	1	RESISTOR 432 1% .125W F TC=0+-100 RESISTOR 750 1% .125W F TC=0+-100 RESISTOR 5.62K 1% .125W F TC=0+-100 RESISTOR 301 1% .125W F TC=0+-100 RESISTOR 121 1% .5W F TC=0+-100	24546 24546 24546 24546 19701	C4-1/8-T0-432R-F C4-1/8-T0-751-F C4-1/8-T0-5621-F C4-1/8-T0-301R-F MF7C-1/2-T0-121R-F
A1R 46 A1R 47 A1R 48 A1R 49 A1R 50	0757-0284 0698-3441 0757-0408 0757-0409 0757-0428	1 2	RESISTOR 150 1% -125W F TC=0+-100 RESISTOR 215 1% -125W F TC=0+-100 RESISTOR 243 1% -125W F TC=0+-100 RESISTOR 274 1% -125W F TC=0+-100 RESISTOR 1.62K 1% -125W F TC=0+-100	24546 16299 24546 24546 24546	C4-1/8-T0-151-F C4-1/8-T0-215R-F C4-1/8-T0-243R-F C4-1/8-T0-274R-F C4-1/3-T0-1621-F
A1R51 A1R52 A1R53 A1R54 A1R55	0757-0386 0757-0422 0757-0273 0757-0392 0757-0401	2	RESISTOR 24.3 1% .125W F TC=0+-100 RESISTOR 909 1% .125W F TC=0+-100 RESISTOR 3.01K 1% .125W F TC=0+-100 RESISTOR 43.2 1% .125W F TC=0+-100 RESISTOR 100 1% .125W F TC=0+-100	19701 24546 24546 24546 24546	MF4C1/8-TO-24R3-F C4-1/8-TO-909R-F C4-1/8-T0-3011-F C4-1/8-TO-43R2-F C4-1/8-TO-101-F
A1R 56 A1R 57 A1R 58 A1R 59 A1R 61	0757-0400 0757-0401 0758-0002 0758-G054 0757-0280	1	RESISTOR 90.9 1% .125W F TC=0+-100 RESISTOR 100 1% .125W F TC=0+-100 RESISTOR 560 5% .25W F TC=0+-100 RESISTOR 330 5% .25W F TC=0+-100 RESISTOR 1K 1% .125W F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-T0-90P9-F C4-1/8-T0-101-F C5-1/4-T0-561-J C5-1/4-T0-331-J C4-1/8-T0-1001-F
A1F62 A1F63 A1F63 A1F63 A1F64	0757-0409 0698-3262 0757-0397 0757-0401 0757-0397	2	RESISTOR 274 1% -125W F TC=0+-100 RESISTOR 40-2 1% -125W F TC=0+-100 RESISTOR 68-1 1% -125W F TC=0+-100 RESISTOR 100 1% 125W F TC=0+-100 RESISTOR 68-1 1% -125W F TC=0+-100	24546 16299 24546 24546 16299	C4-1/8-T0-274R-F C4-1/8-T0-4022-F C4-1/9-T0-68R1-F C4-1/8-T0-68R1-F C4-1/8-T0-4022-F
A1R64 A1R64 A1R65 A1R66 A1R67 A1R68	0698-3262 0757-0384 0698-3242 0757-0401 0757-0401 0698-3242	MAN SALVANIA	RESISTOR 40.2 1% .125W F TC=0+-100 RESISTOR 201% .125W F TC=0+-100  RESISTOR 357 1% .125W F TC=0+-100 RESISTOR 100 1% .125W F TC=0+-100 RESISTOR 100 1% .125W F TC=0+-100 RESISTOR 357 1% .125W F TC=0+-100	16299 24546 24546 16299	C4-1/8-T0-357R-F C4-1/8-T0-101-F C4-1/8-T0-101-F C4-1/8-T0-357R-F
A1R 69 A1R 70 A1R 71 A1R 73 A1R 74	0698-7521 0698-7521 0757-0431 0698-7521 0698-7521 0757-0500	*	RESISTOR 5-1 5% -25W F TC=0+-100  RESISTOR 5-1 5% -25W F TC=0+-100  RESISTOR 2-43K 1% .125W F TC=0+-100  RESISTOR 5-1 5% -25W F TC=0+-100  RESISTOR 5-1 5% -25W F TC=0+-100  RESISTOR 30-1 1% -25W F TC=0+-100	11502 11502 24546 11502 11502 24546	TF07-1/4-T0-5R1-J TF07-1/4-T0-5R1-J C4-1/8-T0-2431-F TF07-1/4-T0-5R1-J TF07-1/4-T0-5R1-J C5-1/4-T0-3091-F
A1R75 A1R76 A1R77 A1R78 A1R79 A1R80	0757-0500 0757-0500 0757-0500 0757-0500 0757-0416	Windows Development of the Control o	RESISTOR 30.1 1% .25W F TC=0+-100 RESISTOR 30.1 1% .25W F TC=0+-100 RESISTOR 30.1 1% .25W F TC=0+-100 RESISTOR 511 1% .125W F TC=0+-100 RESISTOR 511 1% .125W F TC=0+-100	24546 24546 24546 24546 24546	C5-1/4-T0-30R1-F C5-1/4-T0-30R1-F C5-1/4-T0-30R1-F C4-1/8-T0-511R-F C4-1/8-T0-511R-F
A1R81 A1R82 A1R83 A1R84 A1R85	2100 - 0567 0 757 - 0438 0 757 - 0438 2100 - 0567 0698 - 5876	2	RESISTOR 5.11K 1% .125W F TC=0+-100 RESISTOR 5.11K 1% .125W F TC=0+-100 RESISTOR, VAR 2K 20% 0.5W LIN CC	28480 24546 24546 28480 24546	2100-0567 C4-1/8-T0-5111-F C4-1/8-T0-5111-F 2100-0567 C5-1/4-T0-10R0-J
A1R 86 A1R 87 A1R 88 A1R 89 A1R 92	0757-0407 0757-0407 0698-5876 0757-0431 0757-0346		RESISTOR 200 1% -125w F TC=0+-100 RESISTOR 200 1% -125w F TC=0+-100 RESISTOR 10 5% -25w F TC=0+-100 RESISTOR 2-43K 1% -125w F TC=0+-100 RESISTOR 10 1% -125w F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-T0-201-F C5-1/4-T0-10R0-J C4-1/8-T0-2431-F

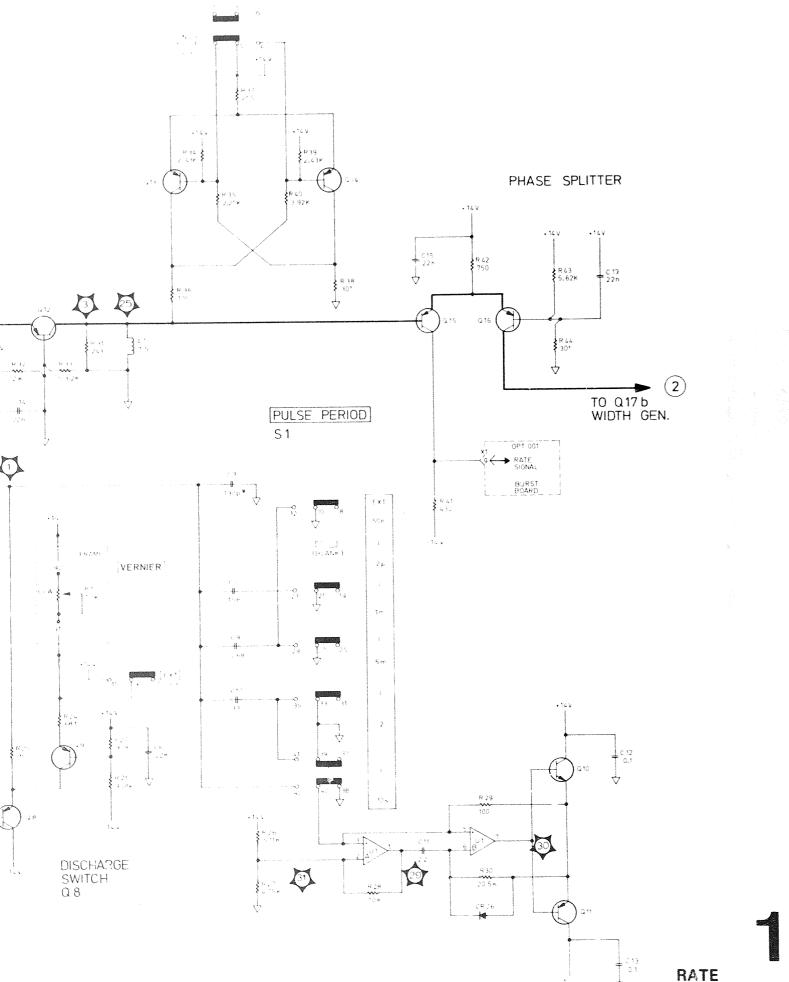
Table 6-5. (cont'd) Board A1 (Standard) Replaceable Parts List

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1R 93 A1R 94 A1R 95 A1R 96 A1R 97	0757-0401 0757-0386 0757-0394 0766-0025 0766-0025	2	RESISTOR 100 1% -125W F TC=0+-100 RESISTOR 24-3 1% -125W F TC=0+-100 RESISTOR 51-1 1% -125W F TC=0+-100 RESISTOR 101 2% 3W MO TC=0+-250 RESISTOR 101 2% 3W MO TC=0+-250	24546 19701 24546 27167 27167	C4-1/8-T0-101-F MF4C1/8-T0-24R3-F C4-1/8-T0-51R1-F FP3-3-250-101R-G FP3-3-250-101R-G
A1R 98 A1R 99 A1R 1CD A1F 1O1 A1F 1O2	0761-0035 0758-0080 0758-0080 0761-0035 0758-0082	2 2 2	RESISTOR 150 5% 1W MO TC=0+-200 RESISTOR 75 5% .25W F TC=0+-100 RESISTOR 75 5% .25W F TC=0+-100 RESISTOR 150 5% 1W MO TC=0+-200 RESISTOR 130 5% .25W F TC=0+-100	24546 24546 24546 24546 24546	FP32-1-T00-151-J C5-1/4-T0-7502-J C5-1/4-T0-7502-J FP32-1-T00-151-J C5-1/4-T0-131-J
A1R103 A1R104 A1R105 A1R107 A1R108	0758-0082 0757-1060 0698-4825 0757-0438 0757-0438	1	RESISTOR 130 5% .25W F TC=0+-100 RESISTOR 196 1% .5W F TC=0+-100 RESISTOR 64.9 1% .5W F TC=0+-100 RESISTOR 5.11K 1% .125W F TC=0+-100 RESISTOR 5.11K 1% .125W F TC=0+-100	24546 19701 24546 24546 24546	C5-1/4-T0-131-J MF7C1/2-T0-196R-F NA6 C4-1/8-T0-5111-F C4-1/8-T0-5111-F
A1R109 A1R110 A1R111 A1R112 A1R113	0698-3620 0698-3620 2100-3104 0698-5880 0698-3616	2 1 2 1	RESISTOR 100 5% 2W MO TC=0+-200 RESISTOR 100 5% 2W MO TC=0+-200 RESISTOR, VAR 50 OHM 10% 5W, CC RESISTOR 15 5% .25W F TC=0+-100 RESISTOR 62 5% 2W MO TC=0+-200	24546 24546 01121 24546 16299	FP42-2-T00-100R-J FP42-2-T00-100R-J OBD C5-1/4-T0-15R0-J FP42-2-T00-62R0-J
A1R115 A1R116 A1R117 A1R118	0757-0421 0757-0421 0757-0411 0757-0411 0757-0421	3	RESISTOR 825 1% -125W F TC=0+-100 RESISTOR 825 1% -125W F TC=0+-100 RESISTOR 332 1% -125W F TC=0+-100 RESISTOR 332 1% -125W F TC=0+-100 RESISTOR 825 1% -125W F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-TO-825R-F C4-1/8-TO-825R-F C4-1/8-TO-32R-F C4-1/8-TO-332R-F C4-1/8-TO-825R-F
A1R119 A1R120 A1R123 A1R124 A1R125	0698-5830 0812-0021 0812-0021 0757-0428 2100-3211	2	RESISTOR 15 5% -25W F TC=0+-100 RESISTOR -47 5% 3W PW TC=0+-90 RESISTOR -47 5% 3W PW TC=0+-90 RESISTOR 1.62K 1% -125W F TC=0+-100 R:VAR CERMET 1000 OHM 20%	24546 91637 91637 24546 28480	C5-1/4-T0-15R0-J CW2B1-3-T2-47/100-J CW2B1-3-T2-47/100-J C4-1/8-T0-1621-F 2100-3211
A1R126 A1k127 A1R128 A1R129 A1R133	0757-0428 0757-0428 2100-3211 0757-0428 0757-0405		RESISTOR 1.62K 1% .1254 F TC=0+-100 RESISTOR 1.62K 1% .1254 F TC=0+-100 R:VAR CERMET 1000 CHM 20% RESISTOR 1.62K 1% .1254 F TC=0+-100 RESISTOR 162 1% .1254 F TC=0+-100	24546 24546 28480 24546 24546	C4-1/8-T0-1621-F C4-1/8-T0-1621-F 2100-3211 C4-1/8-T0-1621-F C4-1/8-T0-162R-F
A1R131 A1P132 A1R133 A1R134 A1R135	2100-3212 0698=4431 2100-3212 0757-0405 0698-5137	2 1 4	R VAR 200 OHM  RESISTOR 2.05K 1% .125W F TC=0+-100 R VAR 200 OHM RESISTOR 162 1% .125W F TC=0+-100 RESISTOR 47 54 .25W F TC=0+-100	28480 16299 28480 24546 24546	2100-3212 C4-1/8-T0-2051-F 2100-3212 C4-1/8-T0-1528-F C5-1/4-T0-47PJ-D
A1R136 A1R137 A1R138 A1R139 A1S1	0698-5137 0698-5137 0698-5137 0757-0384 3101-0597	1	RESISTOR 47 5% .25W F TC=0+-100 RESISTOR 47 5% .25W F TC=0+-100 RESISTOR 47 5% .25W F TC=0+-100 RESISTOR 20 1% 125W FTC-0+-100 SWIICH-PB 9STA .394 IN-CTRS .25A 120VAC	24546 24546 24546 28480	C5-1/4-T0-47P0-D C5-1/4-T0-47R0-D C5-1/4-T0-47R0-D 3101-0597
A152 A153 A154 A155	3101-0596 3101-0595 3101-0593 3101-0598	1 1	SWITCH-PB 3STA INTLH .394 IN-CTRS .25A SWITCH-PB 5STA .394 IN-CTRS .25A 120VAC SWITCH-PB 5STA .394 IN-CTRS .25A 120VAC SWITCH-PB DPDT MOM  SWITCH-PB DPDT ALTING 4A 250VAC	28480 28480 28480 28480 28480	3101-0596 3101-0595 3101-0593 3101-0598
A157 A158	3101-0629 3101-0629	2	SWITCH-SL DPDT-NS MINTR 24 250VAC PC SWITCH-SL DPDT-NS MINTR 2A 250VAC PC	28480 28480	3101-0629 3101-0629
A 1U 1 A 1U 2 A 1U 3 A 1U 4 A 1U 5	1826-0092 1820-0111 1823-0065 1820-0330 1820-0196	1 1 2 2	IC AMPL IC MC1458 50 N GATE IC SN74 70 N FLIP-FLOP IC SN74H 53 N GATE IC RGLTR	28480 01295 01295 07263	1826-0092 SN7470N SN74H53N 723HC
A1U6	1820-0196		IC RGLTR	07263	723HC
		AND CONTRACTOR OF THE CONTRACT			
	min recommendation and the second				
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	environment enviro	HELESON PROCESS AND STREET			
	and Concentration and the State of Stat	- CO			

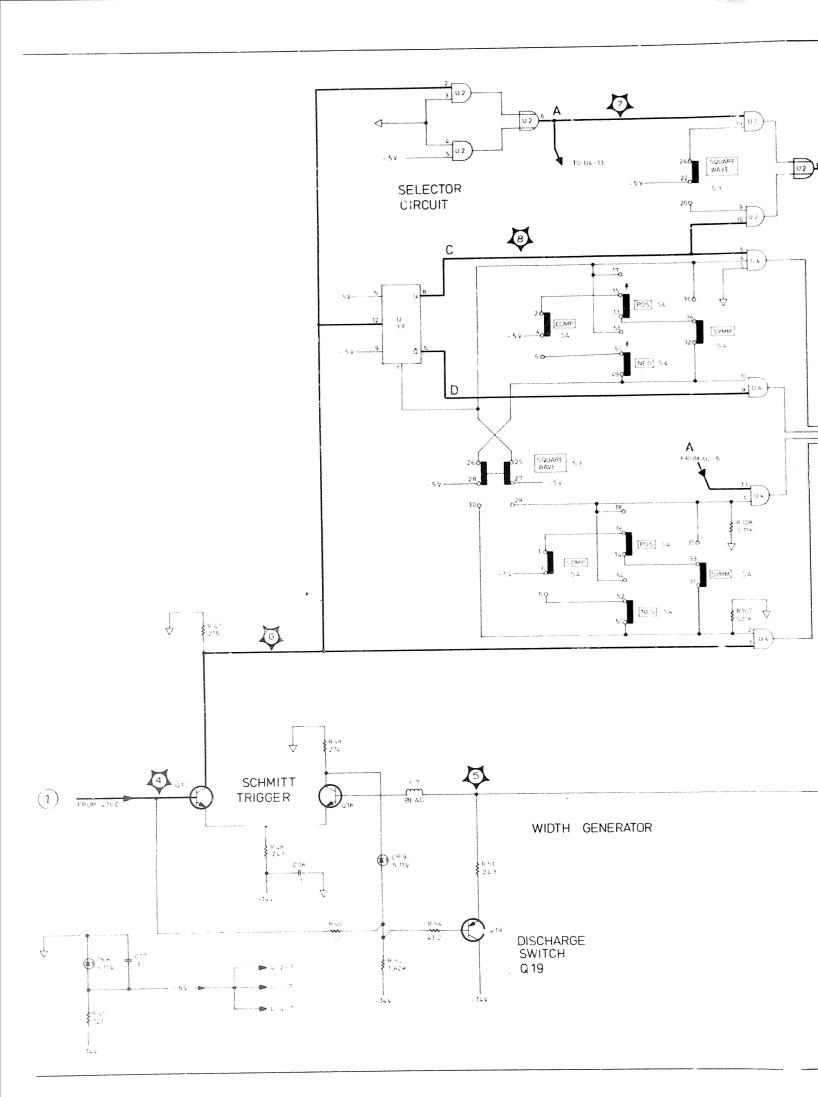


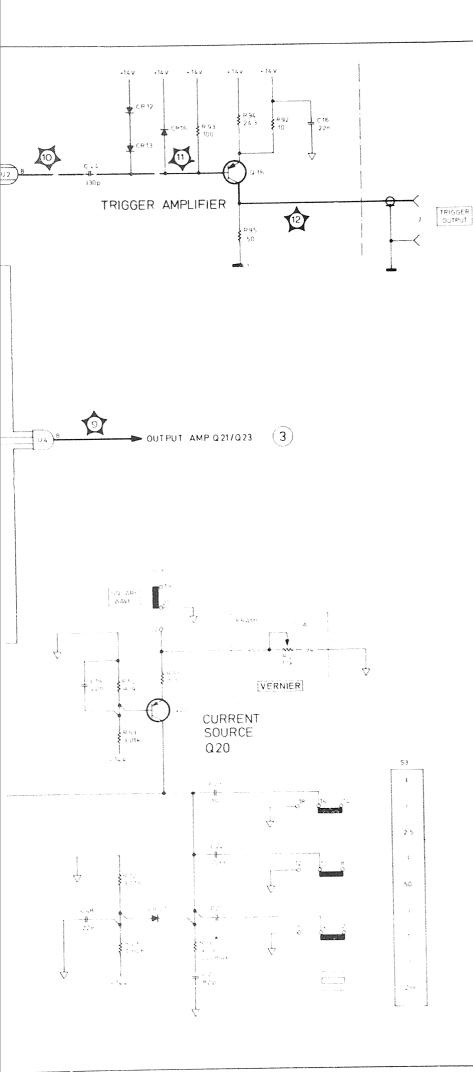
3. COMFONENT ALC7 IS FACTORY SELECTABLE AND MAY VARY FROM 120pF TO 140pF (INFLUENCES MAXIMUM REPETITION RATE)





**GENERATOR** 



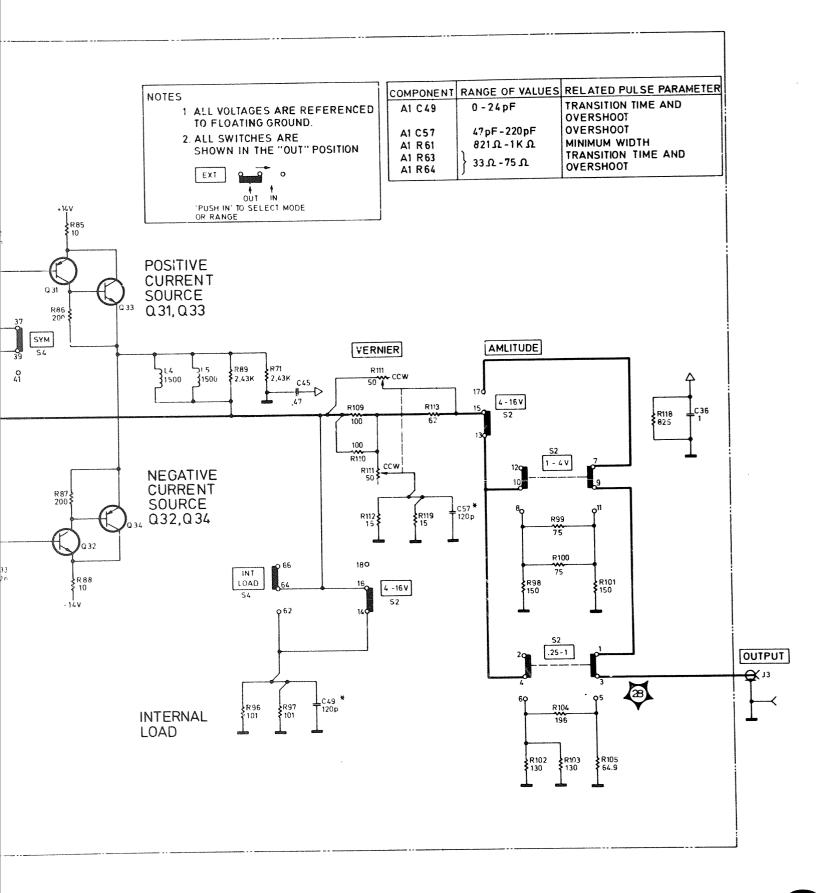


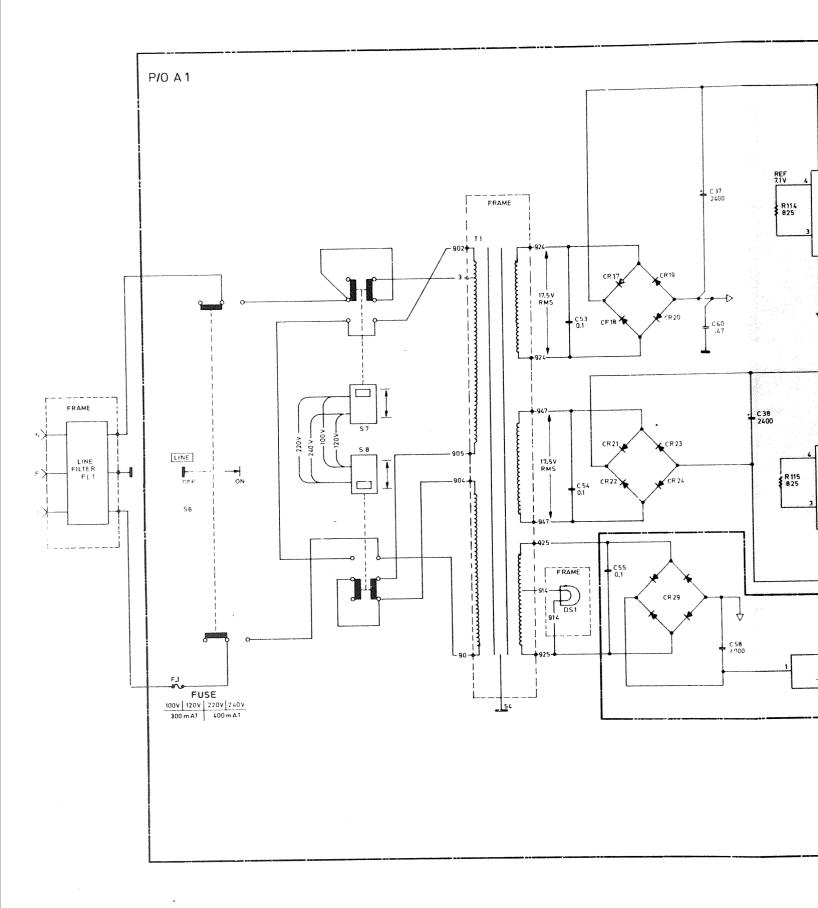
#### NOTES:

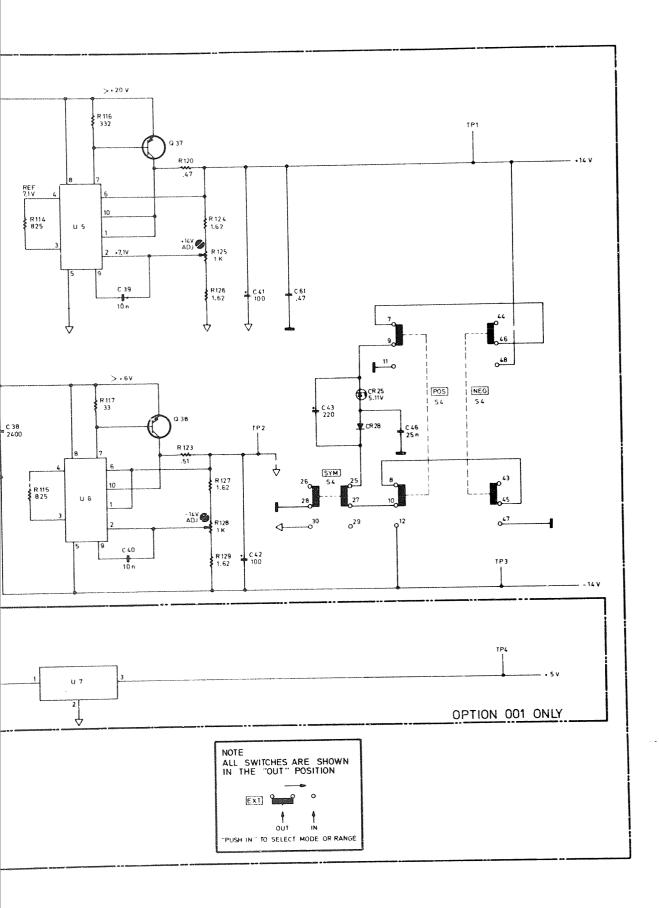
- UNLESS OTHERWISE STATED ALL VOLTAGES ARE REFERENCED TO FLOATING GROUND.
- 2. ALL SWITCHES ARE SHOWN IN THE "OUT" POSITION



3. COMPONENT AIR56 IS FACTORY SELECTABLE AND MAY VARY FROM 90.9 Ω TO 200 Ω (INFLUENCES MINIMUM WIDTH)







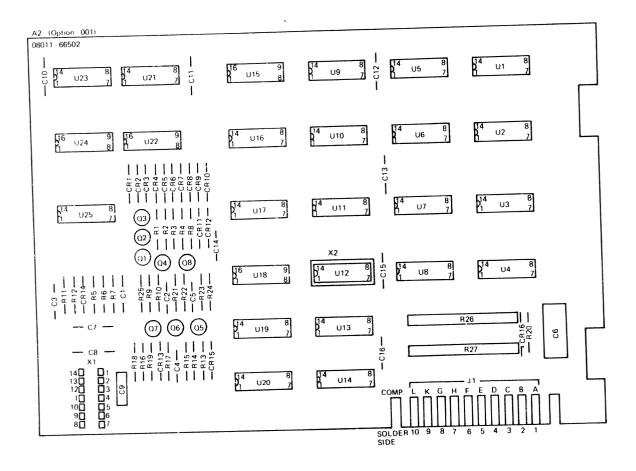


Table 6-6. Board A2 (Option 001) Replaceable Parts List

Reference Designation	HP Part Number	Ωty	Description	Mfr Code	Mfr Part Number
£ 2	J8J11-65502		BOAFD ASSEMBLY, BURST LUPTION COLD	28480	08011~66502
A 20 1 A 20 2 A 20 3 A 20 4 A 20 5	0160-4210 0140-0192 0160-2216 0160-4210 0160-4210	3 1	CAPACITOR-FXD *022UF *-20% 5JWYDC POLYE CAPACITOR-FXD 63PF *-5% 3JJWYDC MICA CAPACITOR-FXD 820PF *-5% 3JJWYDC MICA CAPACITOR-FXD *J22UF *-20% 5JWYDC POLYE CAPACITOR-FXD *022UF *-20% 5JWYDC PJLYE	28480 72136 28490 28480 28480	0160-4210 DM15E680J0300WV1CR 0160-2216 0160-4210 0160-4210
£206 6207 6209 6209 62010	0180-0229 0160-4213 0160-4213 0180-0229 0160-2930	2 2 7	CAPACITOR-FXD: 33UF+-10% 10VDC TA-SOLID CAPACITOR-FXD -1UF +-20% 50WDC POLYE CAPACITOR-FXD -1UF +-20% 50WDC POLYE CAPACITOR-FXD: 33UF+-10% 10VDC TA-SOLID CAPACITOP-FXD -01UF +83-20% 100WVDC CER	56289 28480 28480 56289 28480	1500 336 X 901 082 0160 - 4213 0160 - 4213 1500 336 X 901 082 0160 - 2930
A2011 A2012 A2013 A2014 42015	0160-2930 0160-2930 0160-2930 0160-2930 0160-2930		CAPACITOR-FXO .OIUF +30-20% 1004VDC CER CAPACITOR-FXD .OIUF +30-20% 1304VDC CER CAPACITOR-FXD .OIUF +30-20% 1004VDC CER CAPACITOR-FXD .OIUF +80-20% 1004VDC CER CAPACITUR-FXD .OIUF +30-20% 1004VDC CER	28480 28480 28480 28480 28480	0160-2930 0160-2930 0160-2930 0160-2930 0160-2930
42016	0160-2930		CAPACITUR-FXO .01UF +8J-20% 100WVDC CER	28480	0160-2930
A 2CF1 A 2CF2 A 2CF3 A 2CF4 A 2CF5	1901-0179 1901-0179 1901-0179 1901-0179 1901-0179	11	DIODE-SWITCHING 15V 50NA 750PS 00-7 01:00E-SWITCHING 15V 50NA 750PS 00-7 01:00E-SWITCHING 15V 5CNA 750PS 00-7 01:00E-SWITCHING 15V 50NA 750PS 00-7 01:00E-SWITCHING 15V 50NA 750PS 00-7	28480 28480 28480 28480 28480	1901-0179 1901-0179 1901-0179 1901-0179 1901-0179
A 2026 A 2047 A 2048 A 2043 A 20410	1901-0179 1901-0179 1901-0179 1901-0179 1901-0535	1	DIGDE-SWITCHING 15V 50N4 750PS DO-7 DIGDE-SWITCHING 15V 50NA 750PS DO-7 DIGDE-SWITCHING 15V 50NA 750PS DO-7 DIGDE-SWITCHING 15V 50NA 750PS DO-7 DIGDE-SWITCHING 15V 50NA 750PS DO-7 DIGDE-SCHUTTKY	28480 28480 28480 28480 28480	1901-0179 1901-0179 1901-0179 1901-0179 1901-0535
42CK11 #2CF12 A2CF13 #2CF14	1901-0179 1901-0179 1901-0040 1901-0040 1901-0040	÷	DIODE-SWITCHING 15V 50NA 750PS 00-7 DIODE-SWITCHING 15V 50NA 750PS 00-7 DIODE-SWITCHING 30V 50NA 2NS 0C-35 DIODE-SWITCHING 30V 50NA 2NS 0C-35 DIODE-SWITCHING 30V 50NA 2NS 0C-35	28480 28480 28480 28480 28480	1901-0179 1901-0179 1901-0040 1901-0040 1901-0040
A2CK15 A2C416	1901-0040		DINDE-SWITCHING 30V 50NA 2NS 00-35	29480	1901-0040
A 201 A 202 A 203 A 204 A 205	1854-0215 1853-0089 1853-0089 1853-0089 1853-0089	5	TPANSISTOP NPN SI PD=350MW FT=300MHZ TRANSISTOP PNP 2N4917 SI PD=200MW TPANSISTOR PNP 2N4917 SI PD=270MW TRANSISTOR PNP 2N4917 SI PD=230MW TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOP PNP 2N4917 SI PD=200MW	04713 07263 07263 07263 07263	SPS 3611 2N4917 2N4917 2N4917 2N4917 2N4917
A246 A247 A248	1853-0069 1854-0215 1854-0005	1	TRANSISTOR PNP 2N4917 51 PD=200MM TRANSISTOR NPN SI PD=350MM FT=300MHZ TRANSISTOR NPN 2N708 SI TJ-18 PD=360MM	07263 04713 28480	2N4917 SPS 3611 1854-0005
62h 1 42f 2 62P 3 67P 4 62P 5	C757-C411 2698-3242 2757-0398 0757-0398 0757-0413	2 1 2	RESISTOR 357 1% .125W F TC=0+-100 RESISTOR 30-1 1% .125W F TC=0+-100 RESISTOR 30-1 1% .125W F TC=0+-100	24546 16299 24546 24546 24546	C4-1/8-T0-332R-F C4-1/8-T0-357R-F C4-1/8-T0-30R1-F C4-1/8-T0-30R1-F C4-1/8-T0-392R-F
A256 A247 A248 A2i3 A2+1J	0757-0417 0757-0410 0757-0410 0757-0417 0757-0411	2 2	1 1 361, E TC-14-100	24546 24546 24546 24546 24546	C4-1/8-TJ-562P-F C4-1/8-TJ-301R-F C4-1/8-TJ-301R-F C4-1/8-TJ-562R-F C4-1/8-TJ-332R-F
A 2P 11 A 2F 12 A 2K 13 A 2F 14 A 2P 15	07570437 07570416 07570407 07570401 07570428	1 1	RESISTOR 511 1% .125W F 7C=0+100 RESISTOR 200 1% .125W F 7C=0+-100 RESISTOR 100 1% .125W F 7C=0+-100	24546 24546 24546 24546 24546	C4-1/8-T0-511R-F C4-1/8-T3-201-F C4-1/8-T0-101-F
A 28 16 A 26 17 A 26 18 A 28 19 A 28 20	0757-0444 0693-3496 0757-0433 0757-0443		RESISTOR 3.57K 18 .125W F TC=0+100 RESISTOR 3.32K 1% .125W F TC=0++100 RESISTOR 11K 1% .125W F TC=0++100	24546 16299 24546 24546 24546	C4-1/8-T0-357R-F C4-1/8-T0-3321-F C4-1/8-T0-1102-F
428 21 428 22 428 23 428 24 429 25	0757-0433 0698-3432 0757-0421 0757-0283 0757-0435	1	RESISTOR 3.32K 1% .125W F TC=0+100 RESISTOR 2.67K 1% .125W F TC=0+-100 RESISTOR 825 1% .125W F TC=0+-100 RESISTOR 2K 1% .125W F TC=0+-100 RESISTOR 3.92K 1% .125W F TC=0+-100	24546 16299 24546 24546 24546	C4-1/8-T0-2671-F C4-1/8-T0-825R-F C4-1/8-T0-2001-F
A 2R 26 A 2R 27	1810-0055 1810-0055		NETWORK-RES 9-PIN-SIP .15-PIN-SPCG NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	28480 23480	

Table 6-6. (cont'd) Board A2 (Option 001) Replaceable Parts List

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A 2U 1 A 2U 2 A 2U 3 A 2U 4 A 2U 5	1620-0070 1820-0070 1820-0174 1820-0174 1820-0282	4 6 4	IC SN74 30 N GATE IC SN74 30 N GATE IC SN74 04 N INV IC SN74 04 N INV IC SN74 66 N GATE	01295 01295 01295 01295 01295	SN7430N SN7430N SN7404N SN7404N SN7486N
A2U6 A2U7 A2U8 A2U9 A2U10	1820-0282 1820-0282 1820-0282 1820-6676 1820-0174		IC SN74 86 N GATE IC SN74 86 N GATE IC SN74 86 N GATE IC SN74 30 N GATE IC SN74 04 N INV	01295 01295 01295 01295 01295	SN7486N SN7486N SN7486N SN7430N SN7404N
6 2011 A 2012 A 2013 A 2014 A 2015	1820-0070 1820-0328 1820-0174 1820-0054 1820-1277	1 3 3	1C SN74 30 N GATE IC SN74 02 N GATE IC SN74 04 N INV IC SN74 00 N GATE IC SN74 192 N COUNTER	01295 01295 01295 01295 01295	SN7430N SN7402N SN7404N SN7400N SN74192N
A 2U16 A 2U17 A 2U18 A 2U19 A 2U 2O	1820-0371 1820-0076 1820-0629 1820-0304 1820-0054	1 1 1	IC SN74H 10 N GATE IC SN74 76 N FLIP-FLOP IC SN74S 112 N FLIP-FLOP IC SN74 72 N FLIP-FLOP IC SN74 00 N GATE	01295 01295 01295 01295 01295	SN74H10N SN7476N SN74S112N SN7472N SN7400N
A 2U 21 A 2U 22 A 2U 23 A 2U 24 A 2U 25 A 2X1 A 2X2	1620-0174 1820-1277 1820-0174 1820-1277 1820-0054 1200-0424 1200-0474	1	IC SN74 O4 N INV IC SN74 192 N COUNTER IC SN74 O4 N INV IC SN74 152 N COUNTER IC SN74 O0 N GATE SOCKET IC 14 CON SOCKET IC 14 CON	01295 01295 01295 01295 01295 23880 23880	SN7404N SN74192N SN7404N SN74192N SN7400N CSA 2900-14B CSA-3100-14B

Table 6-7. Frame (Option 001) Replaceable Parts List

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1 A2 A3 MP2 AP3 MP4	08011-66504 08011-66502 08011-66503 56-0-7623 0370-2486 06011-00207 3100-6552	1 1 2 2 1	COPTION OOLD BUARD ASSEMBLY, PGEN-BURST BOARD ASSEMBLY, BURST BCARD ASSEMBLY, CONNECTOR  PUSH-ROD KNOB, PUSHBUTTON, SINGLE BURST, BURST PANEL, FRONT, OPT OOL  SWITCH, THUMBWHEEL	28480 28480 28480 28480 28480 28480 28480	08011-66504 08011-66502 08011-66503 5040-7023 0370-2486 08011-00207

Table 6-8. Board A1 (Option 001) Replaceable Parts List

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
Al	08011-66504	1	BOARD ASSEMBLY,PGEN-BURST (OPTION 001)	29480	08011-66504
A1C1 A1C2 A1C3 A1C4 A1C5	0160-2208 0160-4210 0160-4210 0140-0210 0160-2150	2 17 1 1	CAPACITOR-FXD 330PF +-5% 300WVDC MICA CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD 270PF +-5% 300WVDC MICA CAPACITOR-FXD 33PF +-5% 300WVDC MICA	28480 28480 28480 72136 28480	0160-2209 0160-4210 0160-4210 DH15F271J0300WV1CR 0160-2150
A1C6 A1C7 A1C8 A1C9 A1C10	0160-4210 0140-0195 0160-3715 0160-3725 0180-0229	1 1 1	CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD 130PF +-5% 300WVDC MICA CAPACITOR-FXD .015UF +-10% 250WVDC MET CAPACITOR-FXD .68UF +-10% 40HVDC MET CAPACITOR-FXD; 33UF+-10% 10VDC TA-SOLID	28480 72136 28480 28480 56289	0160-4210 0M15F131J0300MV1CR 0160-3715 0160-3725 1500336X901082
A1C11 A1C12 A1C13 A1C14 A1C15	0150-3839 0160-4213 0160-4213 0160-4210 0160-4210	1 6	CAPACITOR-FXD 2.2UF +-10% 40WVDC MET CAPACITOR-FXD .1UF +-20% 50WVDC POLYE CAPACITOR-FXD .1UF +-20% 50WVDC POLYE CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD .022UF +-20% 50WVDC POLYE	28480 28480 28480 28480 28480	0160-3839 0160-4213 0160-4213 0160-4210 0160-4210
A1C16 A1C17 A1C18 A1C19 A1C20	0160-4210 0160-6127 0160-4213 0160-4210 0140-0193	2	CAPACITOR-FXD .022UF +-20% 50MVDC POLYE CAPACITOR-FXD 1UF +-20% 25MVDC CER CAPACITOR-FXD .01UF +-20% 50MVDC POLYE CAPACITOR-FXD .022UF20% 50MVDC POLYE CAPACITOR-FXD 82FF +-5% 300MVDC MICA	28480 28480 28480 28480 72136	0160-4210 0160-0127 0160-4213 0160-4210 5M15E82030300WV1CR
A1C21 A1C22 A1C23 A1C24 A1C25	0160-3220 0160-3723 0180-1746 0160-2208 0160-4210	1 1 1	CAPACITOR-FXD 6800PF +-5% 250WVDC MET CAPACITOR-FXD 33UF10% 40WVDC MET CAPACITOR-FXD; 15UF+-10% 20VVDC TA-SOLID CAPACITOR-FXD 330PF5% 300WVDC MICA CAPACITOR-FXD 302UF +-20% 50WVDC POLYE	FR 009 28480 56289 28480 28480	CKB-68 0160-3723 1500156 X902 0B2 0160-22 0B 0160-4210
A1C26 A1C27 A1C28 A1C29 A1C30	0160-4210 0140-0193 0160-0174 0160-0174 0160-0174	7	CAPACITOR-FXD -022UF +-20% 50WVDC POLYE CAPACITOR-FXD 82PF +-5% 300WVDC MICA CAPACITOR-FXD -47UF -80-20% 25WVDC CER CAPACITOR-FXD -47UF -80-20% 25WVDC CER CAPACITOR-FXD -47UF -80-20% 25WVDC CER	28480 72136 28480 28480 28480	0160-4210 DM15E820J0300WV1CR 0160-0174 0160-0174 0160-0174
A1C31 A1C32 A1C33 A1C34 A1C35	0160-0174 0160-4210 0160-4210 0160-4210 0160-2959	2	CAPACITOR-FXD .47UF .80-20% 25WVDC CER CAPACITOR-FXD .02ZUF +-20% 50WVDC POLYE CAPACITOR-FXD .02ZUF +-20% 50WVDC POLYE CAPACITOR-FXD .02ZUF +-20% 50WVDC POLYE CAPACITUR-FXD 1000PF +30-20% 1000WVDC	28480 28480 28480 28480 28480	0160-0174 0160-4210 0160-4210 0160-4210 0160-2959
A1C36 A1C37 A1C38 A1C39 A1C40	0160-0127 0180-2240 0180-2240 0160-4209 0160-4209	2	CAPACITOR-FXD; 2400UF+75-10% 25VUL AL	28480 56289 56289 28480 28480	0160-0127 39D248G025JL2 399248G025JL2 0160-4209 0160-4209
A1C41 A1C42 A1C43 A1C44 A1C44	0180-0061 0180-0061 0180-0061 0160-2306 0160-0174	asure exercises	CAPACITOR-FXD: 100UF-75-10% 16VDC AL CAPACITOR-FXD: 100UF-75-10% 16VDC AL CAPACITOR-FXD: 100UF-75-10% 16VDC AL CAPACITOR-FXD 27PF +-5% 300WVDC MICA CAPACITOR-FXD -47UF -80-20% 25WVDC CER	56289 56289 56289 28480 28480	0160-2306
A1C46 A1C47 A1C48 A1C49 A1C50	0160-4210 0160-4210 0160-4210 0160-2259 0160-2959		CAPACITOR-FXD .022UF +-20% 50MYDC POLYE CAPACITOR-FXD .022UF +-20% 50MYDC POLYE CAPACITOR-FXD .022UF +-20% 50MYDC POLYE CAPACITOR-FXD 12PF +-5% 500MYDC CER CAPACITOR-FXD 1000PF +80-20% 1000MYDC	20400	0160-4210 0160-4210 0160-2259
A1C 51 A1C 52 A1C 53 A1C 54 A1C 55	0160-4210 0160-4210 0160-4213 0160-4215 0160-4213	Andread Control of the Control of th	CAPACITOR-FXD .022UF +-20% 50WVDC POLYE CAPACITOR-FXD .02UF +-20% 50WVDC POLYE CAPACITOR-FXD .1UF +-20% 50WVDC POLYE CAPACITOR-FXD .1UF +-20% 50WVDC POLYE CAPACITOR-FXD .1UF +-20% 50WVDC POLYE	28480 28480 28480 28480 28480	0160-4210 0160-4213 0160-4213
A1C57 A1C57 A1C58 A1C6G A1C61	0160-2205 0160-0134 0180-2296 0160-0174 0160-0174	Ĭ	CAPACITOR-FXD 120PF5% 300WVDC MICA CAPACITOR-FXD 220PF5% 300WVDC MICA CAPACITOR-FXD 4000UF 475-10% 15VDC AL CAPACITOR-FXD 47UF -80-20% 25WVDC CER CAPACITOR-FXD 47UF -80-20% 25WVDC CER CAPACITOR-FXD 01UF +50VDC CER	28480 28480 28480 28480 28480	0 0160-0134 0 0180-2296 0 0160-0174 0 0160-0174
A1CG2 A1CR1 A1CR2 A1CR3 A1CR4 A1CR5	0160-3470 1901-0040 1901-0040 1901-0040 1901-0040 1901-0040	p d	3 DIODE-SHITCHING 30V 50NA 2NS DO-35 DIODE-SHITCHING 30V 50NA 2NS DO-35 DIODE-SHITCHING 30V 50NA 2NS DO-35 DIODE-SHITCHING 30V 50NA 2NS DO-35 DIODE-SHITCHING 30V 50NA 2NS DO-35	28480 28480 28480 28480 28480	1901-0040 1901-0040 1901-0040 1901-0040
AICR6 AICR7 AICR8 AICR9 AICR10	1902-0041 1901-0040 1902-0041 1902-0041 1902-3104	ekamanan anjarahangganan apakensakian	4 DIUDE-ZNR 5-11V 5% DD-7 PD=.4W TC=009 DIODE-SWITCHING 30V 50NA ZNS DD-35 DIODE-ZNR 5-11V 5% DD-7 PD=.4W TC=009 DIODE-ZNR 5-11V 5% DD-7 PD=.4W TC=009 DIODE-ZNR 5-62V 5% DD-7 PD=.4W TC=+.016	98 0471 98 0471	0 1901-0040 3 SZ 10939-98 3 SZ 10939-98
9					

Table 6-8. (cont'd) Board A1 (Option 001) Replaceable Parts List

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1CR11 A1CR12 A1CR12 A1CR13 A1CR14 A1CP15	1902-3104 1901-0040 1901-0040 1901-0040 1901-0040		DIODE-INR 5.62V 5% DO-7 PD=.4W TC=+.016% DIODE-SWITCHING 30V 50NA 2NS DO-35	04713 28480 28480 28480 28480	SZ 10939-110 1901-0040 1901-0040 1901-0040 1901-0040
AICHI6 AICHI7 AICHI8 AICHI9 AICH20	1901-0040 1901-0159 1901-0159 1901-0159 1901-0159	9	DIODE-SWITCHING 30V 50NA 2NS DO-35 DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41	28480 04713 04713 04713 04713	1901-0049 SR1358-4 SP1358-4 SR1358-4 SR1358-4
A1CF21 A1CF22 A1CF23 A1CF24 A1CF25	1901-0159 1901-0159 1901-0159 1901-0159 1901-0159 1902-1291	1	DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DU-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-PWR RECT 400V 750NA DO-41 DIODE-ZNR 1N5338B 5.1V 5% PD=5% IR=1UA	04713 04713 04713 04713 04713 04713	SR1358-4 SR1358-4 SR1358-4 SR1358-4 SR1358-4 1N53388
A1CR26 A1CR27 A1CR29 A1CR30 A1CR31	1901-0040 1901-0040 1901-0363 1901-0533 1902-0041	1	DIGDE-SWITCHING 30V 50NA 2NS DG-35 DIGDE-SWITCHING 30V 50NA 2NS DG-35 DIGDE-MULT FULL WAVE BRIDGE RECTIFIER DIGDE-SCHOTTKY DIGDE-ZNR 5.11V 5% DG-7 PD=.4M TC=009%	28480 28480 04713 26480 04713	1901-0040 1901-0040 SDA 10185-3 1901-0533 SZ 10939-98
A1L1 A1L2 A1L3 A1L4 A1L5	9140-0096 9140-0096 9100-1612 9100-1657 9100-1657	2	COIL FXD MOLDED RF CHOKE 1UH 10% COIL FXD MOLDED RF CHOKE 1UH 20% COIL FXD MOLDED RF CHOKE .33UH 20% COIL FXD MOLDED RF CHOKE 1.5MH 5% COIL FXD MOLDED RF CHOKE 1.5MH 5%	24226 24226 24226	15/330 22/154 22/154
A1L 6 A1L 7 A1L 8 A1MP1 A1MP2 A1U1 A1U2 A1U3 A1U4 A1U5	9170-0029 9170-0029 9170-0029 9170-0029 08011-01101 08011-01102 1854-0053 1854-0053 1854-0053 1853-0039 1854-0215	3 1 1 3 7 5	CORE-SHIELDING BEAD CORE-SHIELDING BEAD CORE-SHIELDING BEAD CORE-SHIELDING BEAD HT-SINK FOR Q33, Q34, Q37, Q38, U7 HT-SINK FOR Q27, Q28, Q29, Q30 TEANSISTOR NPN 2N2218 SI TO-5 PD=800MM TEANSISTOR NPN 51 PD=350MM FT=300MHZ	02114 02114 02114 28480 28480 04713 04713 04713 04713 04713	56-590-65A2/4A 56-590-65A2/4A 56-590-65A2/4A 08011-01101 08011-01102 2N2218 2N2218 2N2218 2N2213 2N4917 SPS 3611
A106 A107 A148 A106 A1010	1854-0215 1853-0039 1853-0089 1853-0036 1854-0215	7	TRANSISTCK NPN SI PD=350MW FT=300MHZ TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTCR PNP SI PD=310MW FT=250MHZ (RANSISTOR NPN SI PD=350MW FT=300MHZ	04713 07263 07263 28480 04713	SPS 3611 2N4917 2N4917 1853-0036 SPS 3611
A1Q11 A1Q12 A1Q13 A1Q14 A1Q15	1853-0036 1853-0039 1853-0036 1853-0036 1853-0089		TRANSISTOR PNP SI PD=313MW FT=250MHZ TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR PNP SI PD=310MW FT=250MHZ TRANSISTOR PNP SI PD=310MW FT=250MHZ TRANSISTOR PNP SI PD=310MW FT=250MHZ TRANSISTOR PNP 2N4917 SI PD=200MW	28480 07263 28480 28480 07263	1853-0C36 2N4917 1853-0036 1853-0C35 2N4917
A1016 A1017 A1018 A1019 A1020	1653-0089 1854-0630 1854-0630 1853-0089 1853-0035	4	TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR NPN SI TO-52 PC=360MW TRANSISTOR NPN SI TO-52 PD=360MW TRANSISTOR NPN SI TO-52 PD=300MW TRANSISTOR PNP 2N4917 SI PD=200MW TRANSISTOR PNP SI PD=310MW FT=250MMZ	07263 94713 94713 97263 28480	1
A1021 A1022 A1023 A1024 A1025	1854-0630 1854-0630 1853-0357 1853-0357 1853-0315 1205-0001		TRANSISTOR NPN SI TJ-52 PD=360MW TPANSISTOR NPN SI TO-52 PD=360MW TRANSISTOR PNP SI TO-18 PD=360MW TRANSISTOR PNP SI TO-18 PD=360MW TRANSISTOR PNP SI TO-18 PD=300MW TRANSISTOR PNP SI TO-39 PD=1W FI=1GHZ HEAT-DISSIPATJR SGL TO-5/TJ-39 PKG	04713 04713 28480 28480 28480 28480	\$\$2077 1853-0357 1853-0357 1853-0315
A1U26 A1U27 A1U28 A1U29	1854-0498 1265-061 1853-0012 1853-0012 1854-0213		TRANSISTOR TO-39 PD=1W HEAT-DISSIPATOR SGL TO-5/TO-39 PKG TRANSISTOP PNP 2N2904A SI TO-5 PD=600MW TRANSISTOR PNP 2N2904A SI TO-5 PD=600MW TRANSISTOR NPN 2N253B SI TO-5 PD=800MW	1 01272	1205-0061 2N29044 2N29044
A1030 A1031 A1032 A1033 A1034	1854-0213 1853-0036 1854-0215 1854-0402 1853-0254		TRANSISTOR NPN 2N2538 SI TO-5 PD=800MM TRANSISTOR PNP SI PD=31UMW FT=250MHZ TRANSISTOR NPN SI PD=350MW FT=300MHZ TRANSISTOR NPN SI PD=30W FT=3MHZ TRANSISTOR PNP SI PD=3UW FT=3MHZ	28480 28480 04713 28480 28480	1853-0036 SPS 3611 1854-0402 1853-0254
A1Q35 A1Q36 A1Q37 A1Q38 A1Q40	1854-0215 1853-0012 1853-0356 1853-0356 1853-0036		TRANSISTOR NPN SI PD=350MW FT=300MHZ TRANSISTOR PNP 2N290&A SI TO-5 PD=600Mi  TRANSISTOR PNP SI PO=65W FT=3MHZ TRANSISTOR PNP SI PO=65W FT=31MW FT=250MHZ TRANSISTOR PNP SI PD=310MW FT=250MHZ	04713 01295 28486 28486 28486	2N29044 1853-0356 1853-0356 1853-0036
A1R1 A1R2 A1R3 A1R4 A1R5	0758-0093 0698-3242 0757-0284 0757-0427 0757-0398		RESISTOR 56 5% -25W F TC=0+-100 RESISTOR 357 1% -125W F TC=0+-100 RESISTOR 150 1% -125W F TC=0+-100 RESISTOR 1-5K 1% -125W F TC=0+-100 RESISTOR 75 1% -125W F TC=0+-100	2454) 1629 2454 2454 2454	9 C4-1/8-T0-357R-F 6 C4-1/8-T0-151-F 6 C4-1/8-T0-1501-F

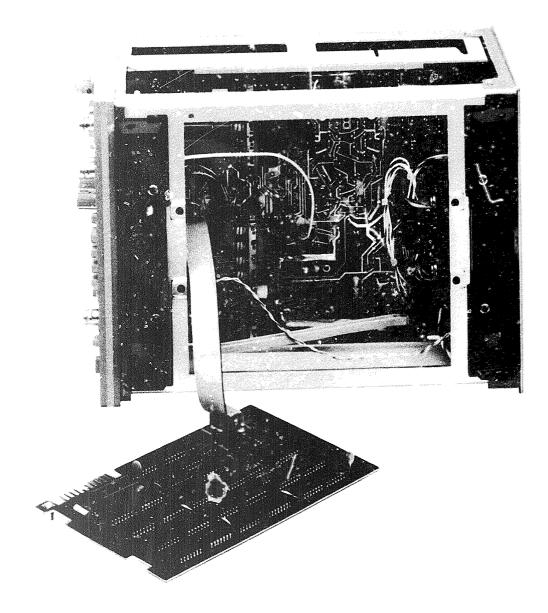
Table 6-8. (cont'd) Board A1 (Option 001) Replaceable Parts List

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1R6 A1R7 A1R8 A1R9 A1R1D	0698-3242 0757-0400 0757-0442 0757-0283 0757-0403	2 2 2 1	RESISTOR 357 1% .125W F TC=0+-100 RESISTOR 90.9 1% .125W F TC=0+-100 RESISTOR 10K 1% .125W F TC=0+-100 RESISTOR 2K 1% .125W F TC=0+-100 RESISTOR 121 1% .125W F TC=0+-100	16299 24546 24546 24546 24546	C4-1/8-T0-357R-F C4-1/8-T0-90R9-F C4-1/8-T0-1002-F C4-1/8-T0-2001-F C4-1/8-T0-121R-F
A1R11 A1R12 A1R13 A1R14 A1R15	0698-3151 0757-0428 0757-0407 0757-0405 0757-0394	1 7 4 3 2	RESISTOR 2.87K 1% .125W F TC=0+-100 RESISTOR 1.62K 1% .125W F TC=0+-100 RESISTOR 200 1% .125W F TC=0+-100 RESISTOR 162 1% .125W F TC=0+-100 RESISTOR 51.1 1% .125W F TC=0+-100	16299 24546 24546 24546 24546	C4-1/8-T0-2871-F C4-1/8-T0-1621-F C4-1/8-T0-201-F C4-1/8-T0-162R-F C4-1/8-T0-51R1-F
A1R16 A1R17 A1R18 A1R19 A1R20	0758-0068 0757-0411 0757-0416 0757-0437 0757-0422	1 3 3 2 2	RESISTOR 910 5% .25W F TC=0+-100 RESISTOR 332 1% .125W F TC=0+-100 RESISTOR 511 1% .125W F TC=0+-100 RESISTOR 4.75K 1% .125W F TC=0+-100 RESISTOR 909 1% .125W F TC=0+-100	24546 24546 24546 24546 24546	C5-1/4-T0-911-J C4-1/8-T0-332R-F C4-1/8-T0-511R-F C4-1/8-T0-4751-F C4-1/8-T0-909R-F
A1R 21 A1R 22 A1R 23 A1P 24 A1R 25	0757-0273 0757-0273 0757-0428 0757-0397 0757-0381	3 3 1	RESISTOR 3.01K 1₹ .125W F TC=0+-100 RESISTOR 3.01K 1₹ .125W F TC=0+-100 RESISTOR 1.62K 1₹ .125W F TC=0+-100 RESISTOR 68.1 1₹ .125W F TC=0+-100 RESISTOR 15 1₹ .125W F TC=0+-100	24546 24546 24546 24546 19701	C4-1/8-T0-3011-F C4-1/8-T0-3011-F C4-1/8-T0-1621-F C4-1/8-T0-68R1-F MF4C1/8-T0-15R0-F
A1R 26 A1R 27 A1R 28 A1R 29 A1R 30	0757-0438 9757-0437 0757-0442 0757-0401 0693-3245	5 7 1	RESISTOR 5.11K 1% .125W F TC=0+-100 RESISTOR 4.75K 1% .125W F TC=0+-100 RESISTOR 10K 1% .125W F TC=0+-100 RESISTOR 100 1% .125W F TC=0+-100 RESISTOR 20.5K 1% .125W F TC=0+-100	24546 24546 24546 24546 16299	C4-1/8-T0-5111-F C4-1/8-T0-4751-F C4-1/8-T0-1002-F C4-1/8-T0-101-F C4-1/8-T0-2052-F
A1R31 A1R32 A1R33 A1k34 A1R35	0757-0408 0757-0283 0757-0230 0757-0431 0777-0430	2 4	RESISTOR 243 1% .125W F TC=0+-150 RESISTOR 2K 1% .125W F TC=0+-100 RESISTOR 5.62K 1% .125W F TC=0+-100 RESISTOR 2.43K 1% .125W F TC=0+-100 RESISTOR 2.21K 1% .125W F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-T0-243R-F C4-1/8-T0-2001-F C4-1/8-T0-5671-F C4-1/8-T0-2431-F C4-1/8-T0-2211-F
A1R 36 A1R 37 A1R 38 A1R 39 A1R 40	0757-0401 0757-0407 0757-0410 0757-0431 0757-0435	2	RESISTOR 100 1% .125W F TC=0+-100 RESISTOR 200 1% .125W F TC=0+-100 RESISTOR 301 1% .125W F TC=0+-100 RESISTOR 2.43K 1% .125W F TC=0+-100 RESISTOR 3.92K 1% .125W F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-T0-101-F C4-1/8-T0-201-F C4-1/8-T0-301R-F C4-1/8-T0-301R-F C4-1/8-T0-3921-F
A1R41 A1R42 A1R43 A1R46 A1R45	0757-0414 0757-0420 0757-0200 0757-0410 0757-0799	1	RESISTOR 432 17 .125W F TC=0+-100 RESISTOR 750 1% .125W F TC=0+-100 RESISTOR 5.62K 1% .125W F TC=0+-100 RESISTOR 301 1% .125W F TC=0+-100 RESISTOR 121 1% .5W F TC=0+-100	24546 24546 24546 24546 19701	C4-1/8-T0-432R-F C4-1/8-T0-751-F C4-1/8-T0-562L-F C4-1/8-T0-301R-F MF7C-1/2-T0-121R-F
A1R46 A1R47 A1R48 A1R49 A1R50	0757 0284 0698-3441 0757-0408 0757-0409 0757-0428	1 2	RESISTOR 150 1% -125W F TC=0+-100 RESISTOR 215 1% -125W F TC=0+-100 RESISTOR 243 1% -125W F TC=0+-100 RESISTOR 274 1% -125W F TC=0+-100 RESISTOR 1.62K 1% -125W F TC=0+-100	24546 16299 24546 24546 24546	C4-1/8-T0-151-F C4-1/8-T0-215P-F C4-1/8-T0-243R-F C4-1/8-T0-274R-F C4-1/8-T0-1621-F
A1R51 A1R52 A1R53 A1R54 A1R55	0757-0386 0757-0422 0757-0273 0757-0392 0757-0401	2	RESISTOR 24.3 1% .125W F TC=0+-100 RESISTOR 909 1% .125W F TC=0+-100 RESISTOR 3.01K 1% .125W F TC=0+-100 RESISTOR 43.2 1% .125W F TC=0+-100 RESISTOR 100 1% .125W F TC=0+-100	19701 24546 24546 24546 24546	MF4C1/8-TO-24R3-F C4-1/8-TO-909R-F C4-1/8-TO-3011-F C4-1/8-TO-43R2-F C4-1/8-TO-101-F
AIR 56 AIR 57 AIR 58 AIR 59 AIR 61	0757-0400 0757-0401 0758-0002 0758-0054 0757-0280	1 1 3	RESISTOR 330 58 .25W F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-T0-90P9-F C4-1/8-T0-101-F C5-1/4-T0-561-J C5-1/4-T0-331-J C4-1/8-T0-1001-F
A1R 62 A1R 63 A1R 63 A1R 63 A1R 64 A1R 64 A1R 64	0757~0409 0757~0397 0699~3262 0757~6401 0757~0397 0698~3262 0757~0384	2	RESISTOR 274 1% .125W F TC=0+-100 RESISTOR 68.1 1% .125W F TC=0+-100 RESISTOR 40.2 1% .125W F TC=0+-100 RESISTOR 1001% .125W F TC=0+-100 RESISTOR 68.1 1% .125W F TC=0+-100 RESISTOR 40.2 1% .125W F TC=0+-100 RESISTOR 201% 125W F TC=0+-100	24546 24546 16299 24546 16299	
A1R65 A1R66 A1R67 A1R68 A1R69	0698-3242 0757-0401 0757-0401 0698-3242 0698-7521		RESISTOR 357 1% -125W F TC=0+-100 RESISTOR 100 1% -125W F TC=0+-100 RESISTOR 100 1% -125W F TC=0+-100 RESISTOR 357 1% -125W F TC=0+-100	16299 24546 24546 16299 11502	C4-1/8-T0-101-F C4-1/8-T0-101-F C4-1/8-T0-357R-F
A1K70 A1R71 A1R73 A1R74 A1R75	0698-7521 0757-0431 0698-7521 0698-7521 0757-0500		RESISTOR 5-1 5% .25W F TC=0+-100 RESISTOR 2-43K 1% -125W F TC=0+-100 RESISTOR 5-1 5% .25W F TC=0+-100 RESISTOR 5-1 5% .25W F TC=0+-100 RESISTOR 30-1 1% .25W F TC=0+-100	11502 24546 11502 11502 24546	C4-1/8-T0-2431-F TF07-1/4-T0-5R1-J TF07-1/4-T0-5R1-J
A1R76 A1R77 A1R78 A1R79 A1R79	0757-0500 0757-0500 0757-0500 0757-0280 0757-0416	A THE CASE OF THE	RESISTOR 30.1 1% .25W F TC=0+-100 RESISTOR 30.1 1% .25W F TC=0+-100 RESISTOR 30.1 1% .25W F TC=0+-100 RESISTOR 1K 1% .125W F TC=0+-100 RESISTOR 511 1% .125W F TC=0+-100	24546 24546 24546 24546 24546	C5-1/4-T0-30R1-F C5-1/4-T0-30R1-F C4-1/8-T0-1001-F

Table 6-8. (cont'd) Board A1 (Option 001) Replaceable Parts List

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
`1880 .1880 A1881 A1882 A1883	0757-0280 0757-0416 2109-2799 0757-0438 0757-0438	2	RESISTOR 1K 1% .125H F TC=0+-100  RESI5:0R 511 1% .125H F TC=0+-100  RESISTOR, VAR 2.2K 20% 0.5H LIN CC  RESISTOR 5.11K 1% .125H F TC=0+-100  RESISTOR 5.11K 1% .125H F TC=0+-100	24546 24546 28480 24546 24546	C4-1/8-TJ-1001-F C4-1/8-TJ-511R-F 2100-2799 C4-1/8-TJ-5111-F C4-1/8-TJ-5111-F
A1R84 A1P85 A1R86 A1R87 A1F88	2100~2799 0698-5876 0757-0407 0757-0407 0693-5876	2	RESISTOR, VAR 2.2K 20% 0.5M LIN CC RESISTOR 10 5% .25M F TC=0+-100 RESISTOR 200 1% .125M F TC=0+-100 RESISTOR 200 1% .125M F TC=0+-100 RESISTOR 10 5% .25M F TC=0+-100	28480 24546 24546 24546 24546	2100-2799 C5-1/4-T0-10R0-J C4-1/8-T0-201-F C4-1/8-T0-201-F C5-1/4-T0-10R0-J
AIR 69 AIR 92 AIR 93 AIR 94 AIR 95	0757-0431 0757-0346 0757-0401 0757-0386 0757-0394	1	RESISTOR 2.43K 1% .125W F TC=0+~100 RESISTOR 10 1% .125W F TC=0+~100 RESISTOR 100 1% .125W F TC=0+~100 RESISTOR 24.3 1% .125W F TC=0+~100 RESISTOR 51.1 1% .125W F TC=0+~100	24546 24546 24546 19701 24546	C4-1/8-T0-2431-F C4-1/8-T0-10P0-F C4-1/8-T0-101-F MF4C1/8-T0-24R3-F C4-1/8-T0-51R1-F
A1R 96 A1R 97 A1R 98 A1R 99 A1R 100	0766-0025 0766-0025 0761-0035 0758-0080 0758-0080	2 2 2	RESISTOR 101 2% 3W MO TC=0+-250 RESISTOR 101 2% 3W MO TC=0+-250 RESISTOR 150 5% 1W MO TC=0+-200 RESISTOR 75 5% -25W F TC=0+-100 RESISTOR 75 5% -25W F TC=0+-100	27167 27167 24546 24546 24546	FP3-3-250-101R-G FP3-3-250-101R-G FP32-1-100-151-J C5-1/4-10-7502-J C5-1/4-T0-7502-J
A1R101 A1R1J2 A1R103 A1R104 A1R105	0761-0035 0758-0092 0758-0032 0757-1060 0698-4825	2 1 1	RESISTOR 150 5% 1W MO TC=0+-200 RESISTOR 130 5% -25M F TC=0+-100 RESISTOR 130 5% -25M F TC=0+-100 RESISTOR 196 1% -5W F TC=0+-100 RESISTOR 64.9 1% -5W F TC=0+-100	24546 24546 24546 19701 24546	FP32-1-T00-151-J C5-1/4-T0-131-J C5-1/4-T0-131-J MF7C1/2-T0-196R-F NA6
A1R 107 A1R 108 A1R 109 A1R 110 A1R 111	0757-0438 0757-0439 0698-3620 0698-3620 2100-3104	2	RESISTOR 5-11K 1% -125M F TC=0+-100 RESISTOR 5-11K 1% -125M F TC=0+-100 RESISTOR 100 5% 2M MO TC=0+-200 RESISTOR 100 5% 2M MO TC=0+-200 RESISTOR, VAR 50 0HM 10% 5M, CC	24546 24546 24546 24546 01121	C4-1/8-T3-5111-F C4-1/8-T0-5111-F FP42-2-T00-100R-J FP42-2-T00-100R-J
A1R112 A1R113 A1R114 A1R115 A1R116	0698-5880 0698-3616 0757-0421 0757-0421 0757-0411	2 1 3	RESISTOR 15 5% .25M F TC=0+-100 RESISTOR 62 5% 2M MO TC=0+-200 RESISTOR 825 1% .125M F TC=0+-100 RESISTOR 825 1% .125M F TC=0+-100 RESISTOR 825 1% .125M F TC=0+-100	24546 16299 24546 24546 24546	C5-1/4-T0-15R0-J FP42-2-T00-62R0-J C4-1/8-T0-825R-F C4-1/8-T0-825R-F C4-1/8-T0-332R-F
A 1R 11 7 A 1R 11 8 A 1R 11 9 A 1R 12 0 A 1R 12 3	0757~0411 0757~0421 0698~5830 0812~0021 0812~0021	2	RESISTOR 332 1% .125W F TC=0+-100 RESISTOR 825 1% .125W F TC=0+-100 RESISTOR 15 5% .25W F TC=0+-100 RESISTOR .47 5% 3W PW TC=0+-90 RESISTOR .47 5% 3W PW TC=0+-90	24546 24546 24546 91637 91637	C4-1/8-T0-332R-F C4-1/3-T0-825R-F C5-1/4-T0-15R0-J CW281-3-T2-47/100-J CW281-3-T2-47/100-J
A1R124 A1R125 A1R126 A1R127 A1R128	0757-0428 2100-2800 0757-0428 0757-0428 2100-2800	2	RESISTOR 1.62K 1% .125W F TC=0+-100 R:VAR CERMET 1000 0HM 20% RESISTOR 1.62K 1% .125W F TC=0+-100 RESISTOR 1.62K 1% .125W F TC=0+-100 R:VAR CERMET 1000 0HM 20%	24546 28480 24546 24546 28480	C4-1/8-T0-1621-F 2100-2800 C4-1/8-T0-1621-F C4-1/8-T0-1621-F 2100-2800
A1R129 A1R130 A1R131 A1R132 A1R133	0757-0428 0757-0405 2100-2739 0698-4431 2100-2739	2	RESISTOR 1.62K 1% .125W F TC=0+-170 RESISTOR 162 1% .125W F TC=0+-100 R:VAR 220 OHM RESISTOR 2.05K 1% .125W F TC=0+-100 R:VAR 220 OHM	24546 24546 28480 16299 28480	C4-1/8-T0-1621-F C4-1/8-T0-162R-F 2100-2739 C4-1/8-T0-2051-F 2100-2739
A1R134 A1R135 A1R136 A1R137 A1R138	0757-0405 0698-5137 0698-5137 0698-5137 0698-5137	, 4	RESISTOR 162 18 -125W 5 TC=0+-100 RESISTOR 47 58 -25W F TC=0+-100 RESISTOR 201% 125W F TC=0+-100	24546 24546 24546 24546 24546	C4-1/8-T0-162R-F C5-1/4-T0-47R0-D C5-1/4-T0-47R0-D C5-1/4-T0-47R0-D C5-1/4-T0-47R0-D
A1R139 A1S1 A1S2 A1S3 A1S4 A1S5	0757 0384 3101-0597 3101-0596 3101-0595 3101-0593 3101-0598	1 1 1 1	SWITCH-PB 9STA .394 IN-CTRS .25A 120VAC SWITCH-PB 3STA INTLH .394 IN-CTRS .25A SWITCH-PB 5STA .394 IN-CTRS .25A 120VAC SWITCH-PB 5STA .394 IN-CTRS .25A 120VAC	28480 28480 28480 28480 28480	3101-05 97 3101-05 95 3101-05 95 3101-05 93 3101-05 98
A156 A157 A158 A159	3101-0555 3101-0629 3101-0629 3101-0594	1 2	SWITCH-SL DPDT-NS MINTR 2A 250VAC PC SWITCH-SL PDT-NS MINTR 2A 250VAC PC	28480 28480 28480 28480	3101-0555 3101-0629 3101-0629 3101-0594
A1U1 A1U2 A1U3 A1U4 A1U5	1826-0092 1820-0111 1820-0065 1820-0380 1820-0196	1 1 1 2	IC MC 1458 50 N GATE IC SN74 70 N FLIP-FLOP IC SN74H 53 N GATE	28480 01295 01295 01295 07263	1826-0092 SN74450N SN7470N SN74H53N 723HC
A1U6 A1U7 A1W! A1X1	1820-0196 1826-0122 8120-1459 1251-2499	1 2	CABLE RIBBON	07263 07263 28480 76381	723HC 7805UC 8120-1459 3406-0000

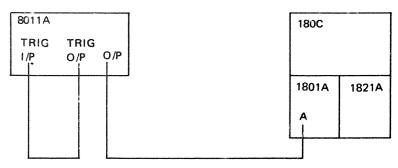
# Removal of Board A2 (Burst Option) for Troubleshooting



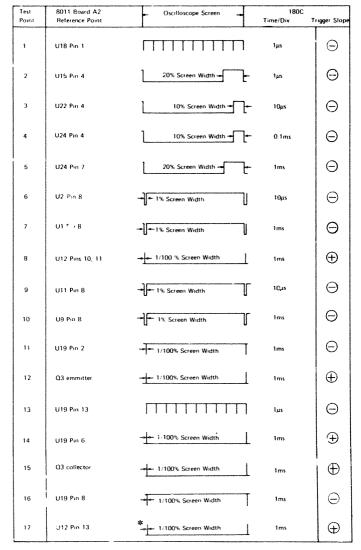
Board A2 is removed, as follows, in preparation for the troubleshooting procedure:

- 1. Remove screw fixing board A2 to the frame.
- 2. Place 8011A on its side
- Remove board A2, leaving ribbon cable, W1 connected (see photograph above)

Table 6-9. Burst Option Troubleshooting

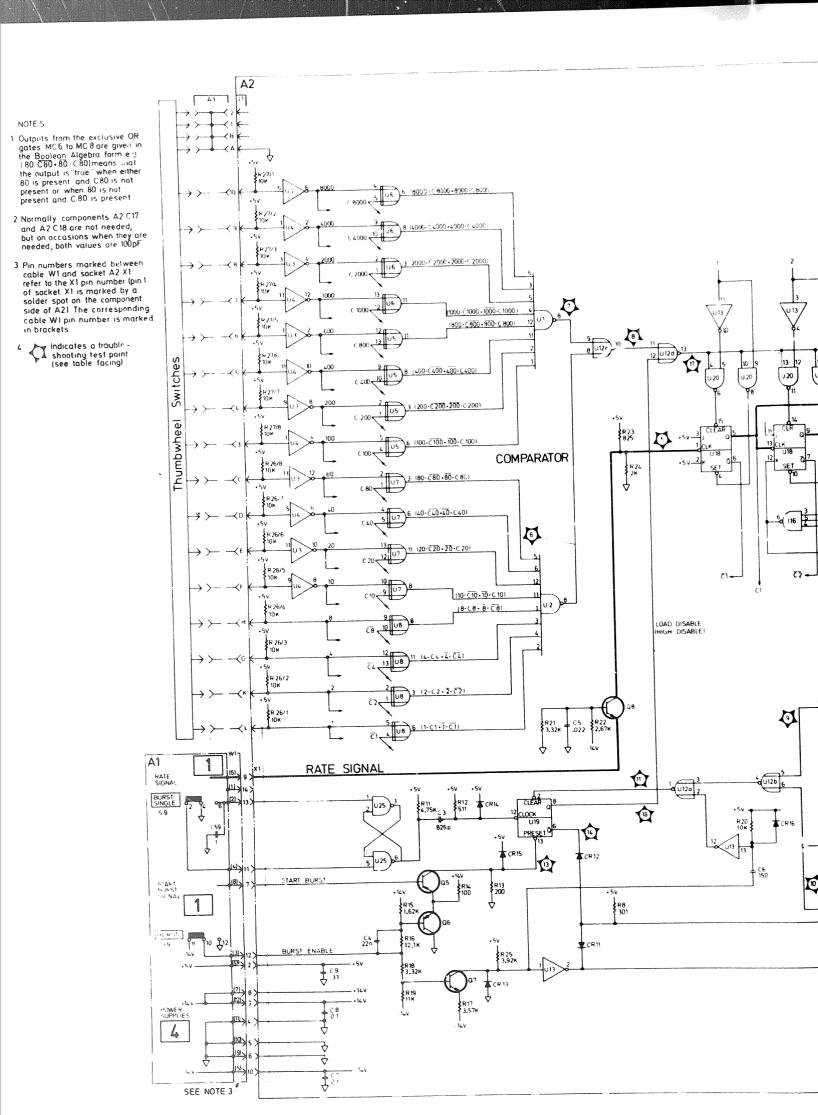


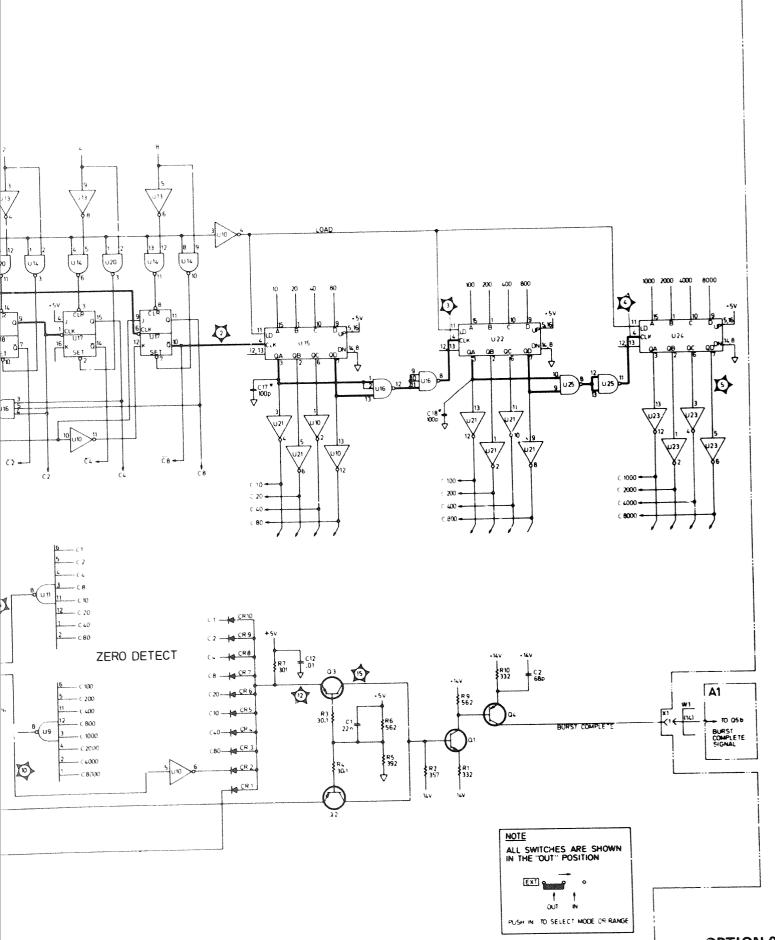
- With oscilloscope set to 1μs/division, set the 8011A output to exactly 1 MHz with minimum width.
- 2. Set 8011A to Burst Mode.
- 3. Connect the 8011A TRIGGER OUTPUT to the 8011A TRIGGER INPUT.
- 4. Disconnect the base connection of transistor A2Q4 and leave as 'open base'.
- 5. Disconnect pin 13 of A2U12 from socket X2 and leave as 'open circuit'.
- 6. Wire-connect the open track (from which A2U12 pin 13 is disconnected) to floating ground.
- 7. Set 1821A to internal trigger.
- 8. Check the waveforms detailed in the following list:



NOTES: 1. \* Only for Burst number greater than 0000

- Some duty cycles are difficult to see on oscilloscope screen
- Set the 8011A to SYM output and check all power supply voltages.
- Check that all the A2J1 pins which are normally connected to the thumbwheel switches (but now disconnected) are high.





5

OPTION 001 BURST BOARD

BACKDATING-

## 7-1 INTRODUCTION

7–2 This section contains backdating information which adapts this manual to instruments with serial numbers lower than that shown on the inside of the front cover.

NOTES:

1. The backdating information does not include changes detailed in Service Notes 8011A—G1 to 8011A—G5. These changes are also serial number related, and should be incorporated (in manual and instrument) in addition to the backdating information.

2. During the production life of this instrument, certain capacitors have been changed for improved component quality. When replacing these parts in old instruments, the values given in this manual should be the replacement value. The capacitors concerned are as follows:

Board A1 (Standard and Option) — C2, C3, C6, C12, C13, C14, C15, C16, C18, C19, C25, C26, C32, C33, C34, C39, C40, C41, C42, C46, C47, C43, C51, C52, C53, C54.

Board A2 — C1, C4, C5, C7, C8

CHANGE 1 (Serial number 1411G00910 and below)
On schematic 1, disconnect pin 13 of EXT switch from +14V.

CHANGE 2 (Serial number 1410G00380 and below) in Tables 6–5 and 6–8 change the fo!lowing components to:

C24	0140-0192	C-F 68pF 300 V
C24	0160-2147	C-F .025µF 100V
C35		C-F 220µF 10V
C43	0180-0159	C-F .025µF 100V
C50	0160-2147	
C56	0160-2214	C-F 680pF 300V
C57	0160-0134	C-F 220pF
CR12	1902-3074	DIO BKDN 4.32V
CR13	1902-3074	DIO BKDN 4.32V
CR16	1902-3003	DIO BKDN 2.37V
L2	9140-0094	CHOKE 0.68µH
L3	9140-0094	CHOKE 0.68µH
Q17	1854-0498	XSTR SI NPN
Q18	1854-0498	XSTR SI NPN
Q21	1854-0005	XSTR SI 2N708
Q22	1854-0053	XSTR SI 2N708
Q23	1853-0034	XSTR SI PNP
Q24	1853-0034	XSTR SI PNP
Q25	1853-0201	XSTR SI PNP
Q26	1854-0332	XSTR SI PNP
Q29	1854-0053	XSTR SI 2N2218
Q30	18540053	XSTR SI 2N2218
Q35	1854-0053	XSTR SI 2N2218R-F 180 5%

R45	0758-0014	R-F 180 5% .25W	R70	0757-0346	R-F 10 1% 0.125W
R46	0757-0401	R-F 100 .125W	R73	0757-0346	R-F 10 1% 0.125W
R63	0757-0397	R-F 68.1 1%	R74	0757-0346	R-F 10 1% 0.125W
R64	0757-0397	R-F 68.1 1%	R75	0698-6213	R-F 37.4 1% 0.25W
R65	0757-0284	R-F 150 1% 0.125W	R76	0698-6213	R-F 37.4 1% 0.25W
R66	0757-0264	R-F 511 1% 0.125W	R77	0698-6213	R-F 37.4 1% 0.25W
	0757-0146	R-F 511 1% 0.125W	R78	0698-6213	R-F 37.4 1% 0.25W
R67	• • • • • • • • • • • • • • • • • • • •	R-F 150 1% 0.125W	R79	0757-0280	R-F 1K 1% 0.125W
R68	0757-0284		****	0757-0280	R-F 1K 1% 0.125W
R69	0757-0346	R-F 10 1% 0.125W	R80		
			R93	07570280	R-F 1K 1% 0.125W

Delete the following components from Tables 6-5 and 6-8.

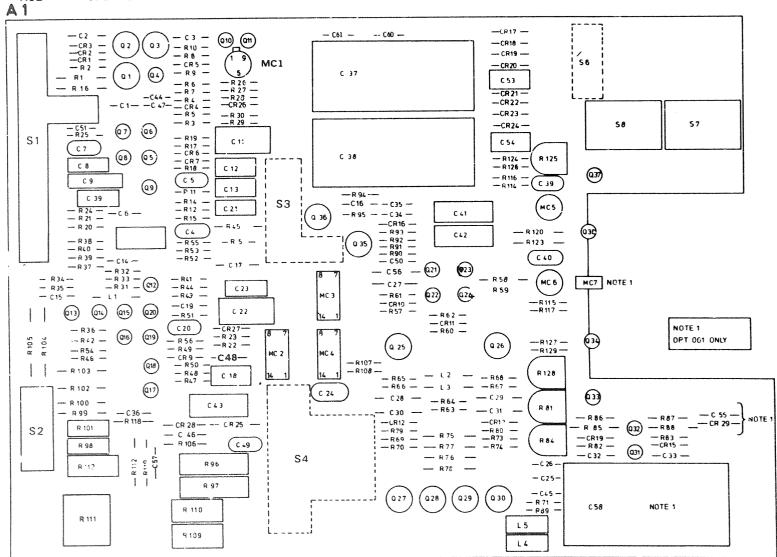
CR31, L7, L8, Q40, R130, R131, R132, R133, R134, R135, R136, R137, R138.

Delete CR30 from Table 6-8.

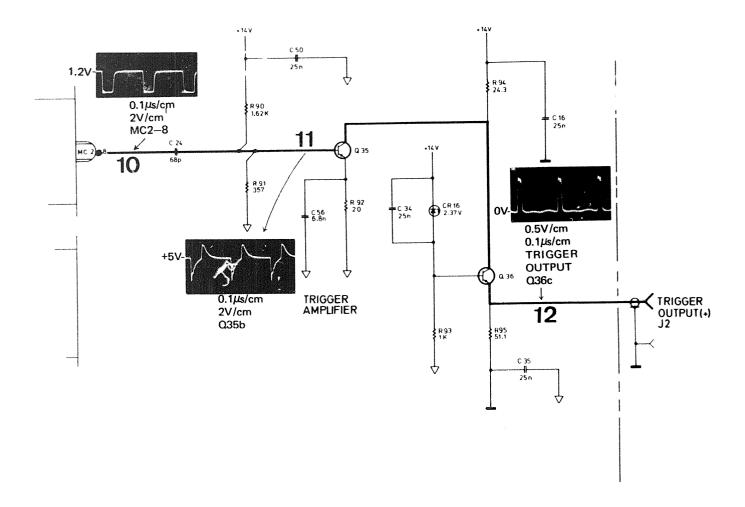
Add the following compoent

Add the following components to Tables 6-5 and 6-8.

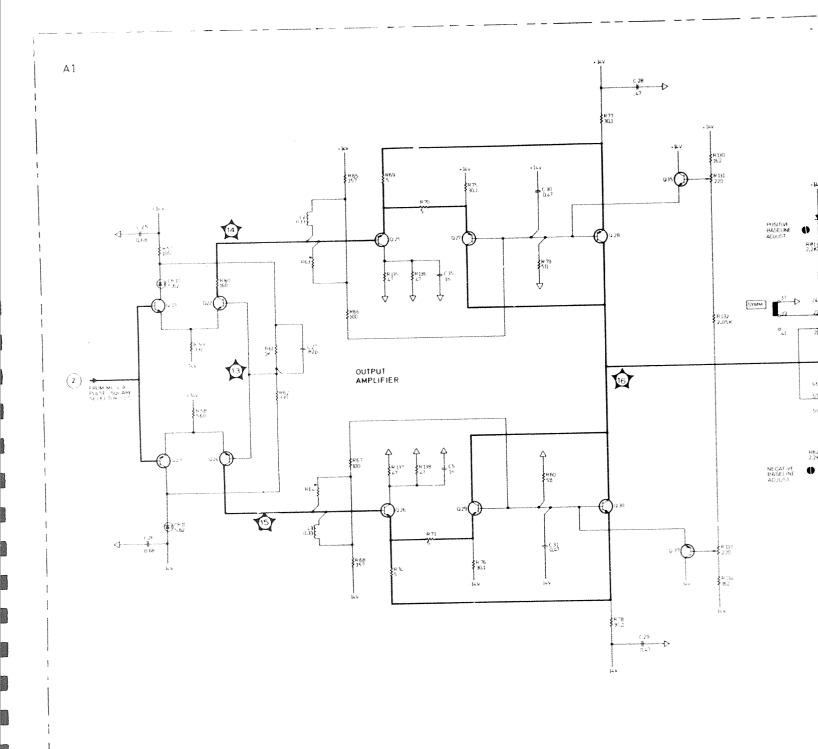
MP35	1205-0033	HT SINK FOR Q35
R60	0757-0405	R-F 162 1% .125W
R91	0698-3242	R-F 357 1% .125W
R92	0757-0384	R-F 20 1% .125W



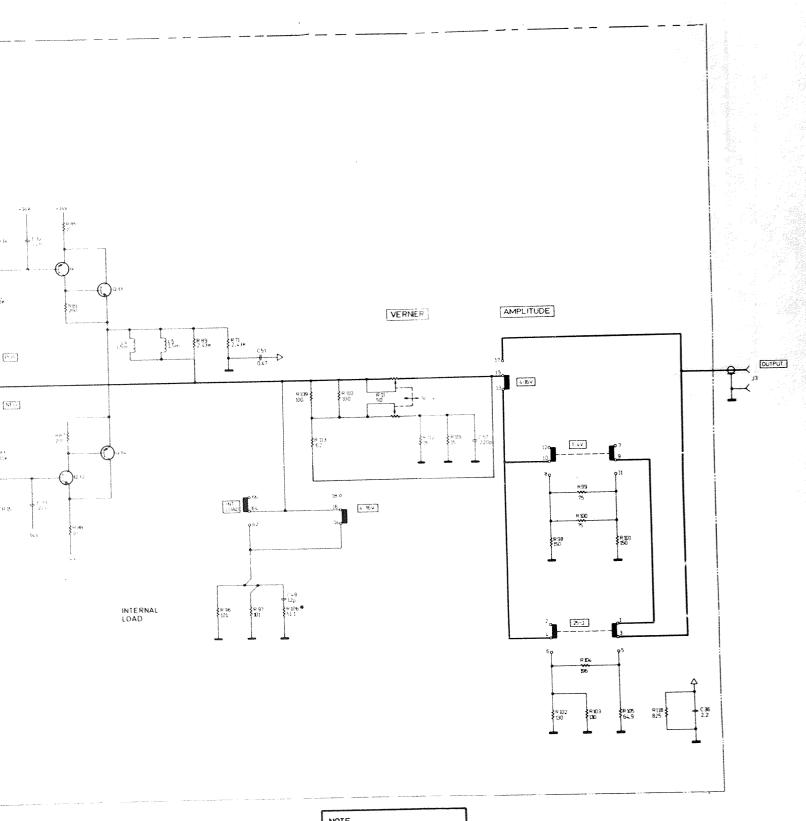
Change Schematic 2 as follows:



Change Schematic 3 as follows:



٨,



NOTE
ALL SWITCHES ARE SHOWN
IN THE "OUT" POSITION

EXT O O
OUT IN
"PUSH IN" TO SELECT MODE OR RANGE

OUTPUT STAGE

## Check the following table for your instrument serial number.

 Serial Number
 Manual Changes

 1411 G 01286 on
 1

 1411 G 01311 on
 1, 2

 1411 G 01386 on
 1-3

 1411 G 01411 on
 1-4

#### **MANUAL CHANGE 1**

## **MANUAL CHANGE 2**

On Page 6-6, Assembly A1 Parts List: delete A1C34 0160-4210

On Page 6-4, Frame Parts List: change MP5 Part No. to 08011-60202

### **MANUAL CHANGE 3**

On Page 6-18, Assembly A2 Parts List: change Q5, Q6 Part No. to 1853-0281

### **MANUAL CHANGE 4**

Change parts list and schematic: Standard Instrument — A1 (08011–66501)

> Add C 46 0160-4210 C-F 0.022 UF Add F 1 2110-0340 FUSE 0.4 FER



## MANUAL CHANGES

Manual for Model Number	8011A
Manual printed on	Sept 1977
Manual Part Number	08011-90004

Make all ERRATA corrections.

Check the following table for your instrument serial prefix/serial number and make the listed changes to your manual.

#### New Item

Gerial Prefix or Serial Number !	Manual Changes	Serial Prefix or Serial Number	Manual Changes
1411G01635 and below	Refer to Manual's yellow pages		
1411G01636 on			
1411G01661 on 1411G01761 on	1 2 3		

Model 8011A

## ERRATA

Page 6-21 Change AlW1 as follows:
AlW1 5081-1968 CABLE AY RI
Delete AlX1

## Manual Change 1

Pages 6-8, 6-15, 6-21, change A1R68 0698-4421 RF 249 1%

### Manual Change 2

Page 6-4 change FL 1 9100-312 FL1 9135-0035

#### Manual Change 3

Pages 6-9 and 6-21, Board A1 (Schange U5, U6 1826-0010

## NUAL CHANGES

I for Model Number	8011A
l printed on	Sept 1977
l Part Number	08011-90004

erial number

Prefix or Manual Number Changes Model 8011A

## ERRATA

Page 6-21 Change AlW1 as follows:
AlW1 5081-1958 CABLE AY RIBBON
Delete AlX1

## Manual Change 1

Pages 6-8, 6-15, 6-21, change A1R68 0698-4421 RF 249 1% .125W

## Manual Change 2

Page 6-4 change FL 1 9100-3121 to FL1 9135-0035

## Manual Change 3

Pages 6-9 and 6-21, Board Al (Standard and Option) Parts List: change U5, U6 1826-0010 IC V-REG.

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