HEWLETT hp PACKARD

OPERATING AND SERVICE MANUAL
MODEL 8011A
PULSE GENERATOR

This manual corresponds to instruments
with the serial number prefix

1333G

703 BÖBLINGEN, HERRENBERGER STR. 110, WEST GERMANY

08011–90001

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PREFACE

One copy of this manual is supplied with each instrument. Additional copies may be purchased from the local Hewlett-Packard Sales and Service Office. Specify the instrument model number and serial number.

A 'microfiche' microfilm version of this manual is available under part number 08011–90051.

Reference should be made to the manual change sheets supplied with the manual for errata and technical changes.

Technical changes are indicated by the prefix (the first five characters) of the serial number which appears on the rear panel of the instrument; the title page carries the serial number prefix of the instrument to which the manual applies directly.

CONTENTS

ILLUSTRATIONS

TABLES

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 produce 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: < ± 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 50Ω, 8V with 50Ω 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 ± 10% shunted by 30pF. 4V–16V range, 50 ohms ± 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 delivering ≥ +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 in. x 5.6 in. x 11.8 in.).

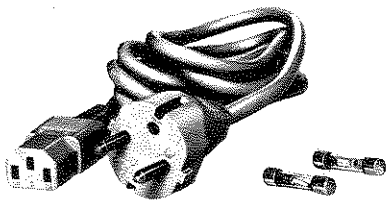


Figure 2–1. 8011A and Delivered Accessories

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 2–16 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 220/240V operation	2110–0044
600mA fuse (for 110/120V operation)	2110–0016
Power Cord (one of those shown in figure 2–2).	

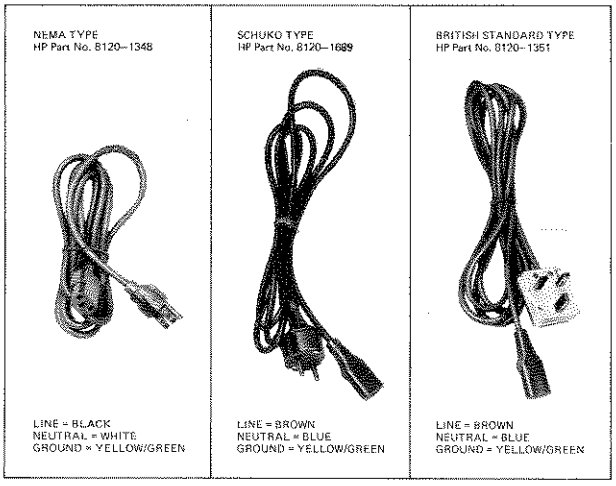


Figure 2–2. Power Cords

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.

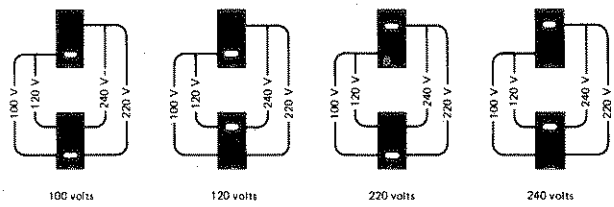


Figure 2–3. Switch Settings for the Various Nominal Powerline Voltages. The power dissipation is 70VA maximum.

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°C (32°F) and 55°C (131°F). The pulse generator may be stored between –40°C (–40°F) and 75°C (167°F).

2–14 CLAIMS AND REPACKAGING

2–15 Claims for Damage

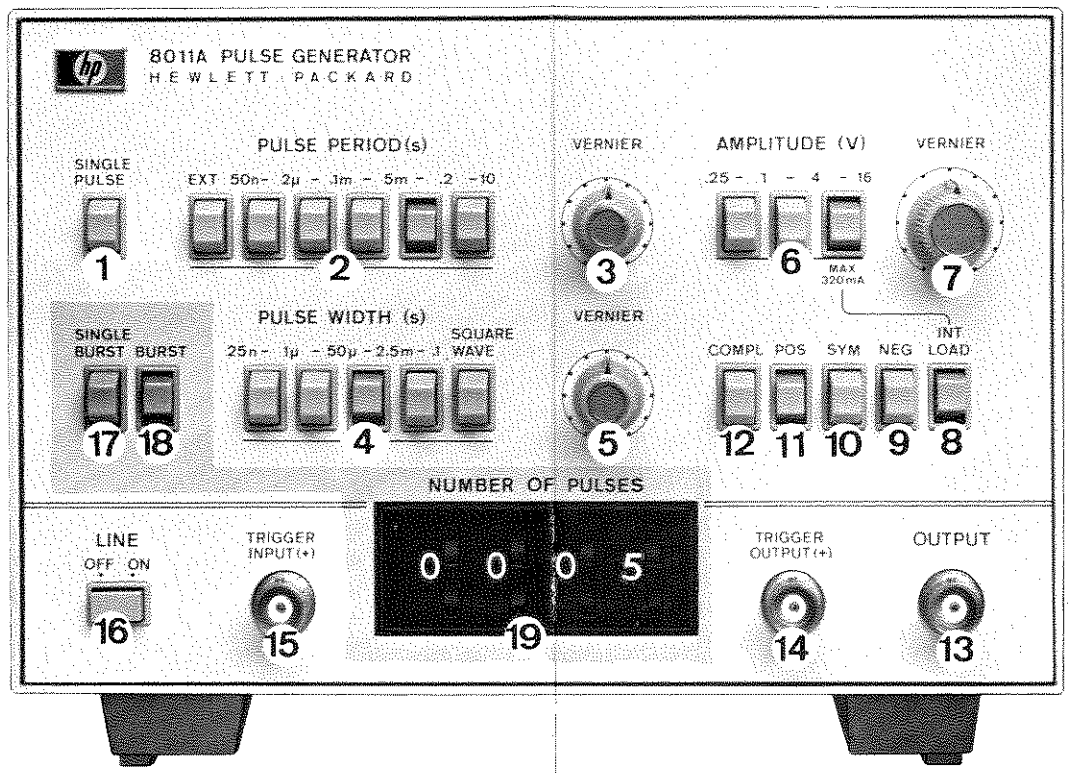
2–16 If physical damage is evident or if the instrument does not meet specifications when received, notify the carrier and the nearest Hewlett-Packard Sales/Service Office. The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against 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 or 15179A option 001 for rackmounting 1 unit.



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.

5 Pulse Width VERNIER: for continuous adjustment of pulse width between the limits of the range selected (is inoperative in SQUARE WAVE).

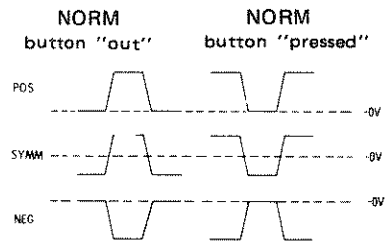
6 AMPLITUDE: mutually-exclusive push-buttons for selecting amplitude range. Note that, in the 4–16 Volt range the maximum current available is 320mA (from a current source) and in the other ranges the source impedance is 50Ω.

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 50Ω internal load in the 4–16 Volt range. In the other ranges the 50Ω 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, 50Ω 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

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.

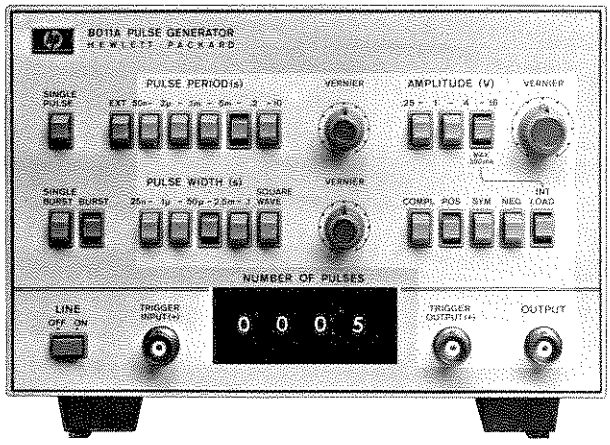


Figure 3–2. 8011A Internal Mode

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.

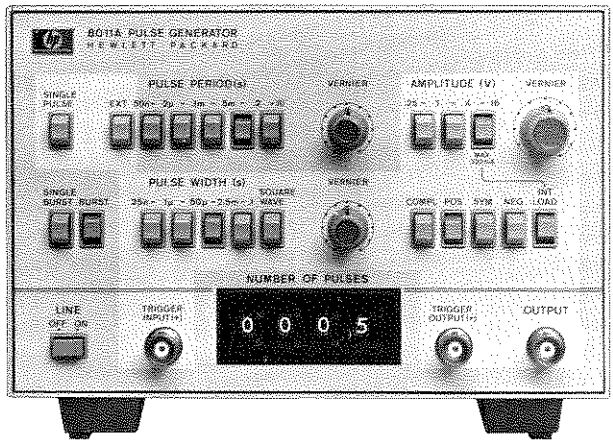


Figure 3–3. 8011A External Mode

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.

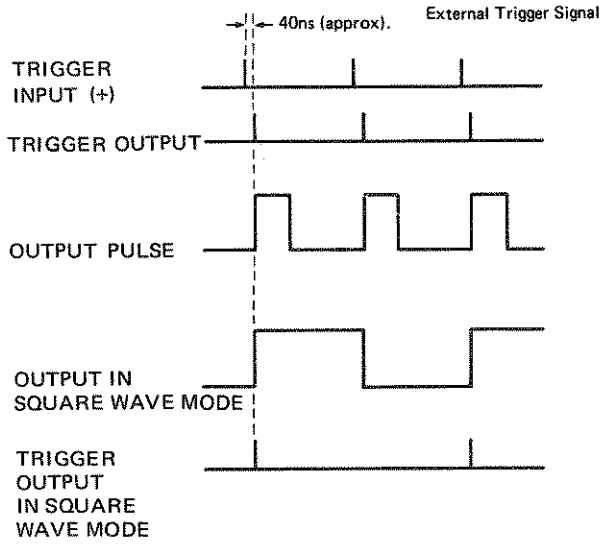


Figure 3–4. External Triggering Timing Sequence

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.

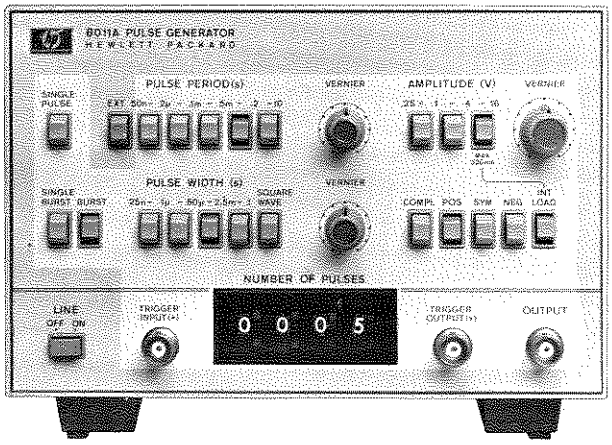


Figure 3–5. 8011A Burst Mode

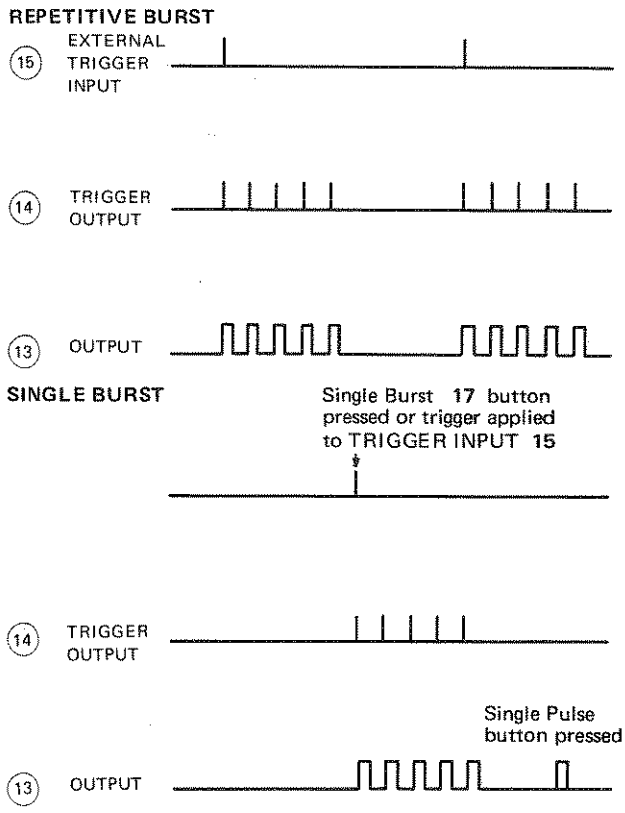


Figure 3–6. Examples of Repetetive and Single Burst Output.

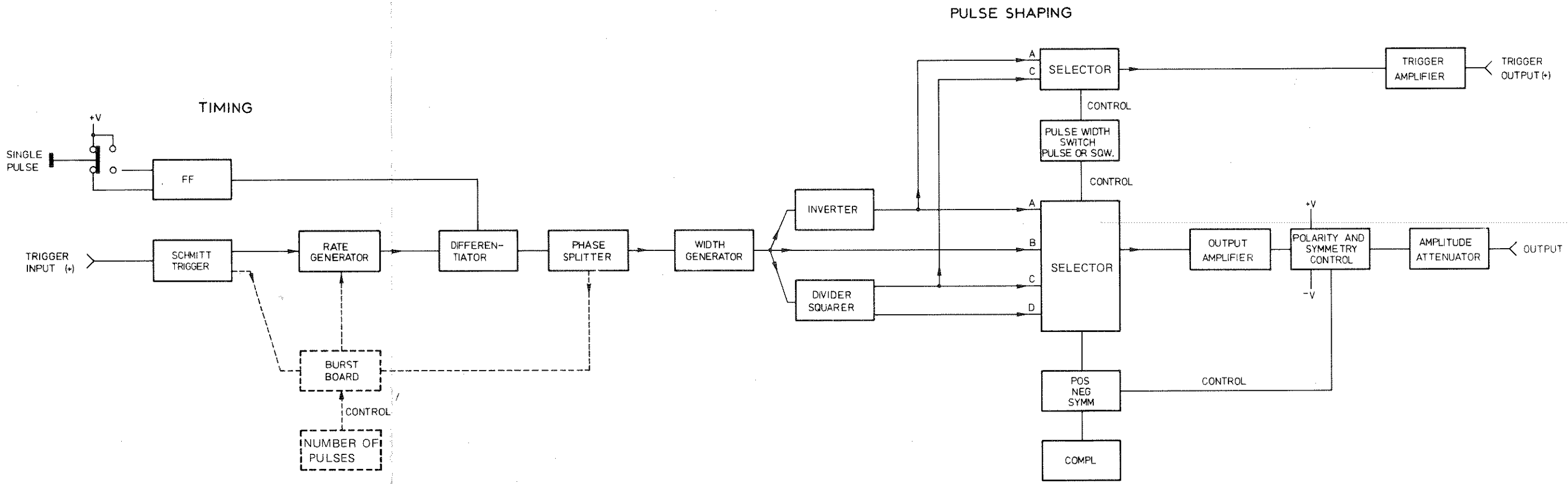


Figure 4–1. 8011A Block

4–1 INTRODUCTION (figure 4–1)

4–2 In normal mode operation, the rate generator is free-running at a rate determined by the PULSE PERIOD controls. In the external mode the disabled rate generator is turned on and off by 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.

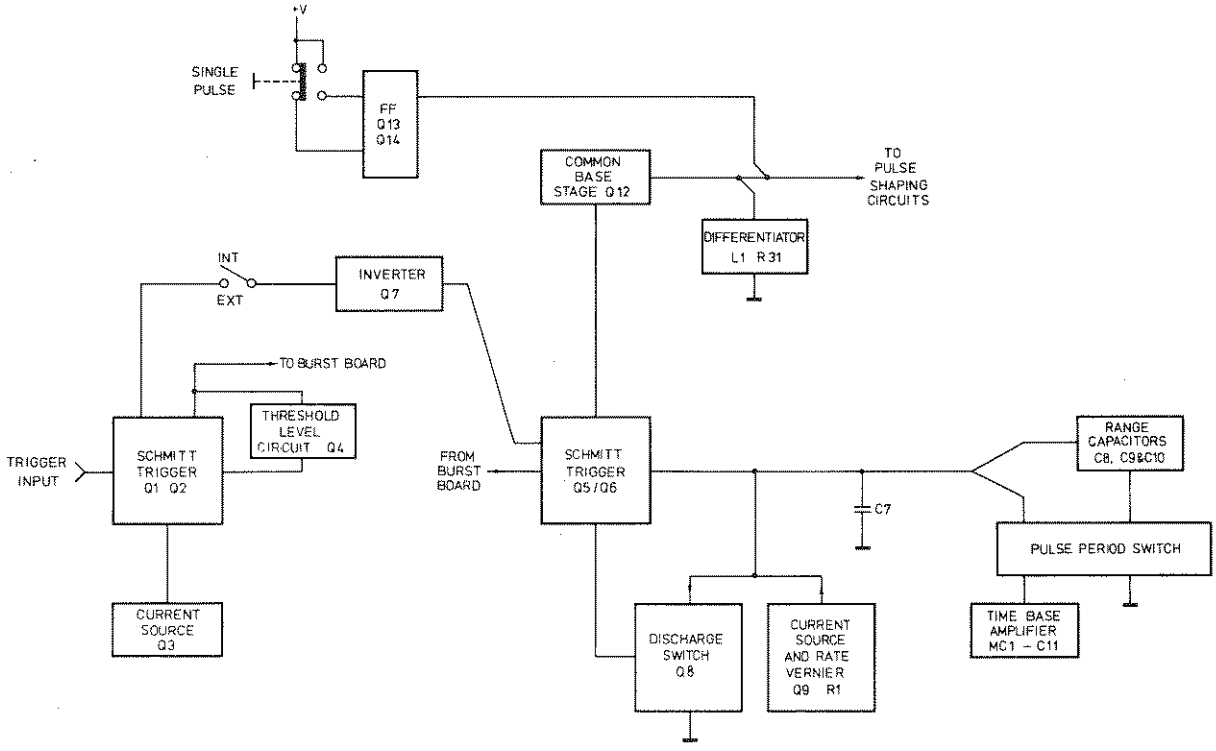


Figure 4–2. Repetition Rate Generator

4–7 The rate generator is a Schmitt trigger (Q5 and Q6) which switches when the voltage output of a ramp generator (Q9, 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 (MC1) 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 (MC1–A). The resulting signal, which is differentiated by C11, activates an operational amplifier (MC1–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 maintains a constant voltage at the base of Q2 in spite of the changes in the supply caused by format selection. Refer to paragraph 4–43 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)

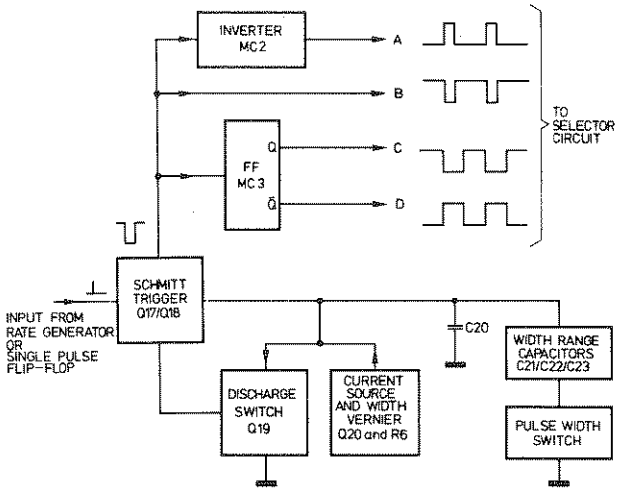


Figure 4–3. Width Generator

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 (Q20 and C21 or C22 or C23), charged from the current source (Q20/Q21), 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.

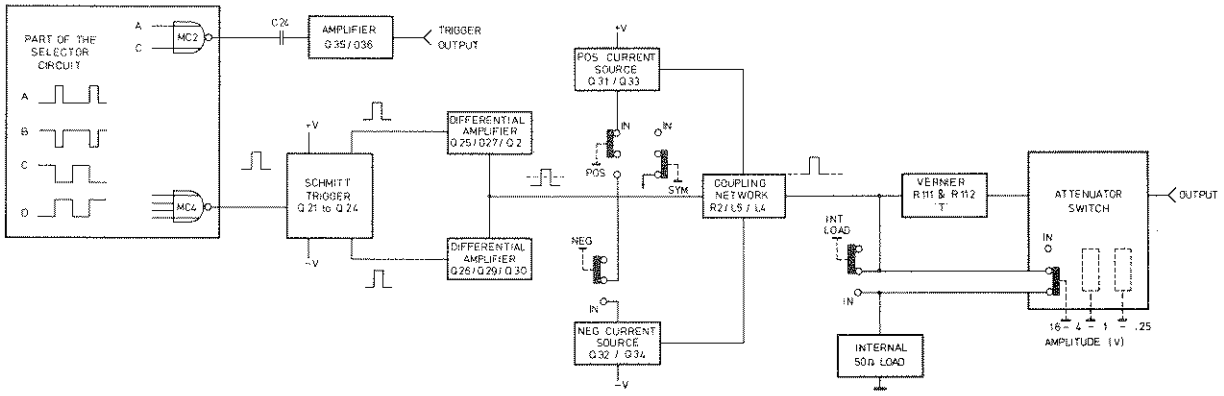


Figure 4–4. Output Stages

4–18 The Schmitt trigger output is applied directly (signal B) and via an inverter (MC2 – signal A) and via the divider squarer (signals C and D) to an array of gates which select the required output as follows:

	Output Format	Mode	
		Pulse	Square Wave
Normal	Positive	B	D
	Symmetrical	B	D
	Negative	A	C
Complement	Positive	A	C
	Symmetrical	A	C
	Negative	B	D

4–19 OUTPUT STAGES (Figure 4–4 and Diagram 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 50Ω 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 50Ω-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 (MC5 and MC6) 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.

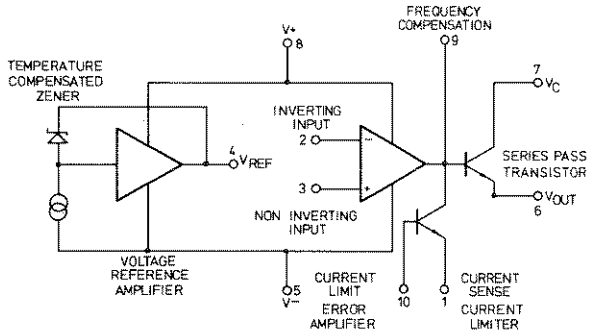


Figure 4–5. Voltage Regulator

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 is essentially a counter, which is loaded with the numbers from the 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 causes a HOLD OFF signal which disables the rate generator.

4–32 When BURST mode is selected, the BURST ENABLE signal goes high (0V) and enables Gate (Q5, Q6) and, via the BUFFER stage (Q7, MC13a), AND gate (CR11, CR12). MC19 Q output and the output from the BUFFER are high so that the output from the AND gate goes high. This high causes the output of the NOR gate (HOLD OFF) to go low (+11V) and disable the rate generator.

4–33 The information from the thumbwheel-switch is loaded into the counter. This is then checked by the comparator and if correct the load (line) is disabled (MC12–13 goes high). The Q output from MC19 is low in this case. When the start burst signal is received, the Q output of MC19 goes high in order to prevent re-load (so that subsequent changes in the configuration of the thumbwheel switches will not affect the state of the count). At the same time the Q goes low causing the HOLD OFF to be removed so that the rate generator is enabled.

4–34 Pulses from the rate generator clock the counter via the Rate Buffer Q8. When the counter reaches zero, this condition is detected by the zero detector which clears Q19 (so that LOAD DISABLED is removed), and provides a high input to the NOR gate (so that HOLD OFF is established and the rate generator disabled).

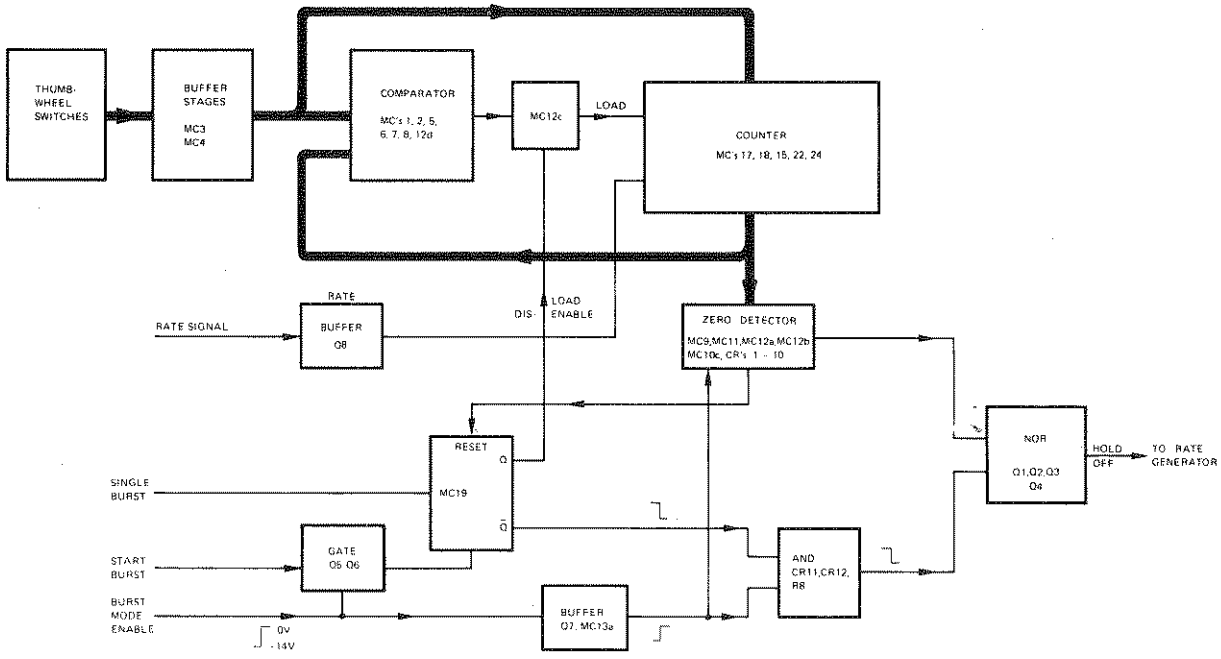


Figure 4–6. Pulse Burst Control

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 ensures accuracy and long life even in hostile environments. 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 Removal of Assemblies

5–8 The majority of troubleshooting and repair procedures can be undertaken without removing the PC board from the frame. If necessary, however, the board can be removed as follows:

Unsolder the connections to the two verniers and BNC connectors. If the burst board (Opt. 001) is fitted, unplug the interconnecting cable and pull the board towards the rear .

Remove the AMPLITUDE vernier knob.

Remove the four fixing screws at the corners of the rear panel.

Now slide the PC board(s) and rear panel towards the rear of the instrument.

5–9 Performance Checks and Adjustment Procedures

5–10 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.

5–10 Troubleshooting

5–11 When a fault symptom is evident, try to locate the fault to a functional block using figure 4–1. Then use table 5–20, 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 the facing figure 5–1.

Table 5–1. Test Equipment and Accessories Required

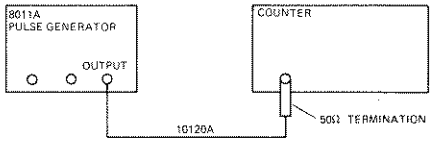
INSTRUMENT	BRIEF SPECIFICATION	RECOMMENDED MODEL
Oscilloscope	Dual Channel, 50 MHz bandwidth, 5mV/div. sensitivity, sweep speeds 5ns/div. to 2s/div. with sweep delay.	HP 180A with plug-ins 1801A and 1821A
Sampling Oscilloscope	Dual Channel, 1 GHz bandwidth, 1mV/div. sensitivity, sweep speeds 10ns/div. to 2s/div.	HP 140A with plug-ins 1401A and 1424A.
Counter	Frequency Range 0 to 50 MHz	HP 5245L
VHF Test Oscillator	Frequency Range 10 MHz to 500MHz	3200B
Test Oscillator	Frequency Range 10 Hz to 10 MHz	651B
Pulse Source	Frequency Range 0.1 Hz to 20 MHz	8011A
Digital Voltmeter	100V range to 4 significant figures. Accuracy ± 0.05% ± 1 digit.	HP 3440A with plug-in 3444A
AC Voltmeter	Sensitivity 100μV to 300V rms.	HP 3400A

ACCESSORIES	RECOMMENDED MODEL
50Ω co-axial cable terminated with BNC male connectors (2 required)	HP 10120A
50Ω termination type GR (2 required)	GR 874–W50B
50Ω Tee connector (2 required)	HP 10221A
50Ω Feed-through	HP 11048B
20dB Attenuator	RS RBU 100. 8654. 25 30W and appropriate adapters
Adder	HP 15104A
10:1 Divider Probe Tip	HP 10214A

Table 5–2. Performance Check – Repetition Rate

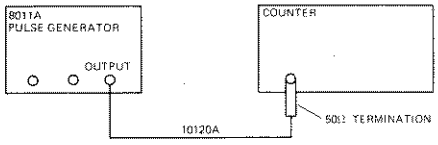
INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	50n – 2μ
VERNIER **3**	CCW
PULSE WIDTH **4**	25n – 1μ
VERNIER **5**	CCW
AMPLITUDE **6**	4 – 16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	ON



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

Table 5–3. Performance Check – Manual Trigger



INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	EXT
VERNIER **3**	
PULSE WIDTH **4**	25n – 1μ
VERNIER **5**	CCW
AMPLITUDE **6**	4 – 16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	ON

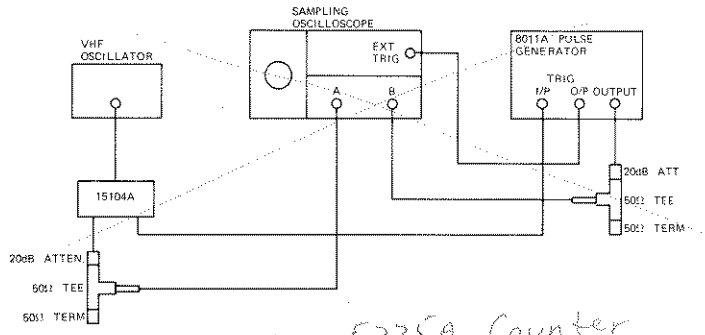
STEP	INSTRUCTION	RESULT
1	Set the counter for manual start.	
2	Press the SINGLE PULSE button once only:	1 pulse

MAY use storage oscilloscope

Table 5–4. Performance Check – Pulse Width

INITIAL CONTROL SETTINGS

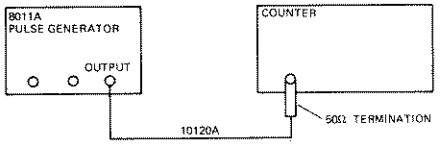
PULSE PERIOD **2**	50n – 2μ
VERNIER **3**	CCW
PULSE WIDTH **4**	25n – 1μ
VERNIER **5**	CCW
AMPLITUDE **6**	4 – 16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	ON



Use 5335A Counter
Pulse A or Oscilloscope

STEP	INSTRUCTION				RESULTS
1	Check the pulse width for each of the control settings listed below.				
	PULSE PERIOD **2**	VERNIER **3**	PULSE WIDTH **4**	VERNIER **5**	Pulse width
	50n – 2μ	CCW	25n – 1μ	CCW	< 25ns
		CW		CW	> 1μ
	2μ – .1m	CCW	1μ – 50μ	CCW	< 1μ
		CW		CW	> 50μ
	.1m – 5m	CCW	50μ – 2.5m	CCW	< 50μ
		CW		CW	> 2.5m
			2.5m –.1	CCW	< 2.5m
				CW	> .1s

Table 5–5. Performance Check — Square Wave



INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	~~25~~ 50n – 2μ
VERNIER **3**	CCW
PULSE WIDTH **4**	SQUARE WAVE
VERNIER **5**	—
AMPLITUDE **6**	4 – 16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	ON

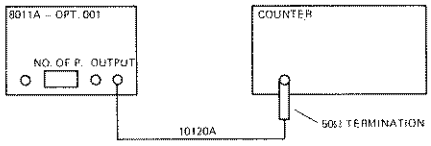
STEP	INSTRUCTION	RESULTS
1	Set the counter function to measure frequency.	
2	Check the square wave pulse for each control setting listed below:	
	PULSE PERIOD **2**	
	~~25~~ 50n – 2μ	> 10 MHz
	2μ – 0.1m	> 250 kHz
	0.1m – 5m	> 5 kHz
3	Set counter function to period average	—
	5m – 0.2	< 10ms
	0.2 – 10	< 400ms

Table 5–6. Performance Check – Single Burst (8011A – Opt. 001)

OPTION: 001

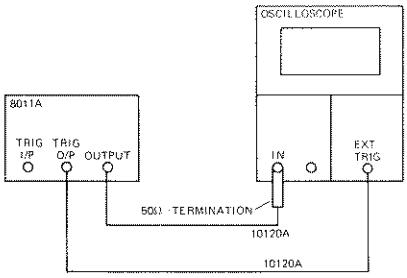
INITIAL CONTROL SETTINGS

PULSE PERIOD 2	50n – 2μ
VERNIER 3	CCW
PULSE WIDTH 4	25n – 1μ
VERNIER 5	CCW
AMPLITUDE 6	4 – 16
VERNIER 7	CW
POLARITY 11	POS
INT LOAD 8	ON
BURST MODES	ON
NUMBER OF PULSES 19	8011



STEP	INSTRUCTIONS	RESULTS
1	Press SINGLE BURST button:	8011 pulses

Table 5–7. Performance Check – Duty Cycle



INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	2μ – 0.1
VERNIER **3**	CCW
PULSE WIDTH **4**	1μ – 5μ
VERNIER **5**	–
AMPLITUDE **6**	4 – 16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	ON

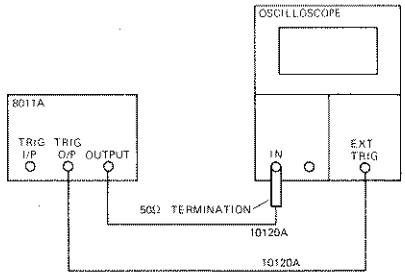
STEP	INSTRUCTIONS	RESULTS
1	By means of the pulse width VERNIER **5**. Set the pulse leading edge on the first line of the oscilloscope screen and the trailing edge on the centre line (5 cm).	
	Turn the pulse period VERNIER **3** slowly CCW until the trailing edge moves an the pulse is divided.	
3	Measure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

PULSE PERIOD **2**	PULSE WIDTH **4**	VERNIER **5**	
2μ – 0.1 m	1μ – 5μ	as in	< 10 = 50%
0.1 – 5m	50μ – 2.5m	step 1	< 10 = 50%
5m – 0.2	2.5m – 0.1		< 10 = 50%

Table 5–8. Performance Check — Pulse Period Jitter

INITIAL CONTROL SETTINGS

PULSE PERIOD	2	0.1m – 5m
VERNIER	3	CCW
PULSE WIDTH	4	50μ – 2.5m
VERNIER	5	CCW
AMPLITUDE	6	4 – 16
VERNIER	7	CW
POLARITY	11	POS
INT LOAD	8	



STEP	INSTRUCTIONS	RESULTS
1	Main Sweep 1ms/CW Delayed Sweep 1μs/CW Sweep Display MAIN	
2	Adjust the pulse period VERNIER (3) to obtain a 1ms pulse period.	
3	Adjust the oscilloscope delay (DIV.) until the intensified Spot coincides with the leading edge of the second pulse on the display.	
4	Switch to MIXED sweep display on oscilloscope.	
5	Measure pulse period jitter t.	

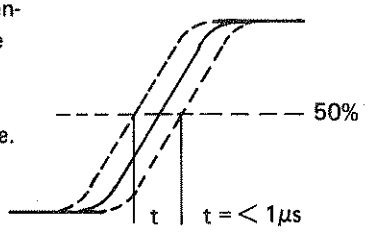
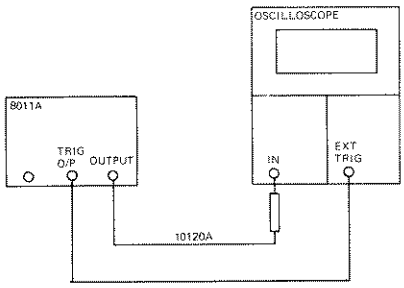


Table 5–9. Performance Check — Pulse Width Jitter



INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	0.1m – 5m
VERNIER **3**	CW
PULSE WIDTH **4**	50μ – 2.5m
VERNIER **5**	CCW
AMPLITUDE **6**	4 – 16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	ON

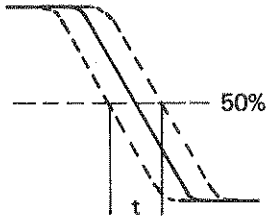
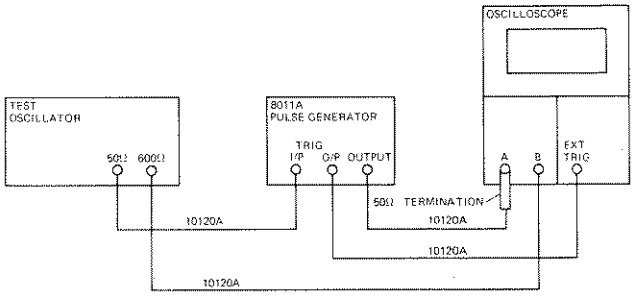
STEP	INSTRUCTIONS	RESULTS
1	Set the controls of the oscilloscope as follows Main Sweep 1ms/cm Delayed Sweep 1μs/cm Sweep Display MAIN	
2	Adjust the pulse width vernier to obtain a 1ms pulse width.	
3	Using the delay VERNIER (**6**), move the trailing edge of the pulse to the centre of the display.	
4	Adjust the Delay (Div.) until the intensified spot coincides with the trailing edge.	
5	Switch to delayed sweep.	
6	Set magnifier X5 and measure the width jitter t.	 t = < 1μ = < 0.01%

Table 5–10. Performance Check — External Trigger

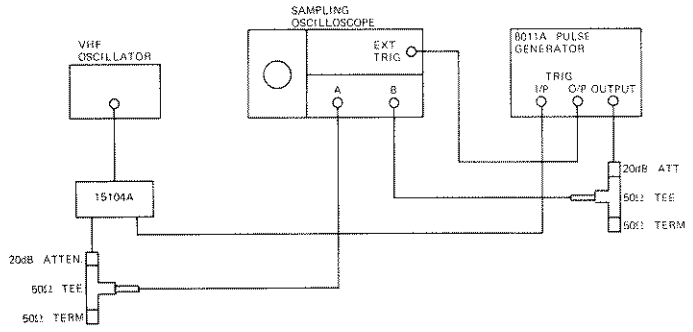
INITIAL CONTROL SETTINGS

PULSE PERIOD 2	EXT
VERNIER 3	CW
PULSE WIDTH 4	2.5 – 0.1
VERNIER 5	CCW
AMPLITUDE 6	1 – 4
VERNIER 7	CW
POLARITY 11	POS
INT LOAD 8	ON



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

Table 5–11. Performance Check — High Frequency Triggering



INITIAL CONTROL SETTINGS

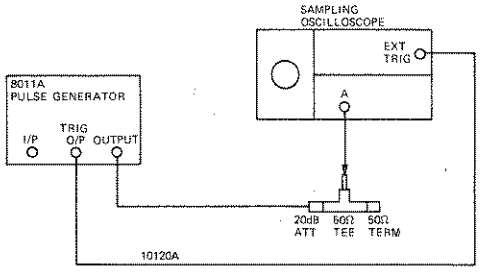
PULSE PERIOD	2	EXT
VERNIER	3	—
PULSE WIDTH	4	25n – 1μ
VERNIER	5	CCW
AMPLITUDE	6	4 – 16
VERNIER	7	CW
POLARITY	11	POS
INT LOAD	8	ON

STEP	INSTRUCTIONS
1	Adjust the oscillator output amplitude to 2.0Vpp (3.6 cm on sampling scope). Set Frequency to 20 MHz.
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.
4	Set the 8011A to SYMM and repeat steps 2 and 3.

Table 5–12. Performance Check – Minimum Width

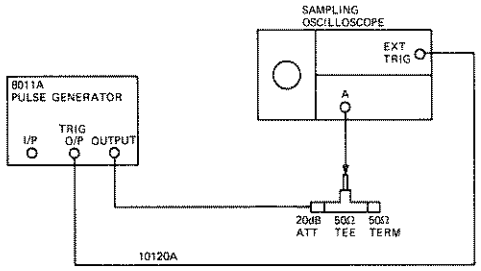
INITIAL CONTROL SETTINGS

PULSE PERIOD 2	50n – 2μ
VERNIER 3	MIDDLE
PULSE WIDTH 4	25n – 1μ
VERNIER 5	CCW
AMPLITUDE 6	4 – 16
VERNIER 7	CW
POLARITY 11	POS
INT LOAD 8	–



STEP	INSTRUCTIONS	RESULTS
1	Set the oscilloscope to obtain the followoing: (1) a full-screen pulse amplitude display (2) expanded pulse centralized on screen.	
2	Measure pulse width	< 25ns
3	Set 8011A controls to NEG and repeat steps 2 and 3	< 25ns

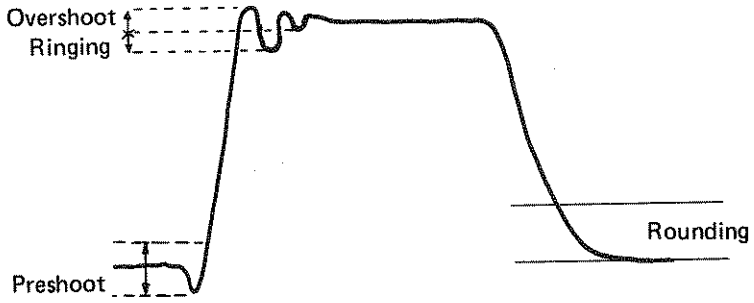
Table 5–13. Performance Check – Preshoot, Overshoot and Ringing



INITIAL CONTROL SETTINGS

PULSE PERIOD	50n – 2μ
VERNIER	CCW
PULSE WIDTH	SQR WAVE
VERNIER	–
AMPLITUDE	4 – 16
VERNIER	CW
POLARITY	POS
INT LOAD	OFF

STEP	INSTRUCTIONS	RESULTS
1	Set the oscilloscope to obtain the following: (1) full-screen amplitude display (2) center amplitude expanded pulse on screen	
2	With reference to the diagram below, measure preshoot, overshoot and ringing. All should be	⩽ 5% of pulse* amplitude

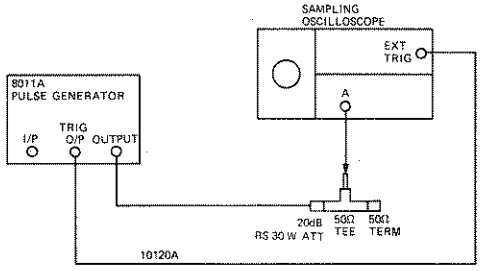


*Overshoot may increase to 10% with Amplitude vernier CCW.

Table 5–14. Performance Check — Transition Times

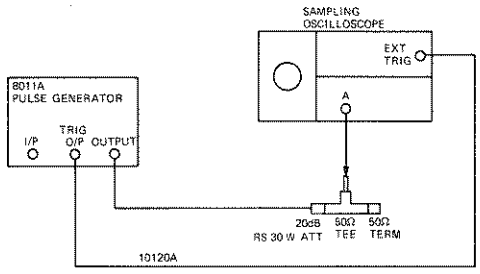
INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	50n – 2μ
VERNIER **3**	CCW
PULSE WIDTH **4**	SQR WAVE
VERNIER **5**	—
AMPLITUDE **6**	4–16
VERNIER **7**	ADJUST FOR 16V
POLARITY **11**	POS
INT LOAD **8**	OFF



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 pulse rise time	< 10ns
3	Centralize trailing edge on screen	
4	Measure pulse fall time	< 10ns

Table 5–15. Performance Check – Output Amplitude



INITIAL CONTROL SETTINGS

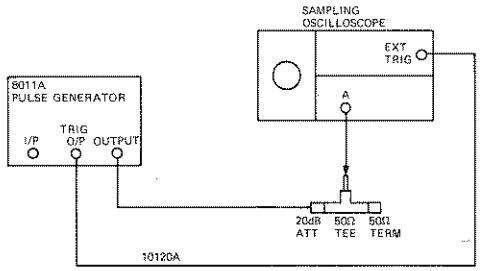
PULSE PERIOD **2**	50n – 2μ
VERNIER **3**	MIDDLE
PULSE WIDTH **4**	SQR WAVE
VERNIER **5**	–
AMPLITUDE **6**	4–16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	OFF

STEP	INSTRUCTIONS		RESULTS
1	Check the amplitude for each setting of the controls listed below		
	AMPLITUDE **6**	VERNIER **7**	
	4 – 16	CW	> 16V
		CCW	< 4V
	1 – 4	CW	> 4V
		CCW	< 1V
	0.25 – 1	CW	> 1V
		CCW	< 0.25V

Table 5–16. Performance Check – Trigger Output

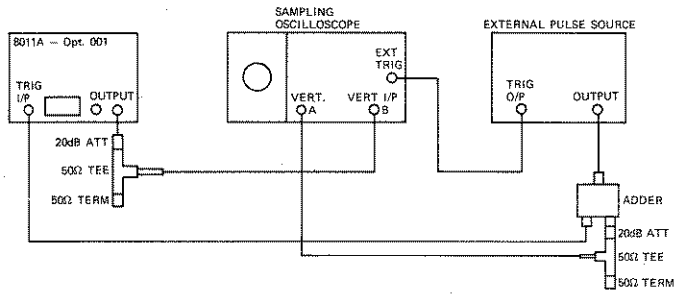
INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	50n – 2μ
VERNIER **3**	CCW
PULSE WIDTH **4**	25n – 1μ
VERNIER **5**	CCW
AMPLITUDE **6**	0.25 – 1
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	ON



STEP	INSTRUCTIONS	RESULTS
1	Check trigger output (1) Amplitude: (2) Width:	 > 1V >10ns
2	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)



INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	50n – 2μ
VERNIER **3**	CCW
PULSE WIDTH **4**	25n – 1μ
VERNIER **5**	CCW
AMPLITUDE **6**	4 – 16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	ON
NUMBER OF PULSES	5
BURST MODE	OFF

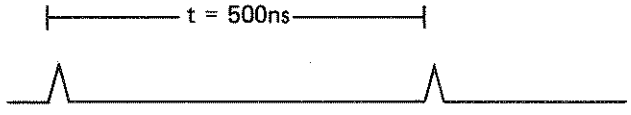
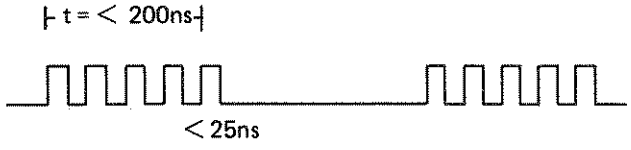
STEP	INSTRUCTIONS	RESULTS
1	Set rep. rate of external signal to 2 MHz:	
2	Select BURST MODE and observe pulses on the oscilloscope	

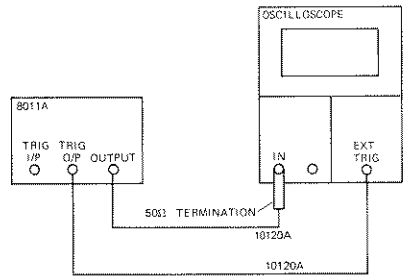
Table 5–18. Adjustment Procedure: Power Supplies

INITIAL CONTROL SETTINGS

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

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		<1mV rms
	–14V		<1mV rms
	+5V		<1mV rms

Table 5–19. Adjustment Procedure – Base Line



INITIAL CONTROL SETTINGS

PULSE PERIOD **2**	EXT
VERNIER **3**	–
PULSE WIDTH **4**	1μ – 50μ
VERNIER **5**	CCW
AMPLITUDE **6**	4 – 16
VERNIER **7**	CW
POLARITY **11**	POS
INT LOAD **8**	OFF

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

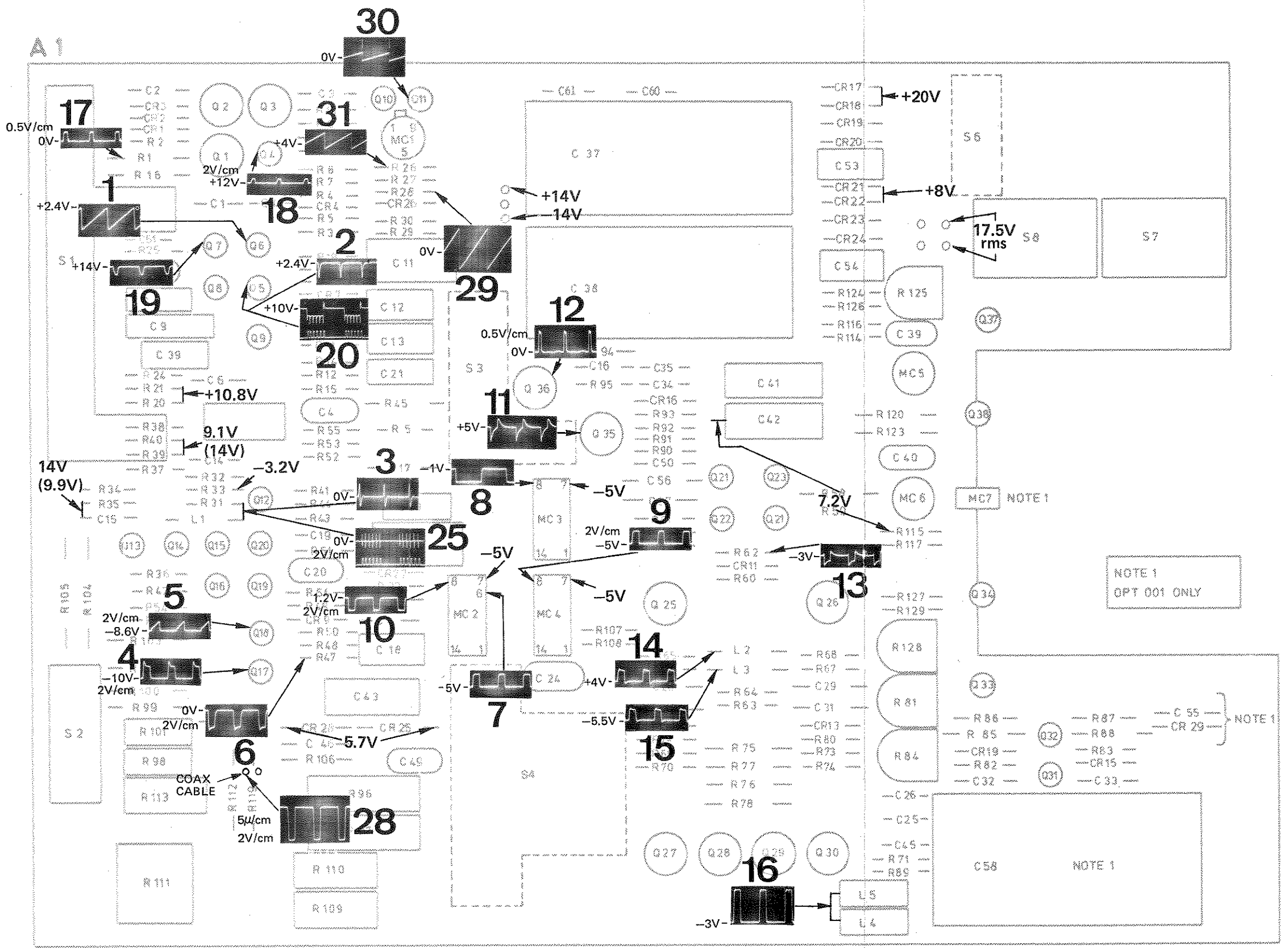
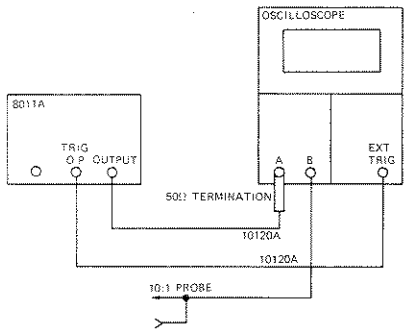


Figure 5—1. Assembly 1: Troubleshooting Aid

Table 5—20. Troubleshooting Procedures



INITIAL CONTROL SETTINGS

PULSE PERIOD	50n — 2μ
VERNIER	Mid-range
PULSE WIDTH	25n — 1μ
VERNIER	Mid-range
AMPLITUDE	1 — 4
VERNIER	CW
SYMM	ON
COMPL	OFF

STEP	INSTRUCTIONS	RESULTS
1	Set the oscilloscope as follows: EXT TRIGGER 1V/cm 0.1μs/cm	
2	Start the troubleshooting procedure by checking all functions.	
3	The illustrated waveforms and voltages can be readily located by refering to Figure 5—1 or the appropriate circuit diagram for assembly 1.	

8011A Burst Board 001

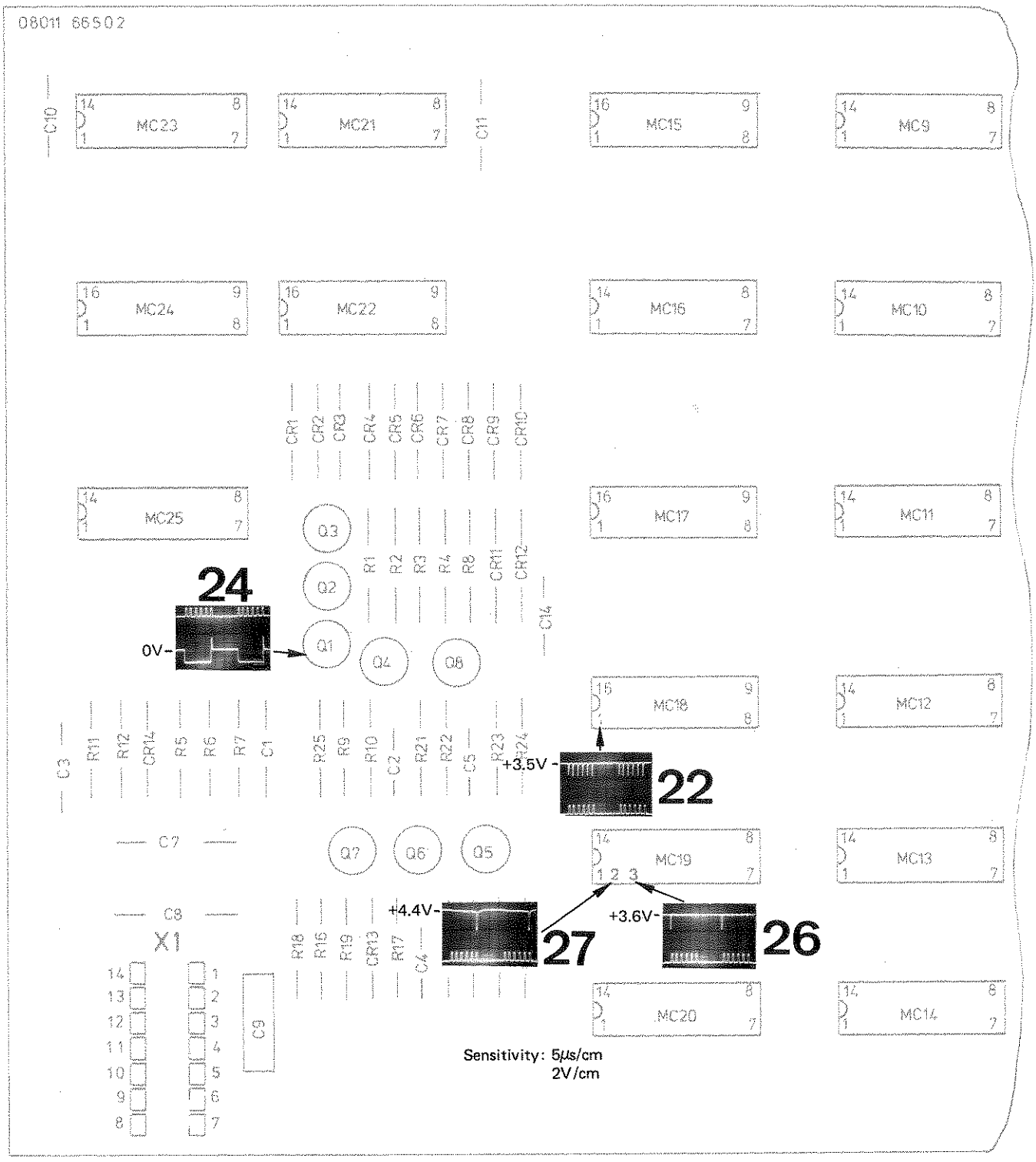


Figure 5–1. Assembly 2: Troubleshooting Aid

Table 5–20 cont'd.

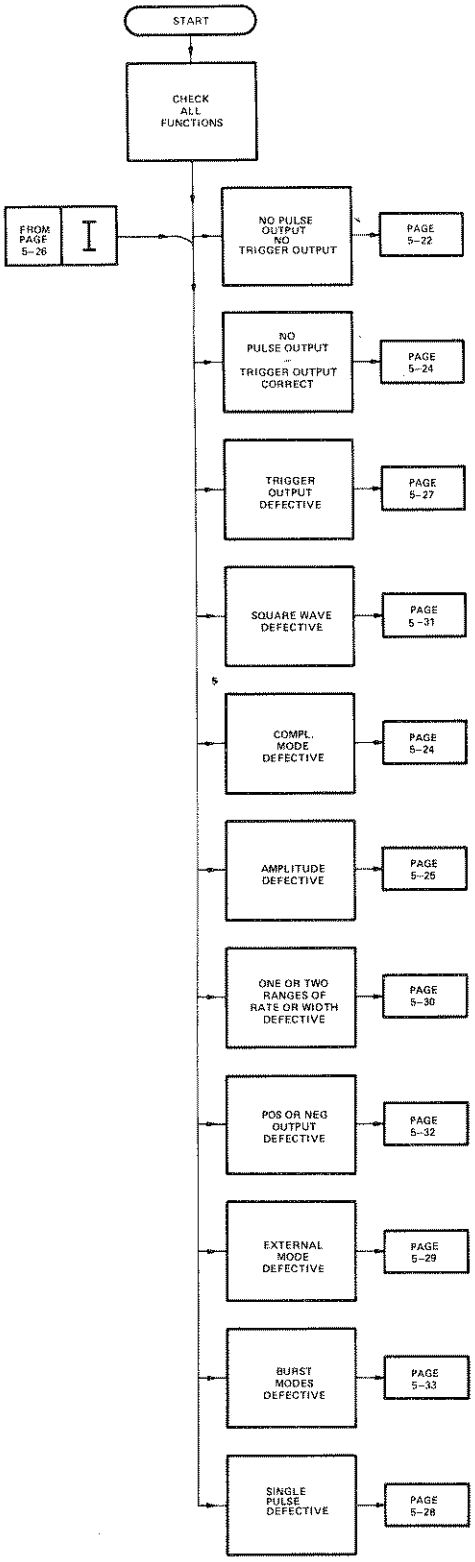
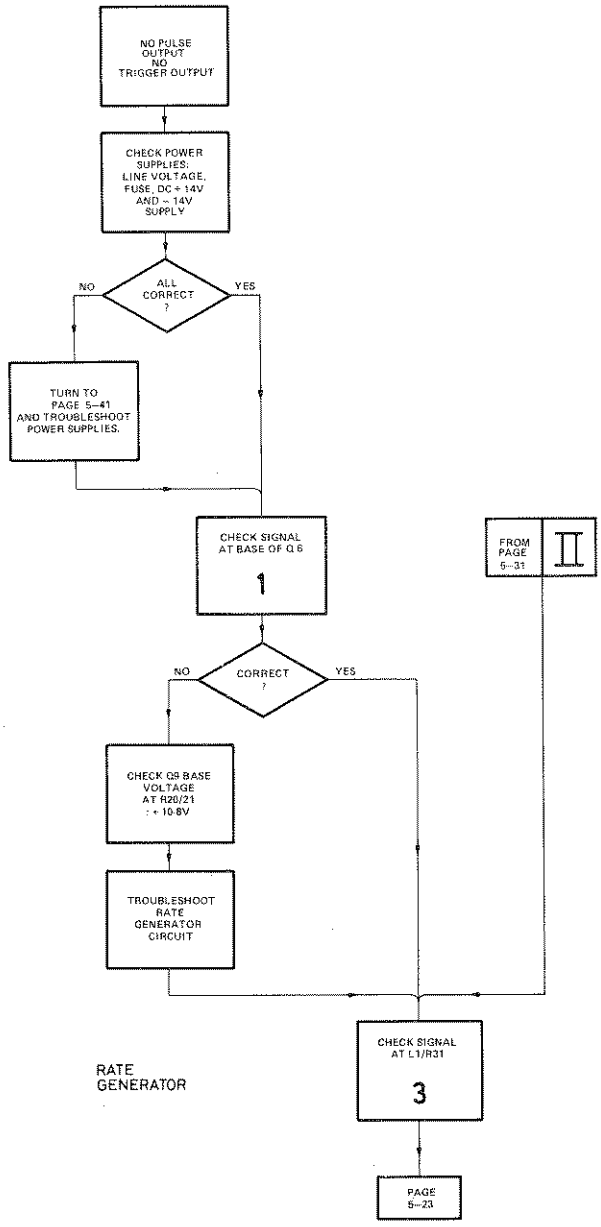


Table 5—20. cont'd



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

CHECK SIGNAL
AT BASE OF Q6
1

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

Table 5–20. cont'd.

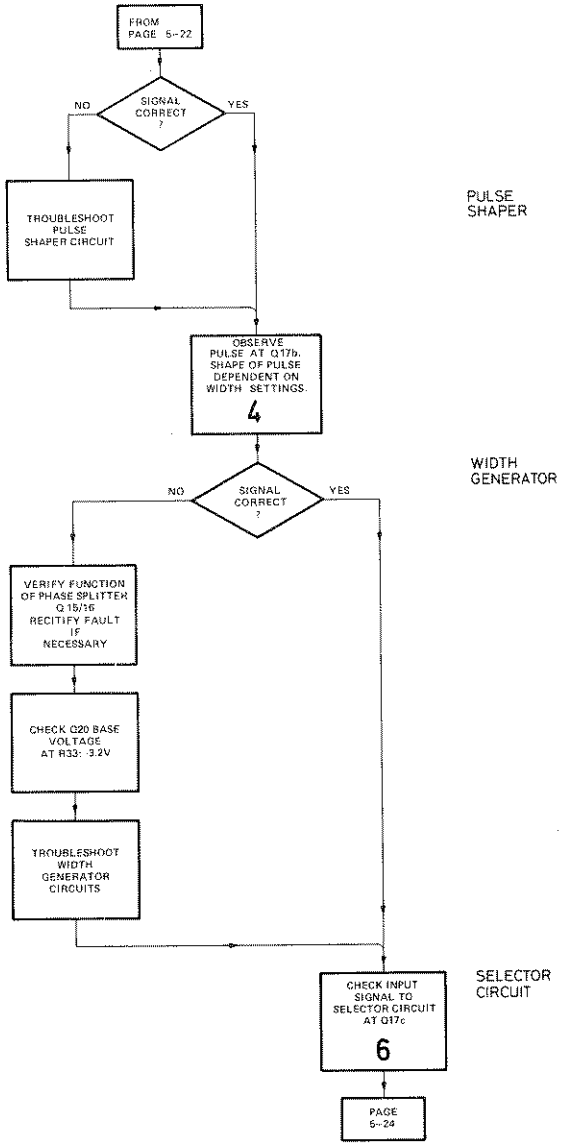


Table 5–20. cont'd

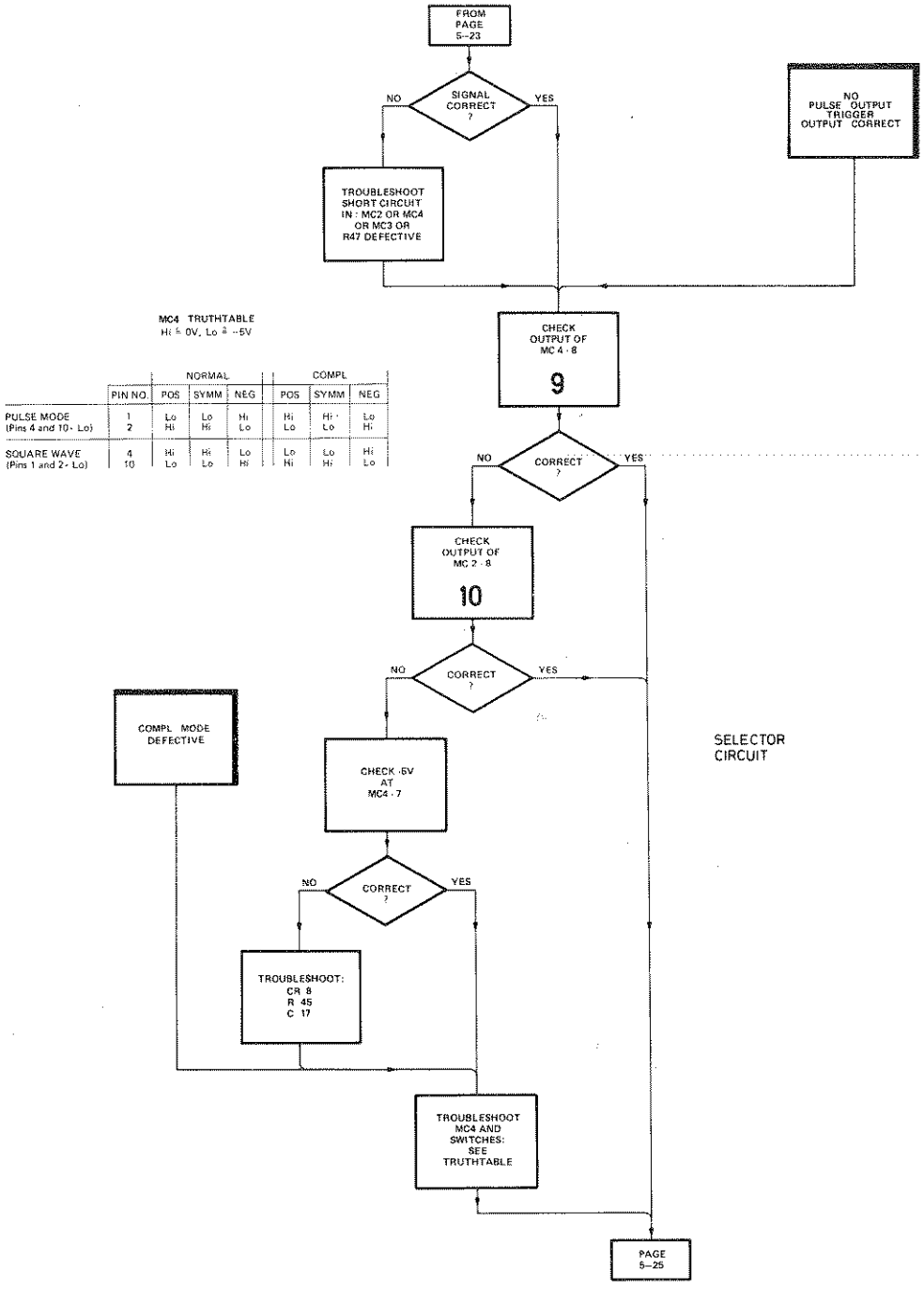
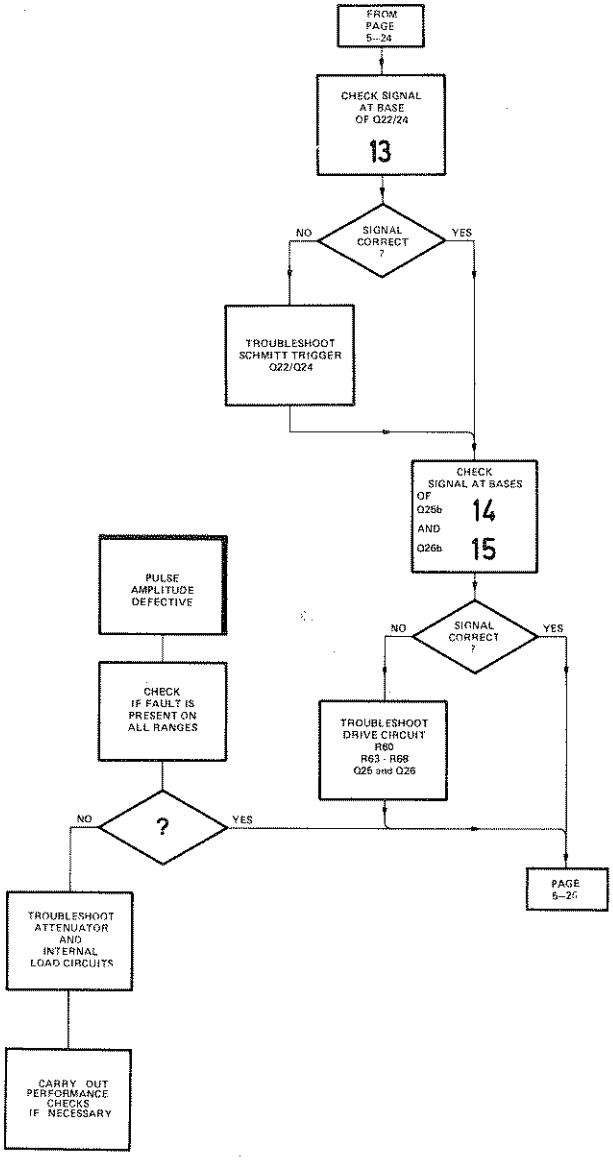


Table 5–20. cont'd



PULSE OUTPUT AMPLIFIER

Table 5–20. cont'd

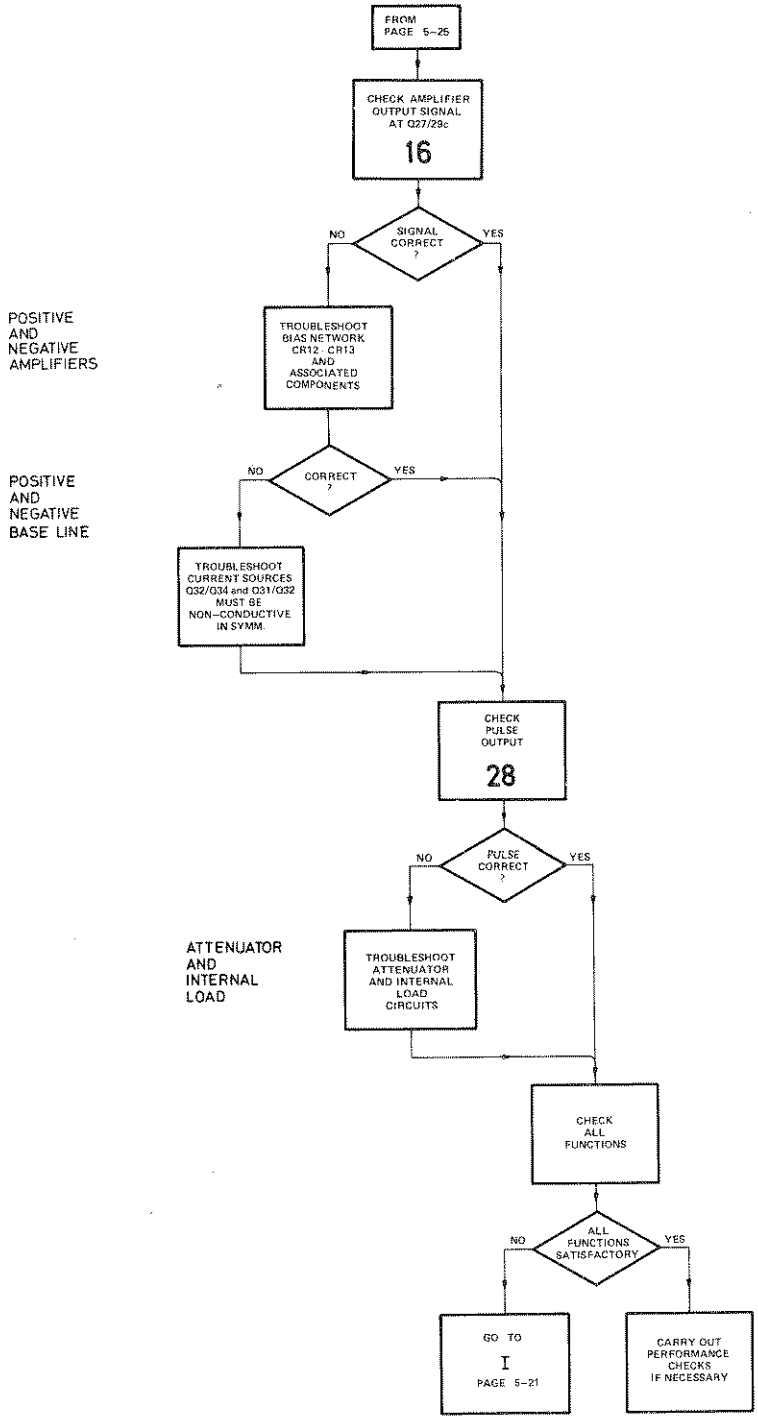
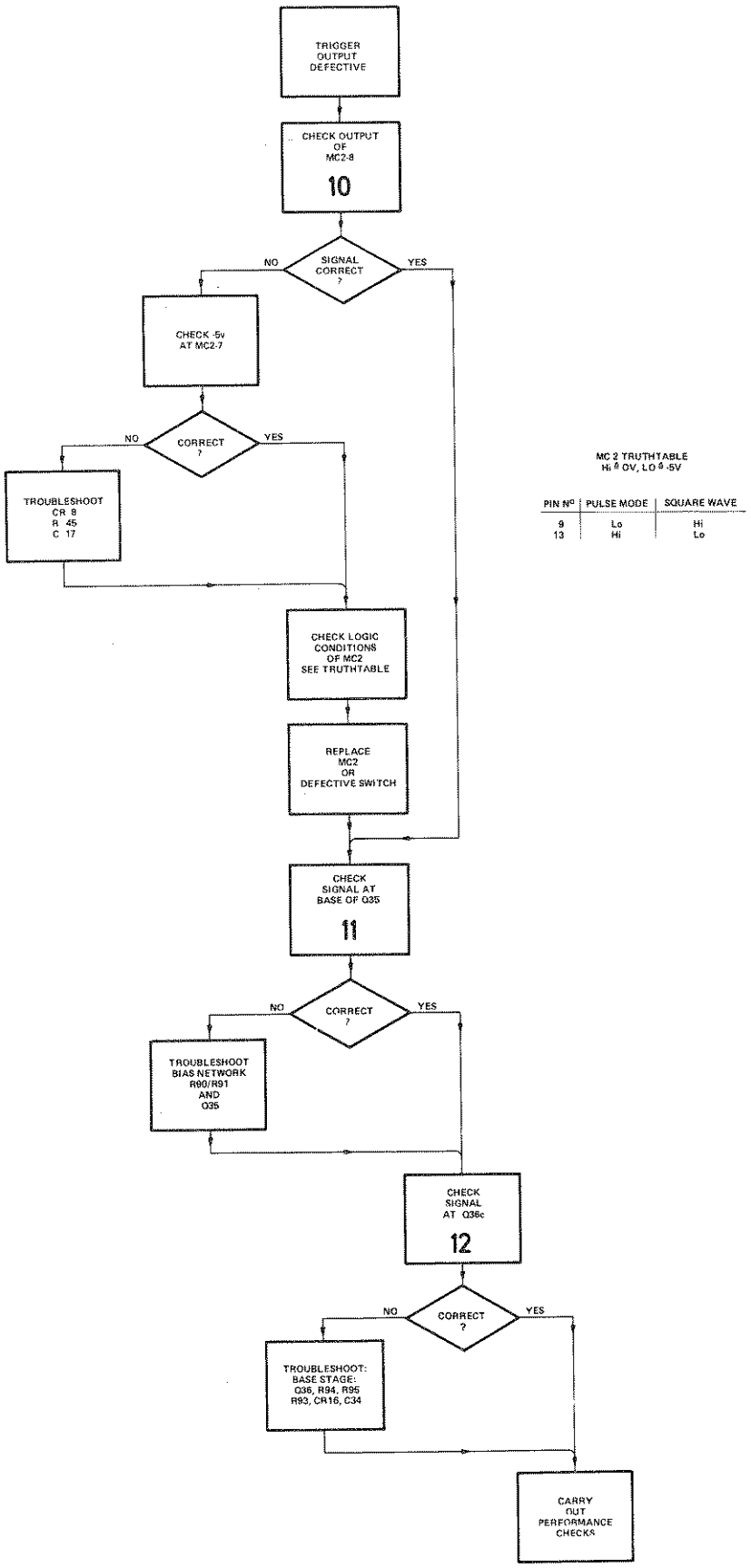


Table 5–20. cont'd



MC 2 TRUTHTABLE
Hi @ 0V, LO @ -5V

PIN NO	PULSE MODE	SQUARE WAVE
9	Lo	Hi
13	Hi	Lo

Table 5–20. cont'd.

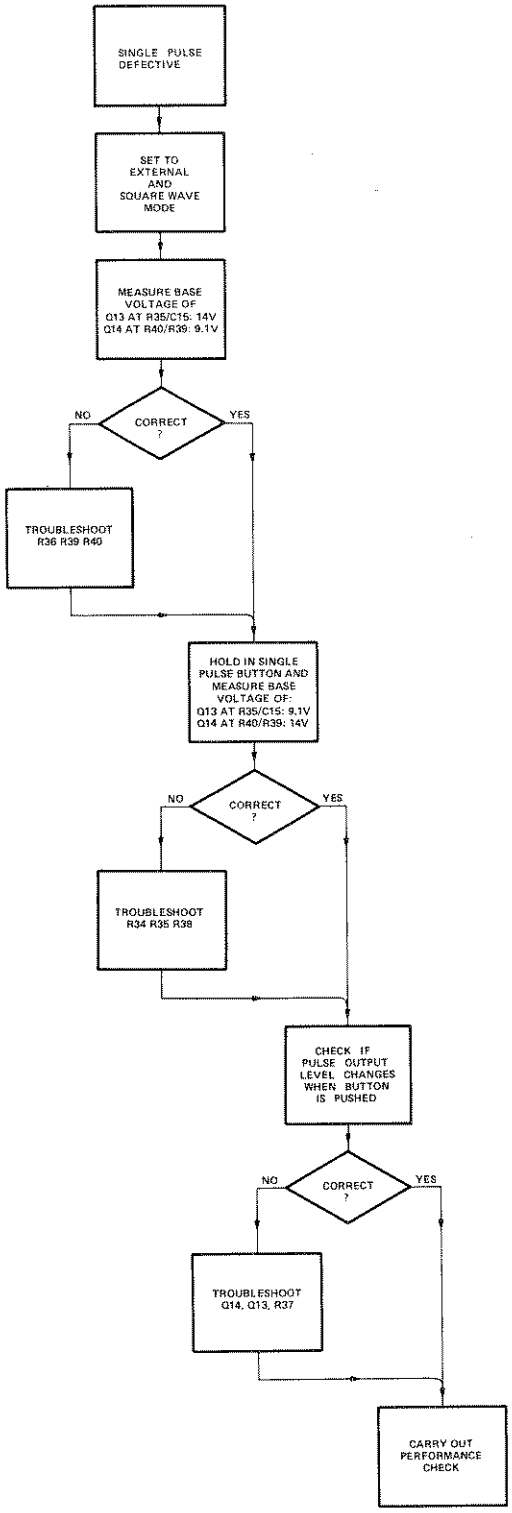


Table 5–20. cont'd

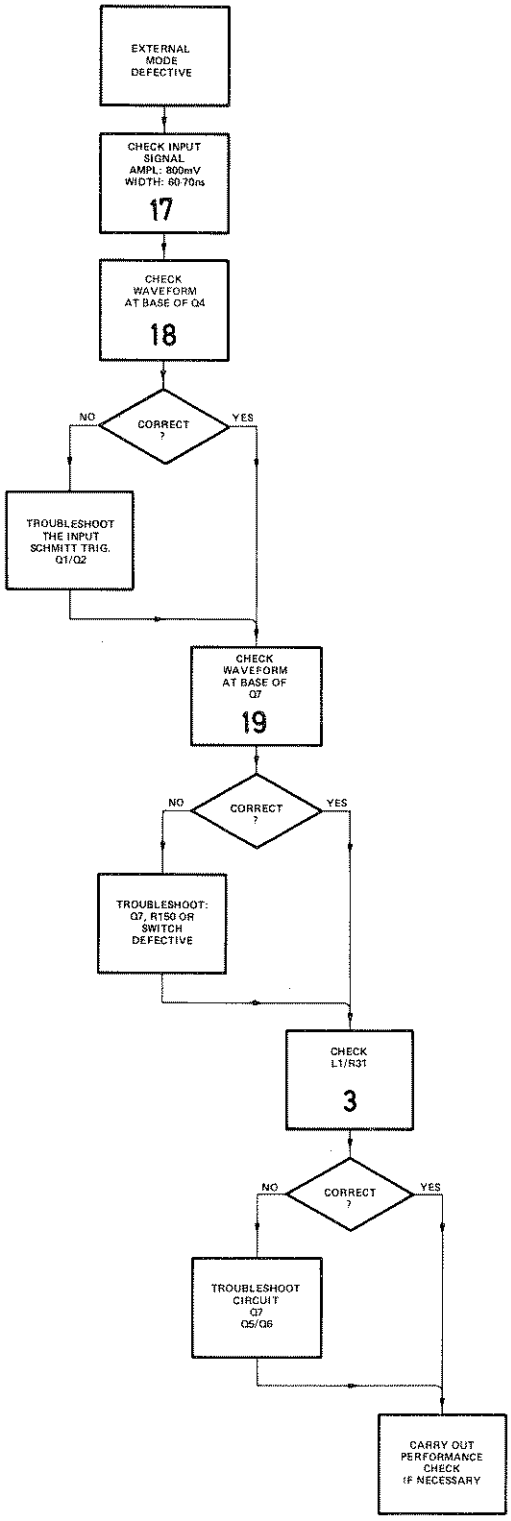


Table 5–20. cont'd

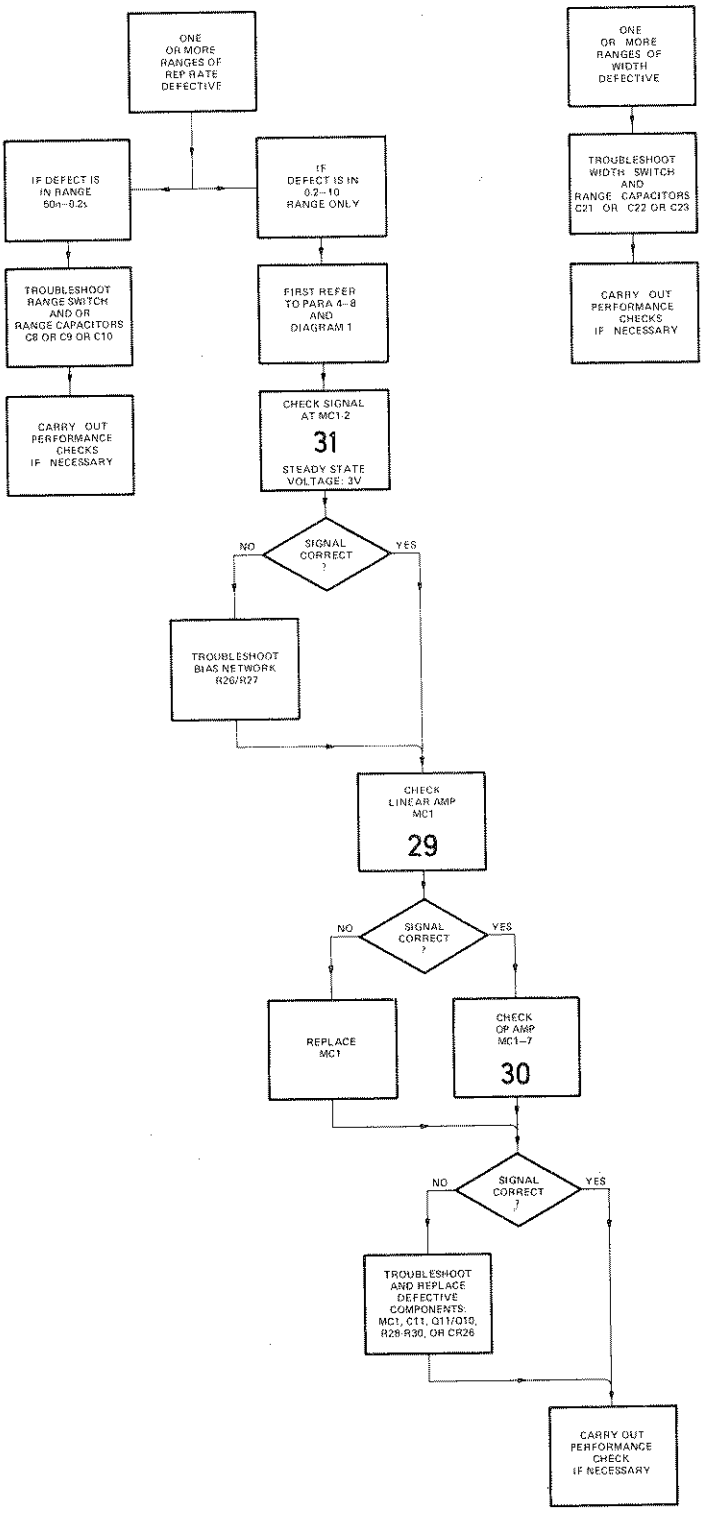


Table 5–20. cont'd

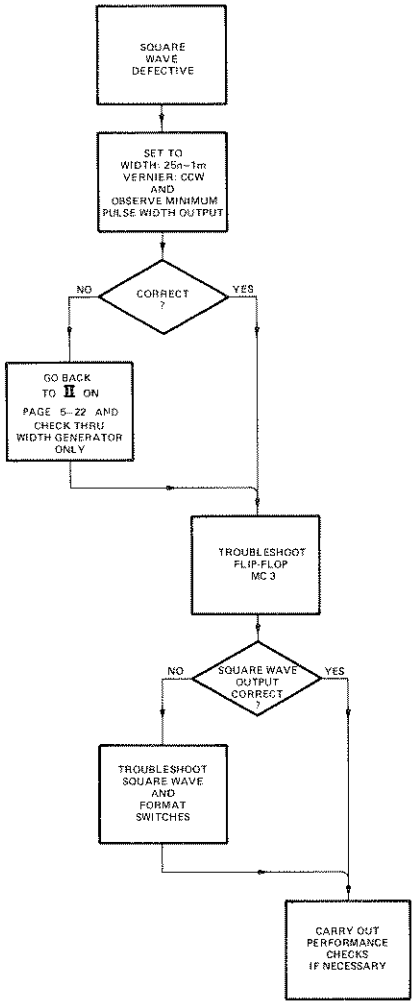


Table 5–20. cont'd

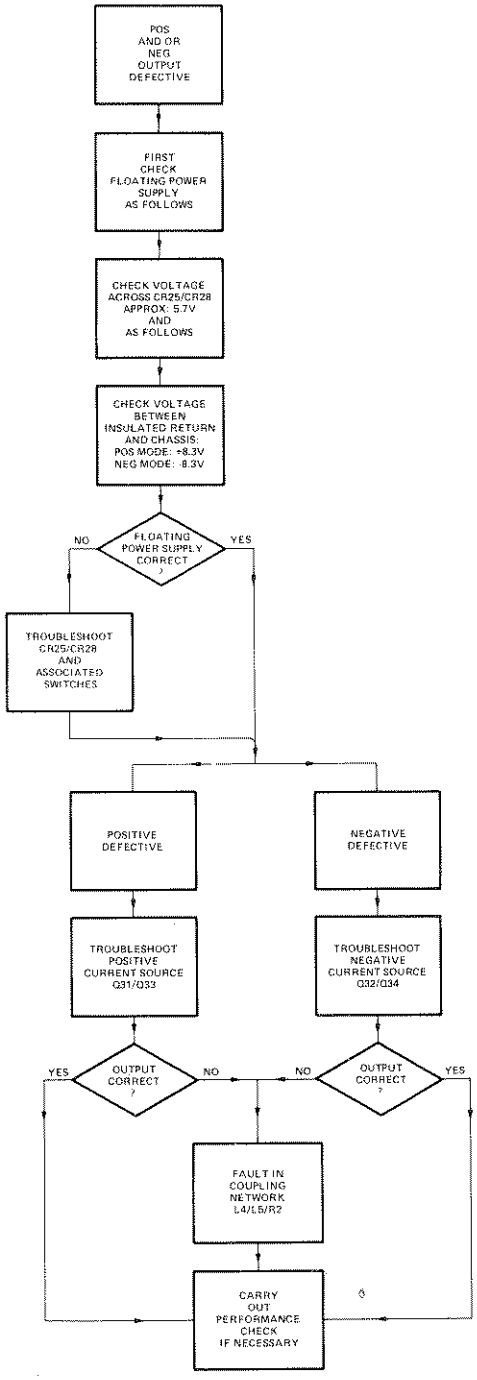


Table 5–20. cont'd.

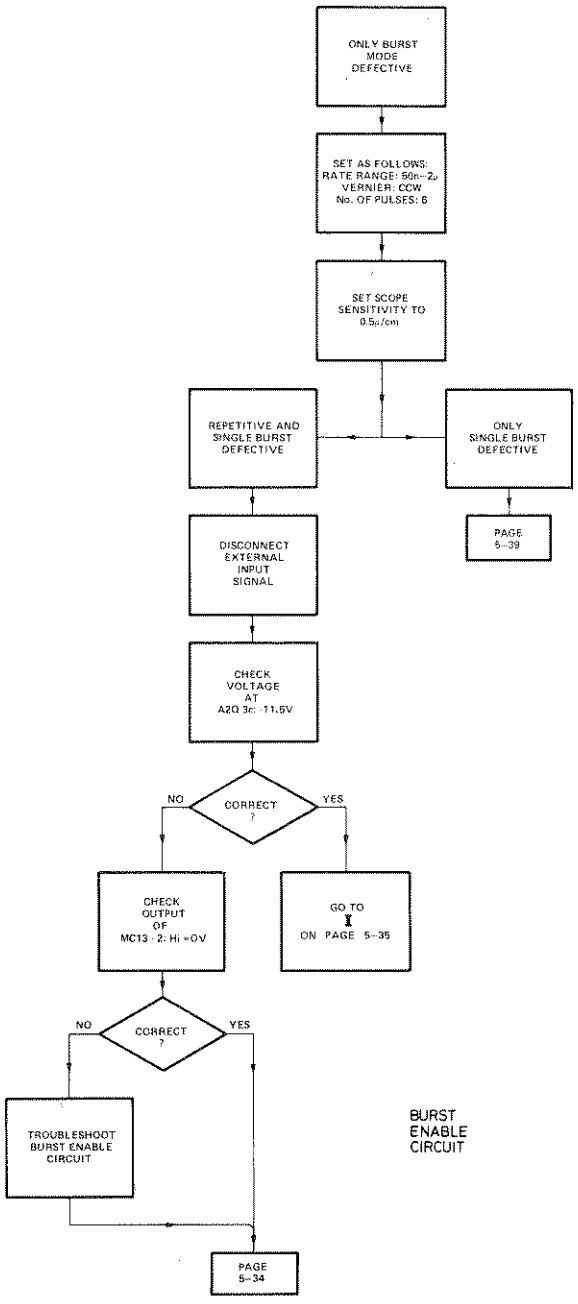


Table 5–20. cont'd

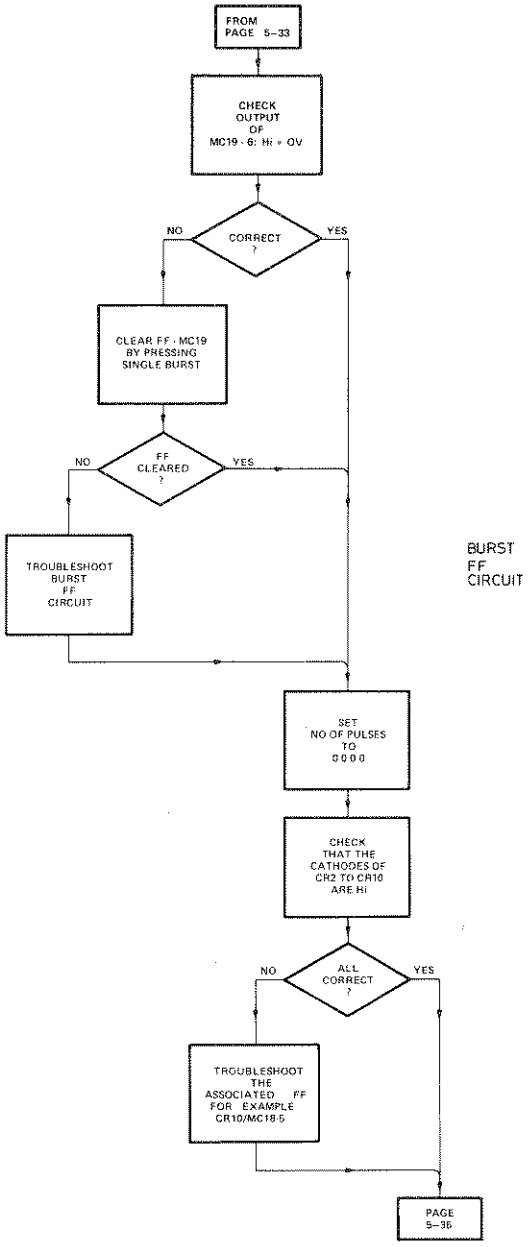


Table 5–20. cont'd

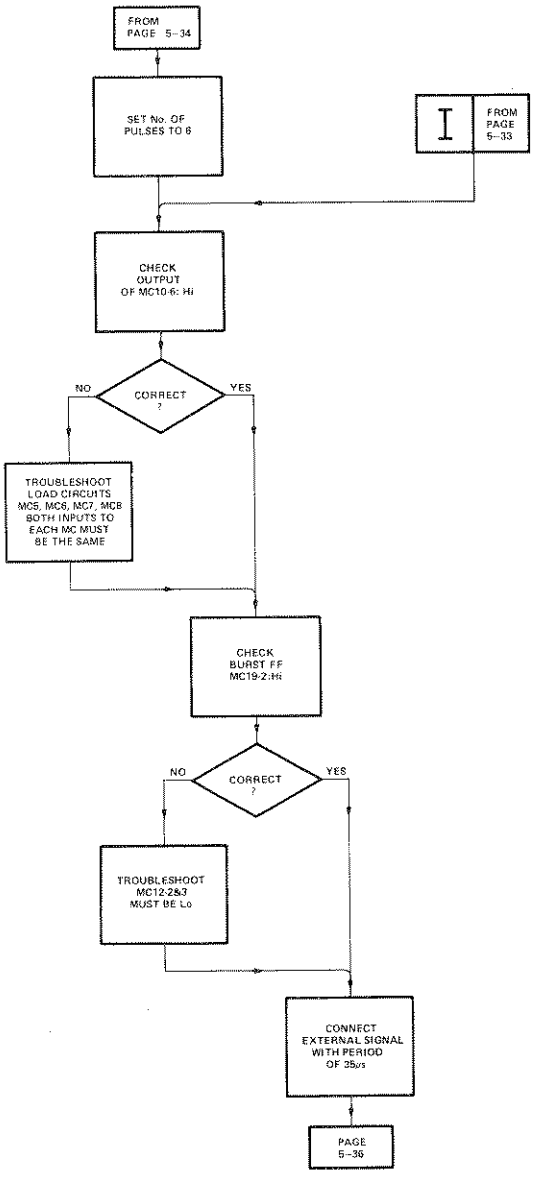


Table 5–20. cont'd

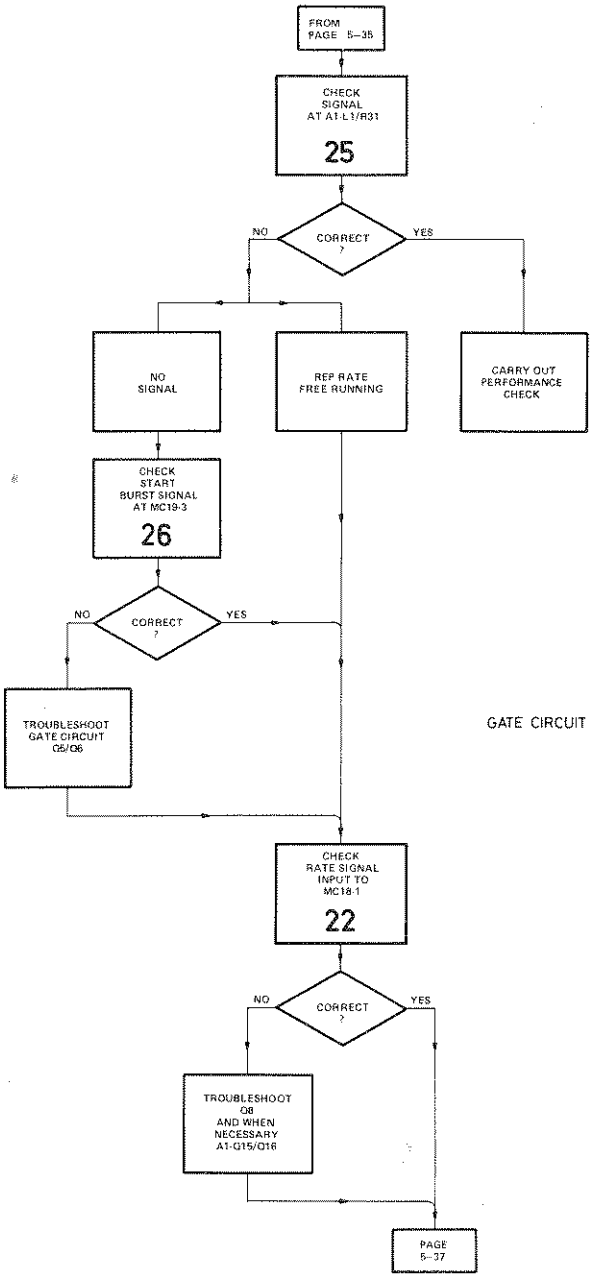


Table 5–20. cont'd

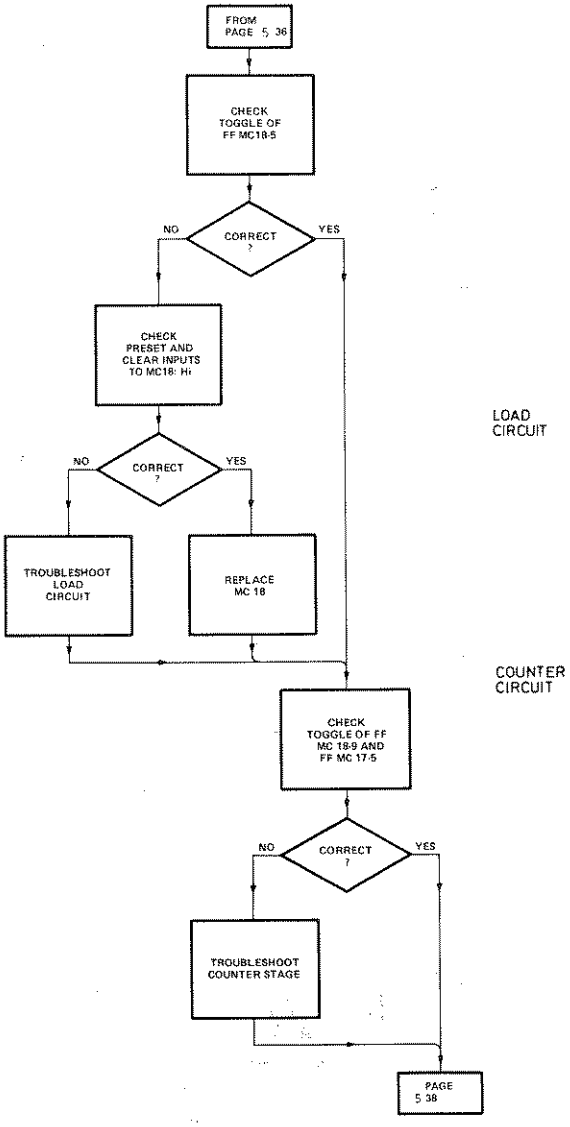


Table 5–20. cont'd

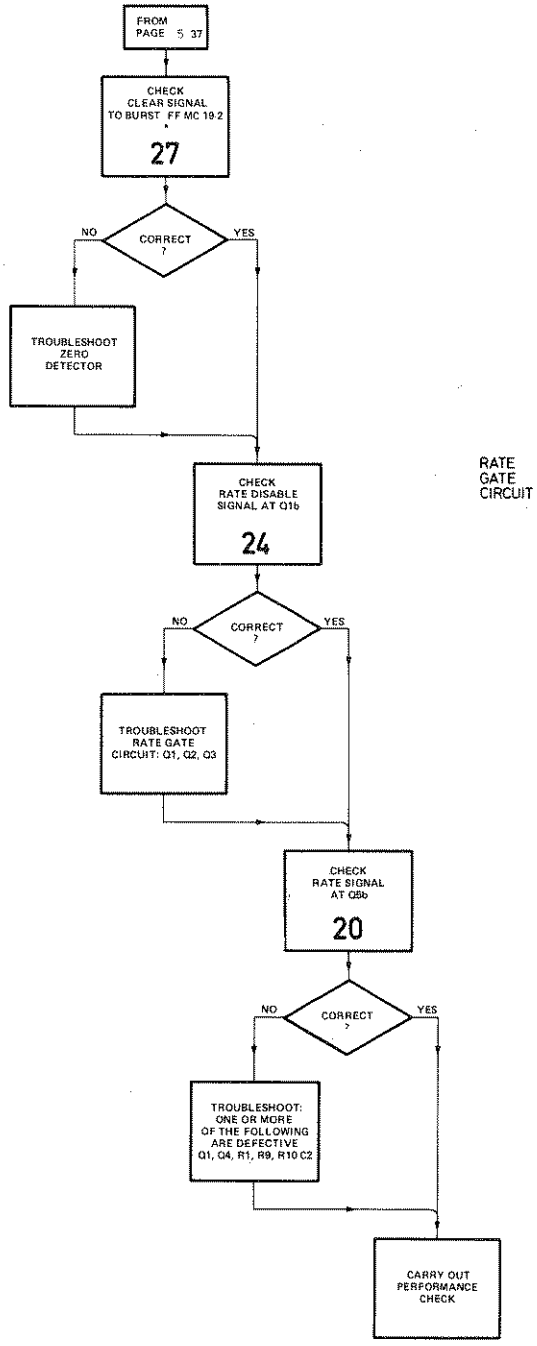


Table 5–20. cont'd

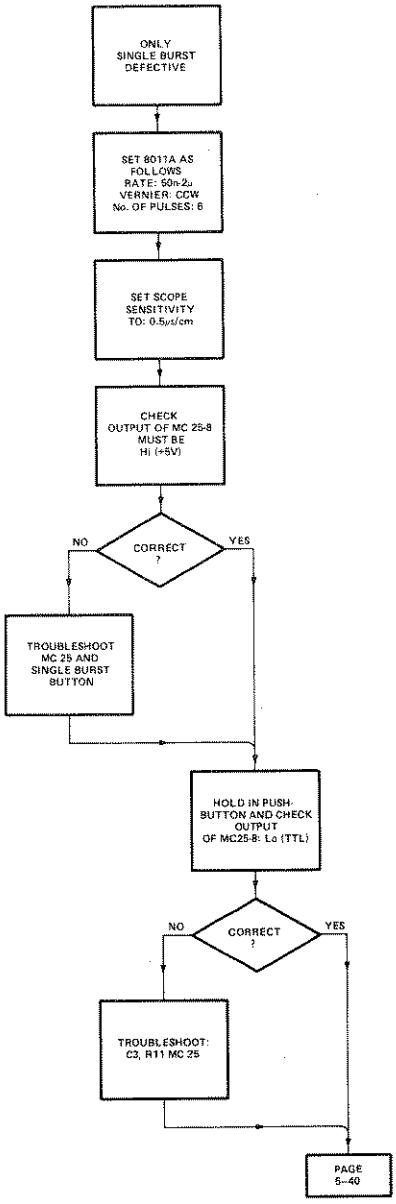


Table 5–20. cont'd

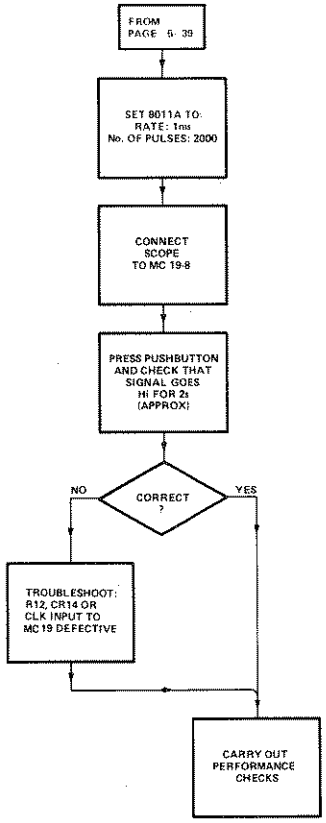
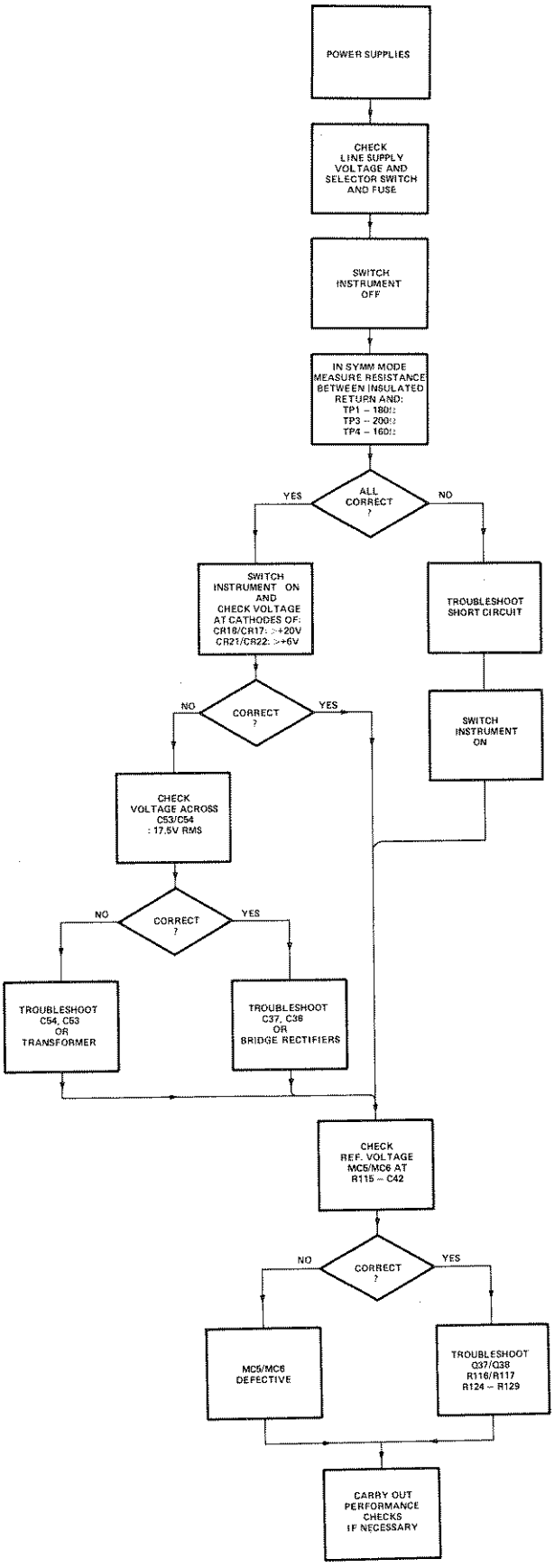


Table 5–20. cont'd.



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:

a) Model and complete serial number of instrument.

b) Hewlett-Packard stock number.

c) Circuit reference stock number.

d) Description.

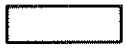
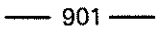
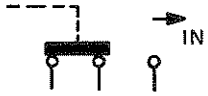
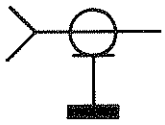
To order a part not listed, give a complete description of the part and include its function and location.

Table 6–1. Reference Designators

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

Table 6–2. Diagram Notes

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

P/O	Part of
*	denotes a factory selected value. Values shown are typical.
	Screwdriver adjustment
	Encloses front panel nomenclature
	Encloses rear panel nomenclature
	Zener diode
	Chassis ground (0 volts)
	Isolated ground
	Wire colour e.g. white, black, brown.
	Part of push-button switch
	Signal input/output connectors

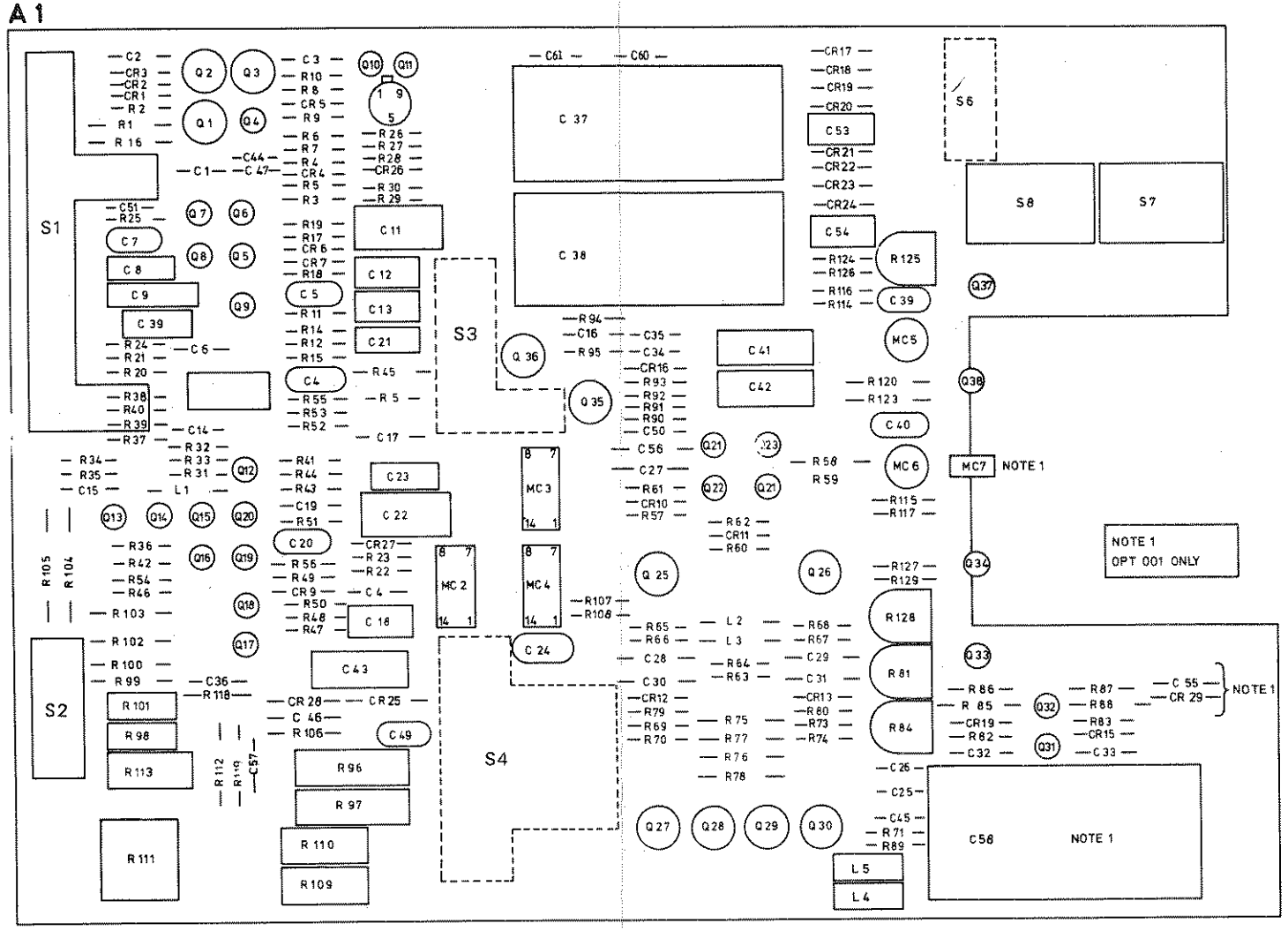
6–8 CIRCUIT DIAGRAM WAVEFORMS

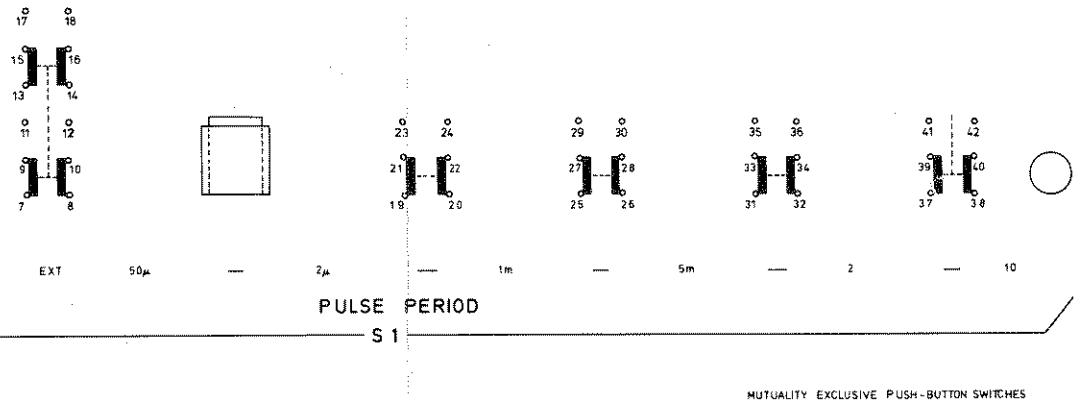
6–9 Waveforms shown on the circuit diagrams **1** to **3** were taken with the 8011A set as follows, changes in time base and sensitivity are noted on the waveform concerned:

PULSE PERIOD	50n – .2μ
VERNIER	Mid-range
PULSE WIDTH	25n – 1μ
VERNIER	Mid-range
AMPLITUDE	1V – 4V
VERNIER	CW
SYM	ON
COMPL	OFF
BURST	OFF

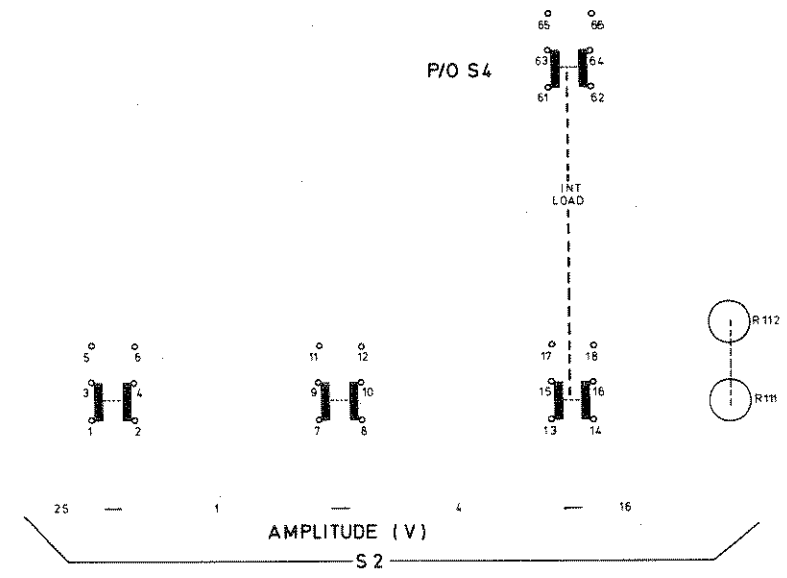
To obtain waveforms shown on diagram **5** select BURST MODE.

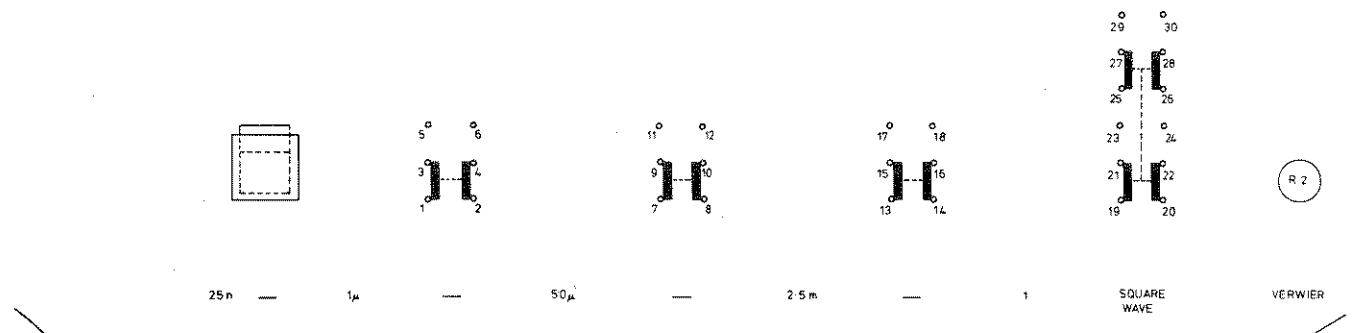
A 1

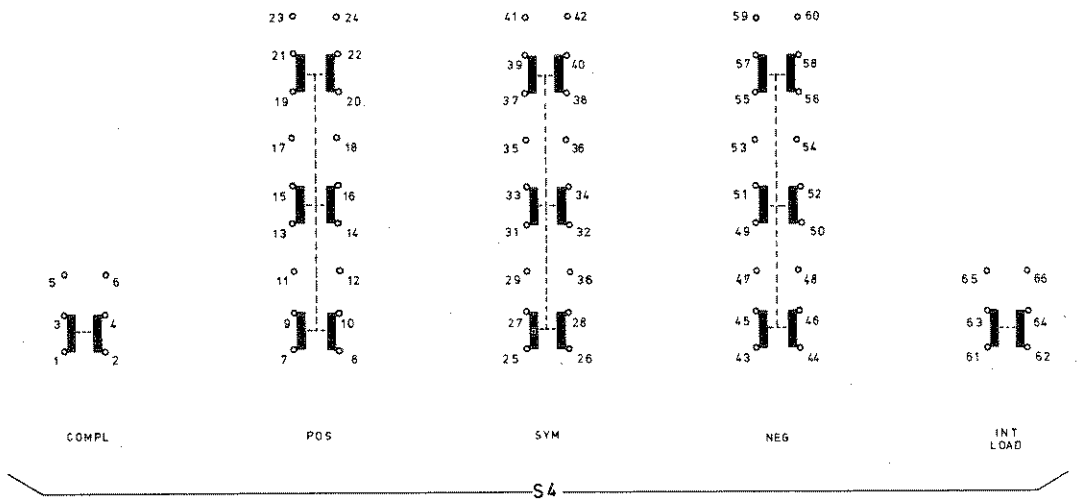




MUTUALITY EXCLUSIVE PUSH-BUTTON SWITCHES







8011A Frame

REFERENCE DESIGNATOR	HP PART NUMBER	DESCRIPTION
A1	08011-66501	BD AY-PULSE GEN
F1	2110-0016	FUSE .6 FBR
F2	2110-0044	FUSE .3 FBR
FL1	9100-3121	FILTER LINE 2A
J1	1250-0118	CONN BNC BLKHD
MP1	0370-1005	KNOB
MP2	0370-1097	KNOB-SAMPLE RATE
MP3	0370-2486	KNOB PB JADE GRA
MP4	08011-00201	PANEL FRONT-STD
MP5	08011-00202	PANEL-REAR
MP6	08011-04101	COVER-SAFETY
MP7	5040-1124	KNOB-PWR POWER
MP8	5040-0445	FOOT BOTTOM
MP10	1460-1300	STAND TILT
MP11	08011-20501	FRAME-FRONT
MP12	08011-20502	FRAME-REAR
MP13	08011-43701	POD-POWER SW
MP14	08012-04101	COVER AY
MP15	08111-43702	POD-AMPL SW
R1	2100-2593	R-VAR 10K ±25W
R2	2100-2593	R-VAR 10K ±25W
T1	5080-0578	XFMR-POWER

8011A Replaceable Parts A1

REFERENCE DESIGNATOR		H-P PART NUMBER	DESCRIPTION
A1	C1	0160-2208	C-F 330PF 300V
A1	C2	0160-2147	C-F .025UF 100V
A1	C3	0160-2147	C-F .025UF 100V
A1	C4	0140-0210	C-F 270PF 300V
A1	C5	0160-2150	C-F 33PF 300V
A1	C6	0160-2147	C-F .025UF 100V
A1	C7	0140-0196	C-F 150PF 300V
A1	C8	0160-3715	C-F .015 UF 250V
A1	C9	0160-3725	C-F .68UF 100V
A1	C10	0180-0229	C-F 33UF 10V
A1	C11	0160-3839	C-F 2.2UF 10%
A1	C12	0170-0085	C-F .1UF 50V
A1	C13	0170-0085	C-F .1UF 50V
A1	C14	0160-2147	C-F .025UF 100V
A1	C15	0160-2147	C-F .025UF 100V
A1	C16	0160-2147	C-F .025UF 100V
A1	C17	0160-0127	C-F 1UF 25V
A1	C18	0170-0085	C-F .1UF 50V
A1	C19	0160-2147	C-F .025UF 100V
A1	C20	0140-0193	C-F 82PF 300V
A1	C21	0160-3220	C-F 6800PF 400V
A1	C22	0160-3723	C-F .33UF 100V
A1	C23	0180-1746	C-F 15UF 20V
A1	C24	0140-0192	C-F 68PF 300V
A1	C25	0160-2147	C-F .025UF 100V
A1	C26	0160-2147	C-F .025UF 100V
A1	C27	0140-0193	C-F 82PF 300V
A1	C28	0160-0174	C-F .47UF 25V
A1	C29	0160-0174	C-F .47UF 25V
A1	C30	0160-0174	C-F .47UF 25V
A1	C31	0160-0174	C-F .47UF 25V
A1	C32	0160-2147	C-F .025UF 100V
A1	C33	0160-2147	C-F .025UF 100V
A1	C34	0160-2147	C-F .025UF 100V
A1	C35	0160-2147	C-F .025UF 100V
A1	C36	0160-0127	C-F 1UF 25V
A1	C37	0180-2240	C-F 2400UF 25V
A1	C38	0180-2240	C-F 2400UF 25V
A1	C39	0160-2938	C-F .01UF 100V
A1	C40	0160-2938	C-F .01UF 100V
A1	C41	0180-0098	C-F 100UF 20V
A1	C42	0180-0098	C-F 100UF 20V
A1	C43	0180-0159	C-F 220UF 10V
A1	C44	0160-2306	C-F 27PF 300V
A1	C45	0160-0174	C-F .47UF 25V
A1	C46	0160-2147	C-F .025UF 100V
A1	C47	0160-2147	C-F .025UF 100V
A1	C48	0160-2147	C-F .025UF 100V
A1	C49	0160-2259	C-F 12PF 500V
A1	C50	0160-2147	C-F .025UF 100V
A1	C51	0160-2147	C-F .025UF 100V
A1	C52	0160-2147	C-F .025UF 100V
A1	C53	0170-0085	C-F .1UF 50V
A1	C54	0170-0085	C-F .1UF 50V
A1	C55	0160-2214	C-F 680PF 300V
A1	C57	0160-0134	C-F 220PF 300V
A1	C60	0160-0174	C-F .47UF 25V
A1	C61	0160-0174	C-F .47UF 25V
A1	CR1	1901-0040	DIO SI .05A 30V
A1	CR2	1901-0040	DIO SI .05A 30V
A1	CR3	1901-0040	DIO SI .05A 30V
A1	CR4	1901-0040	DIO SI .05A 30V
A1	CR5	1901-0040	DIO SI .05A 30V
A1	CR6	1902-0041	DIO BKDN 5.11 V
A1	CR7	1901-0040	DIO SI .05A 30V
A1	CR8	1902-0041	DIO BKDN 5.11 V
A1	CR9	1902-0041	DIO BKDN 5.11 V
A1	CR10	1902-3104	DIO BKDN 5.62 V
A1	CR11	1902-3104	DIO BKDN 5.62 V
A1	CR12	1902-3071	DIODE BKDN
A1	CR13	1902-3071	DIODE BKDN
A1	CR14	1901-0040	DIO SI .05A 30V
A1	CR15	1901-0040	DIO SI .05A 30V
A1	CR16	1902-3003	DIO BKDN 2.37 V
A1	CR17	1901-0159	DIO SI 400V .75A
A1	CR18	1901-0159	DIO SI 400V .75A
A1	CR19	1901-0159	DIO SI 400V .75A
A1	CR20	1901-0159	DIO SI 400V .75A
A1	CR21	1901-0159	DIO SI 400V .75A
A1	CR22	1901-0159	DIO SI 400V .75A
A1	CR23	1901-0159	DIO SI 400V .75A
A1	CR24	1901-0159	DIO SI 400V .75A
A1	CR25	1902-1291	DIO ZENER 5.11V
A1	CR26	1901-0040	DIO SI .05A 30V
A1	CR27	1901-0040	DIO SI .05A 30V
A1	CR28	1901-0159	DIO SI 400V .75A
A1	L1	9100-1616	COIL COKE 1.5 UH
A1	L2	9140-0094	COIL-CHOKE .68UH
A1	L3	9140-0094	COIL-CHOKE .68UH
A1	L4	9100-1657	COIL-CHOKE1500UH
A1	L5	9100-1657	COIL-CHOKE1500UH
A1	L6	9170-0029	FERRITE BEAD
A1	MC1	1826-0092	IC OPER AMPL DUA
A1	MC2	1820-0377	IC 74H50N EQUIV
A1	MC3	1820-0065	IC 7470N EQUIV
A1	MC4	1820-0380	IC 74H53N EQUIV
A1	MC5	1820-0196	IC VOLT REG 40V
A1	MC6	1820-0196	IC VOLT REG 40V
A1	MP35	1205-0033	HT-SINK TO-5
A1	Q1	1854-0053	XSTR SI 2N2218
A1	Q2	1854-0053	XSTR SI 2N2218
A1	Q3	1854-0053	XSTR SI 2N2218
A1	Q4	1853-0089	XSTR 2N4917 SI
A1	Q5	1854-0215	XSTR SI NPN
A1	Q6	1854-0215	XSTR SI NPN
A1	Q7	1853-0089	XSTR 2N4917 SI
A1	Q8	1853-0089	XSTR 2N4917 SI
A1	Q9	1853-0036	XSTR 2N3906 PNP
A1	Q10	1854-0215	XSTR SI NPN
A1	Q11	1853-0036	XSTR 2N3906 PNP
A1	Q12	1853-CC89	XSTR 2N4917 SI
A1	Q13	1853-0036	XSTR 2N3906 PNP
A1	Q14	1853-0036	XSTR 2N3906 PNP
A1	Q15	1853-CC89	XSTR 2N4917 SI
A1	Q16	1853-CC89	XSTR 2N4917 SI
A1	Q17	1854-0354	XSTR SI NPN
A1	Q18	1854-0354	XSTR SI NPN
A1	Q19	1853-CC89	XSTR 2N4917 SI
A1	Q20	1853-0036	XSTR 2N3906 PNP
A1	Q21	1854-0005	XSTR 2N708 SI
A1	Q22	1854-0005	XSTR 2N708 SI
A1	Q23	1853-0034	XSTR SI PNP
A1	Q24	1853-0034	XSTR SI PNP
A1	Q25	1205-0061	HT-SINK XSTR
A1	Q26	1853-0201	XSTR SI PNP
A1	Q26	1205-0061	HT-SINK XSTR
A1	Q28	1854-0332	XSTR SI NPN
A1	Q27	1853-CC12	XSTR 2N2904A PNP
A1	Q28	1853-CC12	XSTR 2N2904A PNP
A1	Q29	1854-0053	XSTR SI 2N2218
A1	Q30	1854-0053	XSTR SI 2N2218
A1	Q31	1853-0036	XSTR 2N3906 PNP
A1	Q32	1854-0215	XSTR SI NPN
A1	Q33	1854-0402	XSTR SI NPN
A1	Q34	1853-0254	XSTR SI PNP
A1	Q35	1854-0053	XSTR SI 2N2218
A1	Q36	1853-0012	XSTR 2N2904A PNP
A1	Q37	1853-0233	XSTR SI PNP
A1	Q38	1853-0233	XSTR SI PNP
A1	R1	0698-CC93	R-F 56 5% .25W F
A1	R2	0698-3242	R-F 357 1% .125W
A1	R3	0757-0284	R-F 150 1% .125W
A1	R4	0757-0427	R-F 1.5K1% .125W
A1	R5	0757-0398	R-F 75 1% .125W
A1	R6	0698-3242	R-F 357 1% .125W
A1	R7	0757-0400	R-F 90.9 1%
A1	R8	0757-0442	R-F 10K1% .125W
A1	R9	0757-0283	R-F 2K1% .125W F
A1	R10	0757-0403	R-F 121 1% .125W
A1	R11	0698-3151	R-F 2.87K1%
A1	R12	0757-0428	R-F 1.62K1%
A1	R13	0757-0405	R-F 162 1% .125W
A1	R14	0757-0394	R-F 51.1 1%
A1	R15	0698-CC68	R-F 910 5% .25W
A1	R17	0757-0411	R-F 332 1% .125W
A1	R18	0757-0416	R-F 511 1% .125W
A1	R19	0757-0437	R-F 4.75K1%
A1	R20	0757-0422	R-F 909 1% .125W
A1	R21	0757-0273	R-F 3.01K1%
A1	R22	0757-0273	R-F 3.01K1%
A1	R23	0757-0428	R-F 1.62K1%
A1	R24	0757-0397	R-F 68.1 1%
A1	R25	0757-0381	R-F 15 1% .125W
A1	R26	0757-0438	R-F 5.11K1%
A1	R27	0757-0437	R-F 4.75K1%
A1	R28	0757-0442	R-F 10K1% .125W
A1	R29	0757-0401	R-F 100 1% .125W
A1	R30	0698-3245	R-F 20.5K1%
A1	R31	0757-0408	R-F 243 1% .125W
A1	R32	0757-0283	R-F 2K1% .125W F
A1	R33	0757-0200	R-F 5.62K1%
A1	R34	0757-0431	R-F 2.43K1%
A1	R35	0757-0430	R-F 2.21K1%
A1	R36	0757-0401	R-F 100 1% .125W
A1	R37	0757-0407	R-F 200 1% .125W
A1	R38	0757-0410	R-F 301 1% .125W
A1	R39	0757-0431	R-F 2.43K1%
A1	R40	0757-0435	R-F 3.92K1%
A1	R41	0757-0414	R-F 432 1% .125W
A1	R42	0757-0420	R-F 750 1% .125W
A1	R43	0757-0200	R-F 5.62K1%
A1	R44	0757-0410	R-F 301 1% .125W
A1	R45	0758-0014	R-F 180 5% .25W
A1	R46	0757-0401	R-F 100 1% .125W
A1	R47	0698-3441	R-F 215 1% .125W
A1	R48	0757-0408	R-F 243 1% .125W
A1	R49	0757-0409	R-F 274 1% .125W
A1	R50	0757-0428	R-F 1.62K1%
A1	R51	0757-0386	R-F 24.3 1%
A1	R52	0757-0422	R-F 909 1% .125W
A1	R53	0757-0273	R-F 3.01K1%
A1	R54	0757-0392	R-F 43.2 1%
A1	R55	0757-0401	R-F 100 1% .125W
A1	R56	0757-0400	R-F 90.9 1%
A1	R57	0757-0401	R-F 100 1% .125W
A1	R58	0758-0002	R-F 560 5% .25W
A1	R59	0758-0054	R-F 330 5% .25W
A1	R60	0757-0405	R-F 162 1% .125W
A1	R61	0757-0280	R-F 1K1% .125W F
A1	R62	0757-0409	R-F 274 1% .125W
A1	R63	0757-0397	R-F 68.1 1%
A1	R64	0757-0397	R-F 68.1 1%
A1	R65	0757-0284	R-F 150 1% .125W
A1	R66	0757-0416	R-F 511 1% .125W
A1	R67	0757-0416	R-F 511 1% .125W
A1	R68	0757-0284	R-F 150 1% .125W
A1	R69	0757-0346	R-F 10 1% .125W
A1	R70	0757-0346	R-F 10 1% .125W
A1	R71	0757-0431	R-F 2.43K1%
A1	R73	0757-0346	R-F 10 1% .125W
A1	R74	0757-0346	R-F 10 1% .125W
A1	R75	0698-6213	R-F 37.4 1% 1/4W
A1	R76	0698-6213	R-F 37.4 1% 1/4W
A1	R77	0698-6213	R-F 37.4 1% 1/4W
A1	R78	0698-6213	R-F 37.4 1% 1/4W
A1	R79	0757-0280	R-F 1K1% .125W F
A1	R80	0757-0280	R-F 1K1% .125W F
A1	R81	2100-2799	R-VAR 2.2K .5W
A1	R82	0757-0438	R-F 5.11K1%
A1	R83	0757-0438	R-F 5.11K1%
A1	R84	2100-2799	R-VAR 2.2K .5W
A1	R85	0698-5876	R-F 10 5% .25W F
A1	R86	0757-0407	R-F 200 1% .125W
A1	R87	0757-0407	R-F 200 1% .125W
A1	R88	0698-5876	R-F 10 5% .25W F
A1	R89	0757-0431	R-F 2.43K1%
A1	R90	0757-0428	R-F 1.62K1%
A1	R91	0698-3242	R-F 357 1% .125W
A1	R92	0757-0384	R-F 20 1% .125W
A1	R93	0757-0280	R-F 1K1% .125W F
A1	R94	0757-0386	R-F 24.3 1%
A1	R95	0757-0394	R-F 51.1 1%
A1	R96	0766-0025	R-F 101 2% 3W MO
A1	R97	0766-0025	R-F 101 2% 3W MO
A1	R98	0761-0035	R-F 150 5% 1W MO
A1	R99	0758-0080	R-F 75 5% .25W F
A1	R100	0758-0080	R-F 75 5% .25W F
A1	R101	0761-0035	R-F 150 5% 1W MO
A1	R102	0758-0082	R-F 130 5% .25W
A1	R103	0758-0082	R-F 130 5% .25W
A1	R104	0757-1060	R-F 156 1% .5W
A1	R105	0698-4825	R-F 64.9 1% .5W
A1	R106	0757-0394	R-F 51.1 1%
A1	R107	0757-0438	R-F 5.11K1%
A1	R108	0757-0438	R-F 5.11K1%
A1	R109	0698-3620	R-F 100 5% 2W MO
A1	R110	0698-3620	R-F 100 5% 2W MO
A1	R111	2100-3104	R-VAR 5C 10% 5W
A1	R112	0698-5880	R-F 15 5% .25W
A1	R113	0698-3616	R-F 62 5% 2W MO
A1	R114	0757-0421	R-F 825 1% .125W
A1	R115	0757-0421	R-F 825 1% .125W
A1	R116	0757-0411	R-F 332 1% .125W
A1	R117	0757-0411	R-F 332 1% .125W
A1	R118	0757-0421	R-F 825 1% .125W
A1	R119	0698-5880	R-F 15 5% .25W
A1	R120	0812-0021	R-F .47 5% 3W PW
A1	R121	0812-0021	R-F .47 5% 3W PW
A1	R124	0757-0428	R-F 1.62K1%
A1	R125	2100-2800	R-VAR 1K .5W
A1	R126	0757-0428	R-F 1.62K1%
A1	R127	0757-0428	R-F 1.62K1%
A1	R128	2100-2800	R-VAR 1K .5W
A1	R129	0757-0428	R-F 1.62K1%
A1	S4	3101-0597	SW PBTN
A1	S5	3101-0596	SW PBTN
A1	S6	3101-0595	SW PBTN
A1	S7	3101-0593	SW PBTN
A1	S8	3101-0598	SW PBTN
A1	S9	3101-0595	SW LINE,1 STAT
A1	S7	3101-0629	SW SLIDE 250V 2A
A1	S8	3101-0629	SW SLIDE 250V 2A

A1

TRIGGER INPUT J1

0V
0.1µs/cm
0.5V/cm
TRIGGER INPUT

+12V
Q4b
0.1µs/cm
2V/cm

+14V
0.1µs/cm
2V/cm
Q7b

0V
0.1µs/cm
1V/cm
L1/R31

0V
BURST OUTPUT
2V/cm
1V/cm
5µs/cm
2V/cm
A1 L1/R31

+2.4V
0.1µs/cm
1V/cm
Q5b

+2.4V
1
0.1µs/cm
1V/cm
Q6B

PHASE SPLITTER

TO Q17b WIDTH GEN. (2)

PULSE PERIOD S1

VERNIER

OPTION 001
START 7 BURST
BURST COMPLETE SIGNAL 1

OPT 001
9 RATE SIGNAL BURST BOARD

OPT 001 C7=180p

OPT 001 C5=47p

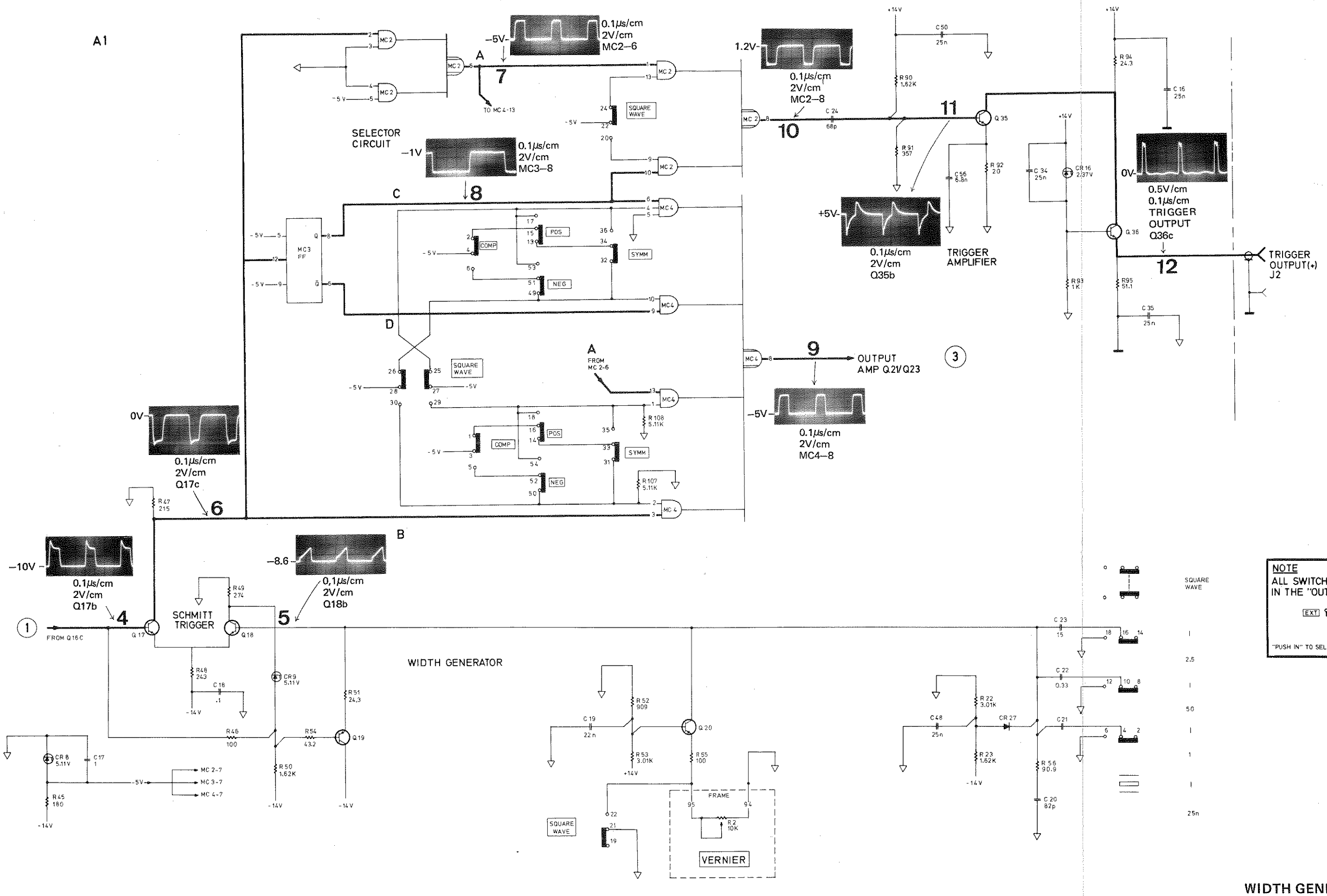
RATE GENERATOR

NOTE
ALL SWITCHES ARE SHOWN IN THE "OUT" POSITION
EXT
OUT IN
"PUSH IN" TO SELECT MODE OR RANGE

EXT 50 n
(BLANK)
1
2µ
1
1m
1
1m
1
5m
1
.2
1
10s

MC1

A1



2

WIDTH GENERATOR AND SELECTOR CIRCUIT

A1

+4V
0.1µs/cm
1V/cm
Q25b

13
−3V
0.1µs/cm
1V/cm
Q22b/Q24b

14

15
−5.5
0.1µs/cm
1V/cm
Q26b

−3V
0.1µs/cm
1V/cm
Q27c/Q29c

FROM MC8-4 PULSE-SQUARE SELECTOR CCT.

OUTPUT AMPLIFIER

POSITIVE BASELINE ADJUST

NEGATIVE BASELINE ADJUST

SYMM

POS

NEG

INTERNAL LOAD

INT LOAD

VERNIER

AMLITUDE

INC (V)

4-16V

1-4V

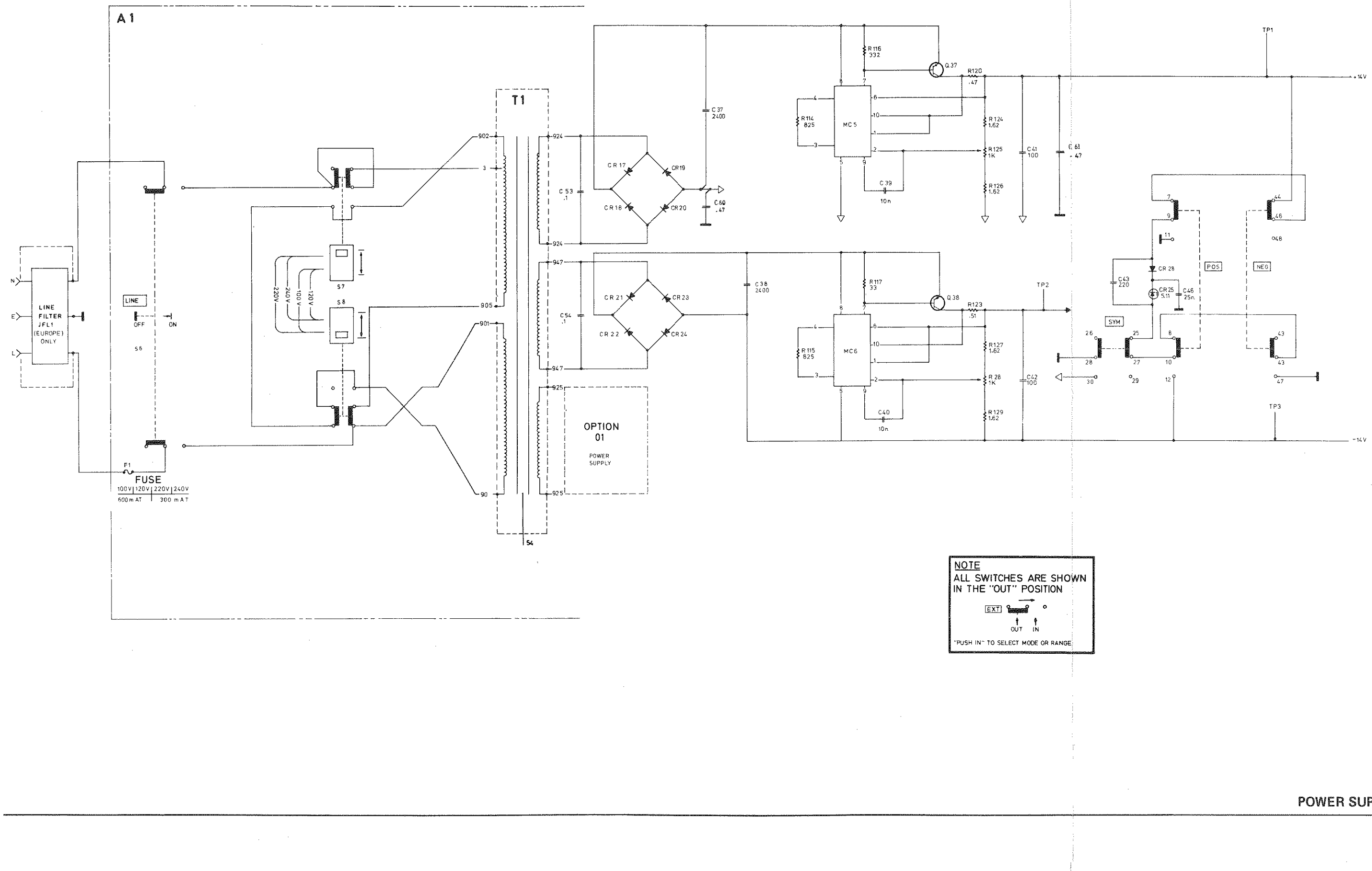
.25-1

OUTPUT J3

NOTE
ALL SWITCHES ARE SHOWN IN THE "OUT" POSITION

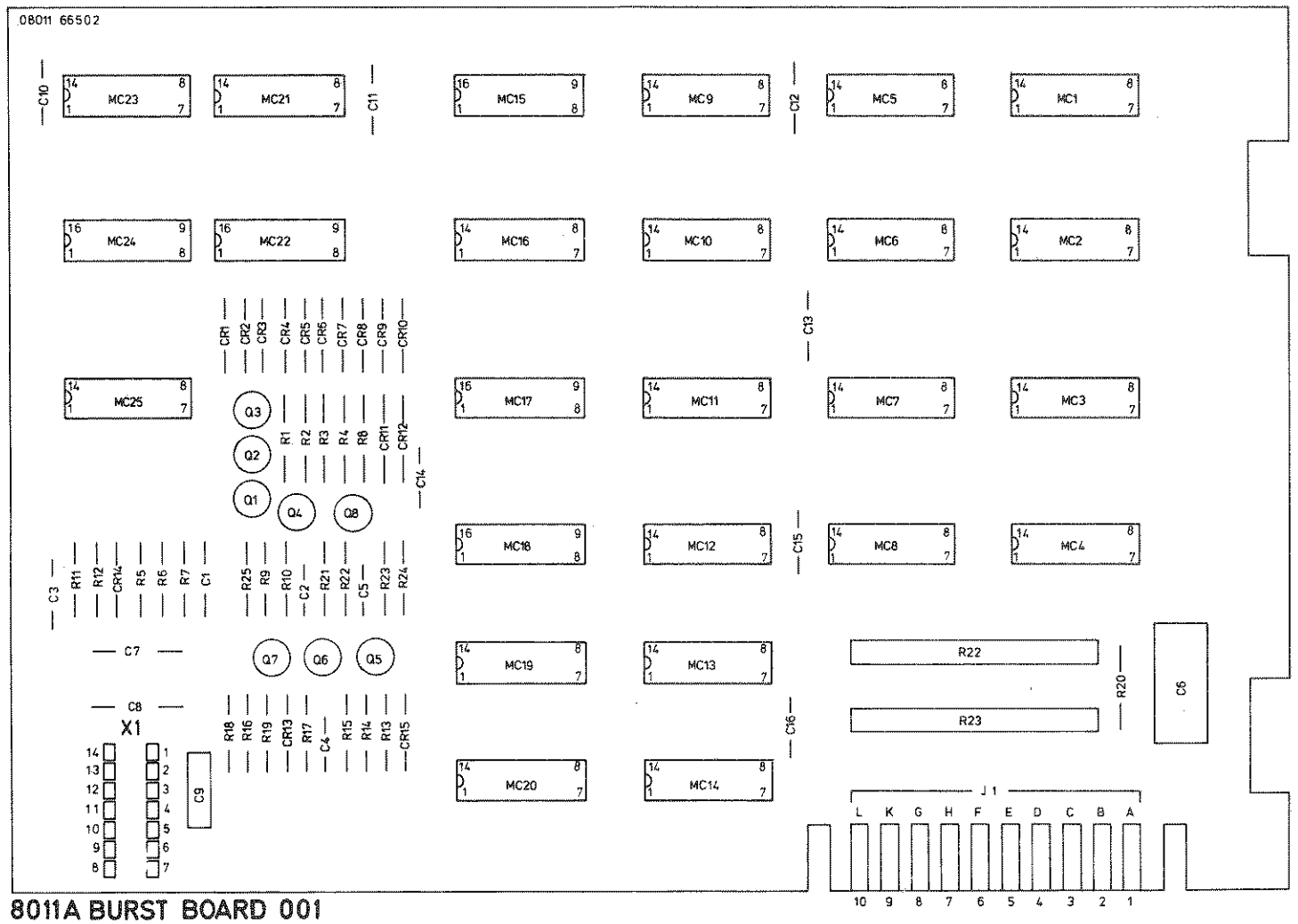
EXT
OUT IN

"PUSH IN" TO SELECT MODE OR RANGE



NOTE
ALL SWITCHES ARE SHOWN IN THE "OUT" POSITION

"PUSH IN" TO SELECT MODE OR RANGE



8011A BURST BOARD 001

8011A OPT.001

REFERENCE DESIGNATOR	H-P PART NUMBER	DESCRIPTION
A1	08011-66504	BD AY-PGEN-BURST
A2	08011-66502	BD AY-BURST
A3	08011-66503	BD AY-CONNECTOR
MP2	5040-7023	PUSH ROD
MP3	0370-2486	KNOB PB JADE GRA
MP4	08011-00204	PANEL-FRONT 001
S1	3100-0552	SW-THUMBWHEEL
	The replaceable parts for A1-08011-66504 are the same as A1-08011-66501 except for the following changes and additions:	
A1-C5	0160-2307	C-F 47pF 300V
A1-C7	0140-0197	C-F 180pF 300V
A1-C55	0170-0085	C-F .1uF 50V
A1-C58	0180-2296	C-F 4000uF 15V
A1-CR29	1901-0040	DIO SI .05A 30V
A1-MC7	1826-0122	REGULATOR 7805
A1-S9	3101-0594	SW PBTN

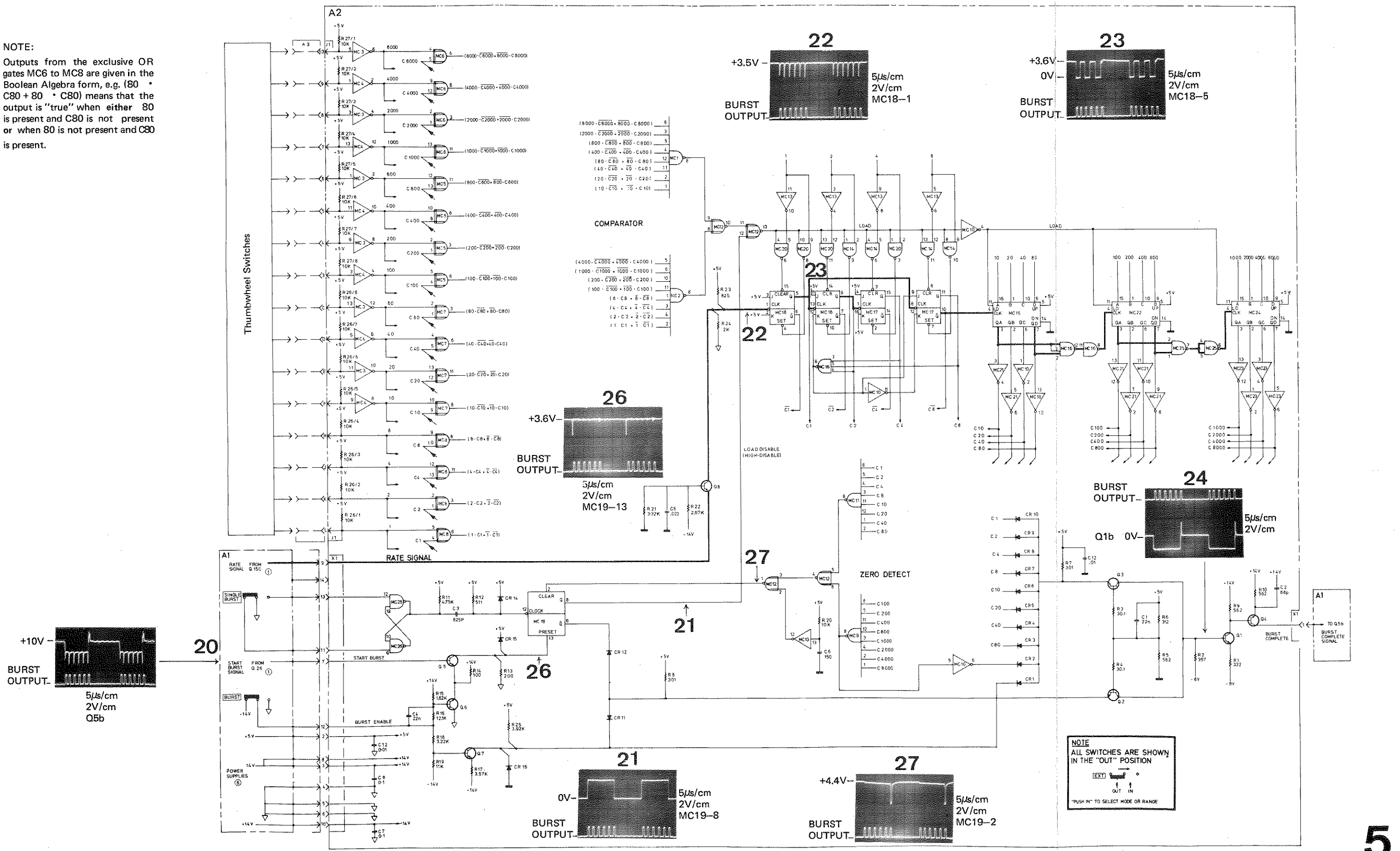
8011A Replaceable Parts A2

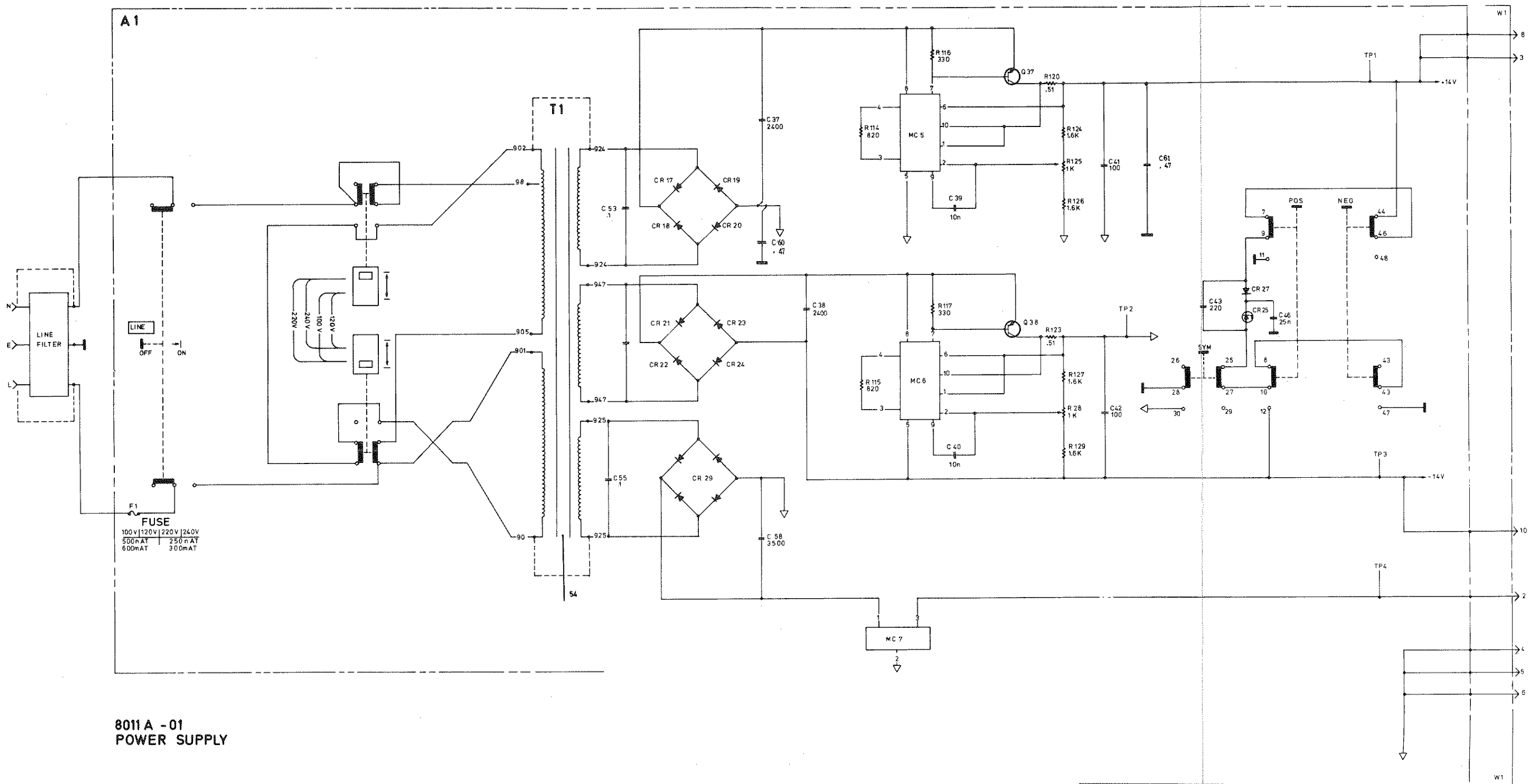
REFERENCE DESIGNATOR	H-P PART NUMBER	DESCRIPTION
A2 C1	0170-0083	C-F .022UF 50V
A2 C2	0140-0192	C-F 68PF 300V
A2 C3	0160-2216	C-F 820PF 300V
A2 C4	0170-0083	C-F .022UF 50V
A2 C5	0170-0083	C-F .022UF 50V
A2 C6	0180-1747	C-F 150UF 15V
A2 C7	0170-0085	C-F .1UF 50V
A2 C8	0170-0085	C-F .1UF 50V
A2 C9	0180-0229	C-F 33UF 10V
A2 C10	0160-2930	C-F .01UF 100V
A2 C11	0160-2930	C-F .01UF 100V
A2 C12	0160-2930	C-F .01UF 100V
A2 C13	0160-2930	C-F .01UF 100V
A2 C14	0160-2930	C-F .01UF 100V
A2 C15	0160-2930	C-F .01UF 100V
A2 C16	0160-2930	C-F .01UF 100V
A2 CR1	1901-0179	DIO SI 15V .75NS
A2 CR2	1901-0179	DIO SI 15V .75NS
A2 CR3	1901-0179	DIO SI 15V .75NS
A2 CR4	1901-0179	DIO SI 15V .75NS
A2 CR5	1901-0179	DIO SI 15V .75NS
A2 CR6	1901-0179	DIO SI 15V .75NS
A2 CR7	1901-0179	DIO SI 15V .75NS
A2 CR8	1901-0179	DIO SI 15V .75NS
A2 CR9	1901-0179	DIO SI 15V .75NS
A2 CR10	1901-0535	DIO SI 15V .02A
A2 CR11	1901-0179	DIO SI 15V .75NS
A2 CR12	1901-0179	DIO SI 15V .75NS
A2 CR13	1901-0040	DIO SI .05A 30V
A2 CR14	1901-0040	DIO SI .05A 30V
A2 CR15	1901-0040	DIO SI .05A 30V
A2 MC1	1820-0070	IC 7430N EQUIV
A2 MC2	1820-0070	IC 7430N EQUIV
A2 MC3	1820-0174	IC 7404A EQUIV
A2 MC4	1820-0174	IC 7404A EQUIV
A2 MC5	1820-0282	IC DIG GLAD OR
A2 MC6	1820-0282	IC DIG GLAD OR
A2 MC7	1820-0282	IC DIG GLAD OR
A2 MC8	1820-0070	IC 7430N EQUIV
A2 MC9	1820-0174	IC 7404A EQUIV
A2 MC10	1820-CC70	IC 7430N EQUIV
A2 MC11	1820-C328	IC 7402A EQUIV
A2 MC12	1820-0174	IC 7404A EQUIV
A2 MC13	1820-0054	IC 7400N EQUIV
A2 MC14	1820-C546	IC DIGITAL

REFERENCE DESIGNATOR	H-P PART NUMBER	DESCRIPTION
A2 MC15	1820-C371	IC 74H1CA EQUIV
A2 MC16	1820-CC76	IC 7476N EQUIV
A2 MC17	1820-C629	IC TCTL SYN 4BIT
A2 MC18	1820-0304	IC 7472A
A2 MC20	1820-0054	IC 7400A EQUIV
A2 MC21	1820-0174	IC 7404A EQUIV
A2 MC22	1820-0546	IC DIGITAL
A2 MC23	1820-0174	IC 7404A EQUIV
A2 MC24	1820-0546	IC DIGITAL
A2 MC25	1820-0054	IC 7400N EQUIV
A2 Q1	1854-0215	XSTR SI NPN
A2 Q2	1853-CC89	XSTR 2N4917 SI
A2 Q3	1853-0089	XSTR 2N4917 SI
A2 Q4	1853-CC89	XSTR 2N4917 SI
A2 Q5	1853-0089	XSTR 2N4917 SI
A2 Q6	1853-0089	XSTR 2N4917 SI
A2 Q7	1854-0215	XSTR SI NPN
A2 Q8	1854-0005	XSTR 2N708 SI
A2 R1	0757-0411	R-F 332 1% .125W
A2 R2	0698-3242	R-F 357 1% .125W
A2 R3	0757-0388	R-F 30.1 1%
A2 R4	0757-0388	R-F 30.1 1%
A2 R5	0757-0417	R-F 562 1% .125W
A2 R6	0757-0413	R-F 392 1% .125W
A2 R7	0757-0410	R-F 301 1% .125W
A2 R8	0757-0410	R-F 301 1% .125W
A2 R9	0757-0417	R-F 562 1% .125W
A2 R10	0757-0417	R-F 562 1% .125W
A2 R11	0757-0437	R-F 4.75K1%
A2 R12	0757-0416	R-F 511 1% .125W
A2 R13	0757-0407	R-F 200 1% .125W
A2 R14	0757-0401	R-F 100 1% .125W
A2 R15	0757-0428	R-F 1.62K1%
A2 R16	0757-0444	R-F 12.1K1%
A2 R17	0698-3496	R-F 3.57K1%
A2 R18	0757-0433	R-F 3.32K1%
A2 R19	0757-0443	R-F 11K1% .125W
A2 R20	0757-0442	R-F 10K1% .125W
A2 R21	0757-0433	R-F 3.32K1%
A2 R22	0698-3492	R-F 2.67K1%
A2 R23	0757-0421	R-F 825 1% .125W
A2 R24	0757-0283	R-F 2K1% .125W F
A2 R25	0757-0435	R-F 3.92K1%
A2 R26	1810-0055	R-NETWORK 8RES
A2 R27	1810-0055	R-NETWORK 8RES
A2 X1	1200-0768	SOCKET INTEG

NOTE:

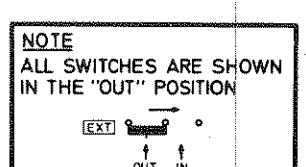
Outputs from the exclusive OR gates MC6 to MC8 are given in the Boolean Algebra form, e.g. (80 • C80 + 80 • C80) means that the output is "true" when **either** 80 is present and C80 is not present **or** when 80 is not present and C80 is present.





8011 A - 01
POWER SUPPLY

NOTE
ALL SWITCHES ARE SHOWN IN THE "OUT" POSITION



"PUSH IN" TO SELECT MODE OR RANGE

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