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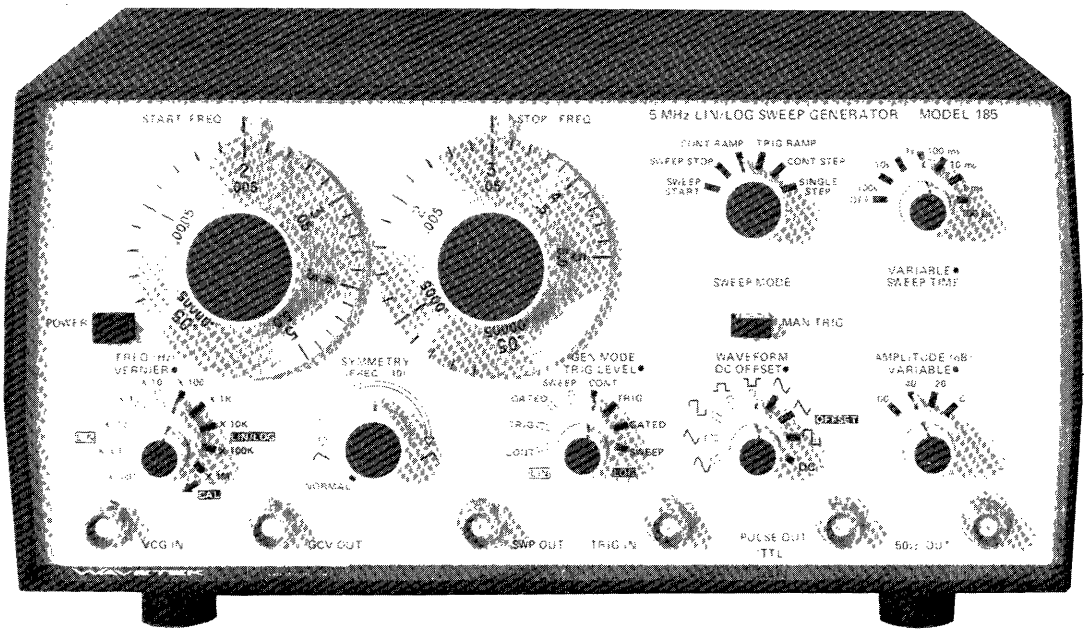
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WAVETEK

INSTRUCTION MANUAL

MODEL 185

5 MHz LIN/LOG SWEEP GENERATOR



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INSTRUCTION MANUAL

MODEL 185
5 MHz LIN/LOG
SWEEP GENERATOR

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SAFETY

This instrument is wired for earth grounding via the facility power wiring. Do not bypass earth grounding with two wire extension cords, plug adapters, etc.

BEFORE PLUGGING IN the instrument, comply with installation instructions.

MAINTENANCE may require power on with the instrument covers removed. This should be done only by qualified personnel aware of the electrical hazards.

The instrument power receptacle is connected to the instrument safety earth terminal with a green/yellow wire. Do not alter this connection. (Reference: ⏚ or ⚠ stamped inside the rear panel near the safety earth terminal.)

WARNING notes call attention to possible injury or death hazards in subsequent operations.

CAUTION notes call attention to possible equipment damage in subsequent operations.

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SECTION 1
GENERAL DESCRIPTION

1.1 THE MODEL 185

Wavetek Model 185, the 5 MHz Lin/Log Sweep Generator, is a precision source of sine, triangle, square, positive pulse and negative pulse waveforms plus dc voltage. Frequency of the waveforms is manually and remotely variable from 100 μHz to 5 MHz. Frequencies are variable both linearly and logarithmically.

The generator can repetitively sweep between two individually set frequencies either linearly or logarithmically and at a particular sweep rate. The sweep of frequencies can also be taken in 10 equal steps, giving 11 frequency levels.

The amplitude of waveforms is variable from 20V p-p, open circuit maximum, to −80 dB. DC reference of the waveforms can be offset positively and negatively.

The symmetry of the waveforms is continuously adjustable from approximately 1:19 to 19:1. Varying symmetry provides variable duty cycle pulses, sawtooth and asymmetrical sine waveforms.

A voltage representing generator frequency, a fixed-amplitude pulse train of that frequency, and a voltage ramp representing frequency sweep rate are provided as front panel outputs.

1.2 SPECIFICATIONS

Specifications (waveform, frequency, and amplitude selection), operating modes, precision (accuracy), and waveform purity (quality) are listed in the following paragraphs.

1.2.1 Versatility

Waveforms
Five selectable waveforms, sine ∿ , triangle △ , square ⊓ , positive pulse ⎍ , negative pulse ⎎ , plus variable DC output. Symmetry of all waveform outputs is continuously adjustable from approximately 1:19 to 19:1. Varying symmetry provides variable duty cycle pulses, sawtooth, or asymmetrical sine waveforms. Separate sync output is included.

Control
Frequency can be controlled manually, with external voltage (VCG) or with internally generated ramp voltage. Both linear and logarithmic distribution of frequencies are available. Besides sweeping with the internal ramp voltage, the frequency may be varied with an internal 10 step voltage. Frequency may be swept, or stepped, up or down; frequency limits are set by two independent frequency dials.

Operating Frequency Range
Frequency selectable from 0.0001 Hz to 5 MHz in the following linear ranges:

X 0.001	0.0001 Hz to 0.005 Hz
X 0.01	0.001 Hz to 0.05 Hz
X 0.1	0.005 Hz to 0.5 Hz
X 1	0.05 Hz to 5 Hz
X 10	0.5 Hz to 50 Hz
X 100	0.5 Hz to 500 Hz
X 1K	5 Hz to 5 kHz
X 10K	50 Hz to 50 kHz
X 100K	500 Hz to 500 kHz
X 1M	5 kHz to 5 MHz

Frequency selectable from 0.005 Hz to 5 MHz in the following logarithmic ranges (5 decades of frequency per range):

X 100	0.005 Hz to 500 Hz
X 1K	0.05 Hz to 5 kHz
X 10K	0.5 Hz to 50 kHz
X 100K	5 Hz to 500 kHz
X 1M	50 Hz to 5 MHz

NOTE

When SYMMETRY control is used, the output frequency is different from the dial indicated frequency. The maximum symmetry ratio obtainable is also dependent on the frequency dial setting.

Main Output
∿ , △ , ⊓ ; variable to 20V p-p into open circuit and 10V p-p into 50Ω load. DC offset of waveform (or DC if selected) is adjustable to ±10 volts open circuit and ±5 volts into 50Ω load.

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⎍ , ⎎ , DC: 0 to +10 or −10 volts into open circuit and 0 to +5 or −5 volts into 50Ω load.

Output dc voltage is limited to approximately ±10 volt open circuit and output current is limited to approximately 130 mA.

Output can be attenuated from 0 dB to −80 dB: −60 dB in 20 dB steps, plus a 20 dB vernier for continuous variation (20 dB vernier does not affect offset or DC).

Pulse Output
Output voltage is TTL compatible. Rise and fall times are typically 15 ns. Sync is normally a symmetrical square waveform; with SYMMETRY control ON, it is rectangular.

Sweep Output
SWEEP OUT connector provides a nominal 0 to + 7.5V (open circuit) ramp from a 600Ω source impedance and a stair step waveform in 10 steps, when step sweep is selected.

DC Offset
DC offset of ∿ , ⩘ , or ⎍ waveform, or DC if selected, is adjustable to ±10 volts open circuit and ±5 volts into a 50Ω load. Output current is limited to approximately 130 mA. Waveform + offset is limited to ±10V into an open circuit.

GCV Output
A dc voltage proportional to the instantaneous frequency of the generator output. 0 to +5V, open circuit, 1 kΩ source impedance.

1.2.2 Operating Modes

Continuous
Operating as a standard VCG (voltage controlled generator), frequency output is determined by front panel control settings in conjunction with external control voltage at VCG IN.

Triggered
Only one complete cycle of output appears at 50Ω OUT connector for each pulse applied to TRIG IN connector (or press of MAN TRIG switch).

Gated
Same as triggered mode except that output oscillations continue for duration of gating signal applied to TRIG IN connector (or as the MAN TRIG switch is depressed).

Sweep
The internal ramp generator can sweep the main generator up or down in frequency, linearly (3 decades) or logarithmically (5 decades), up or down, or in 10 discrete steps. The main generator output may be continuous or triggered for one sweep or one step.

Sweep/Step Time: The time for each sweep/step ramp can be varied from 100s to 100 μs in 6 ranges.

1.2.3 Voltage Controlled Generator

VCG Control Range: In linear mode, up to 1000:1 frequency change with external voltage input. In logarithmic mode, up to 100,000:1 change. Upper frequency limited to max of selected range.

Input Impedance: 10 kΩ.

VCG Voltage: 0 to 5V.

Linear VCG Slew Rate: 2% of range per μs.

Logarithmic VCG Slew Rate: 0 to 80% of range in 40 μs
80 to 100% of range in 200 μs

Linear VCG Response: 0.1 mHz to 50 kHz ±0.5%.

Logarithmic Response: Approximately one decade of frequency per volt input.

1.2.4 Triggered Generator

Trigger pulse is 1V p-p to ±10V; input impedance is 10 kΩ, 33 pF; minimum pulse width is 50 ns; maximum repetition rate is 5 MHz.

1.2.5 Horizontal Precision

Dial Accuracy (Symmetrical Waveform and Linear Mode)
±2% of full scale for 0.005 Hz to 5 MHz.
±4% of reading and ±2% of full scale for 0.0005 Hz to 0.005 Hz.

Frequency Vernier
Approximately 1% of range in linear scale. Approximately 5% of reading in logarithmic scale. Vernier affects calibration of both frequency dials.

Time Symmetry
±1% for 0.005 to 500 kHz.

1.2.6 Vertical Precision

Amplitude Change With Frequency (Sine)
Less than 0.1 dB to 100 kHz.

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Less than 0.2 dB to 1 MHz.
Less than 1 dB to 5 MHz.

Step Attenuator Accuracy
±0.3 dB per 20 dB step.

Stability
Short Term: ±0.05% for 10 minutes.
Long Term: ±0.25% for 24 hours.

Percentages apply to amplitude, dc offset and main generator frequency in the linear mode.

Amplitude Symmetry
±1% of amplitude range to 1 MHz for all symmetrical waveforms.

1.2.7 Purity

Sine Distortion
Less than 0.5% for 10 Hz to 50 kHz.
Less than 1% for 0.005 Hz to 500 kHz.
All harmonics at least 30 dB down for X 1 MHz range.

Triangle Linearity
Greater than 99% for 0.0005 Hz to 100 kHz.

Square Wave Rise and Fall Time
Less than 30 ns terminated into 50Ω load.

Square Wave Total Aberrations
Less than ±5% of peak-to-peak voltage from 1 to 10Vp-p (Offset: OFF).

1.2.8 Environmental

All specifications listed are for 23°C ±5°C. For operation from 0°C to 55°C, specifications including horizontal precision, amplitude symmetry, and sine wave distortion are derated by a factory of 2.

1.2.9 Mechanical

Dimensions
11¼ in./28.6 cm wide; 5¾ in./14.5 cm high; 10¾ in./27.3 cm deep.

Weight
8.5 lb/3.8 kg net; 12 lb/5.5 kg shipping.

1.2.10 Power

90V to 110V, 105V to 125V, 180V to 220V or 210V to 250V; 50 Hz to 400 Hz; less than 25 watts.

NOTE

Specifications apply from 10 to 100% of a selected frequency range with SYMMETRY control OFF.

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SECTION 2
INITIAL PREPARATION

2.1 UNPACKING INSPECTION

After carefully unpacking the instrument, inspect the external parts for damage to knobs, dials, indicators, surface areas, etc. If there is damage, file a claim with the carrier who transported the instrument. Retain the shipping container and packing material for use in case reshipment is required.

2.2 PREPARATION FOR USE

Before connecting the instrument to line power, be sure the rear panel 115/230V and HI/LO switches are set to the value nearest the line voltage and that the fuse is correct for the switch setting. Be sure that the plug on the power cord is the proper mate for the line receptacle.

AC Line Voltage	Switch A	Switch B	Fuse (SB)
90 - 110	115	LO	1/4 amp
105 - 125	115	HI	1/4 amp
180 - 220	230	LO	1/8 amp
210 - 250	230	HI	1/8 amp

2.3 ELECTRICAL ACCEPTANCE CHECK

This checkout procedure verifies the generator operation. If a malfunction is found, refer to the Warranty in the front of this manual. An oscilloscope, 50Ω coax cable and 50Ω feedthru are needed for this procedure (figure 2-1).

Preset the generator front panel controls as follows:

Control	Position
GEN MODE	CONT (LIN)
WAVEFORM	∿
SYMMETRY	NORMAL
FREQ Range	X 1K
FREQ VERNIER	CAL
START FREQ Dial	1
AMPLITUDE	0 dB
AMPLITUDE VARIABLE	Full clockwise
DC OFFSET	Center
TRIG LEVEL	Full counterclockwise
SWEEP MODE	CONT RAMP
STOP FREQ Dial	5
SWEEP TIME Range	10s▮1s
SWEEP TIME VARIABLE	Full clockwise

Perform the steps in table 2-1. Only approximate values are required to verify operation.

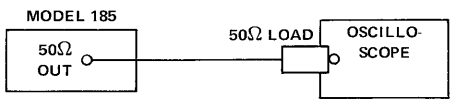


Figure 2-1. Acceptance Test Setup

Table 2-1. Performance Checkout

Step	Control	Position/Operation	Observe at 50Ω OUT
	Function		
1	POWER	Push on	Sine wave, 1 kHz, 10V p-p
2	WAVEFORM	∿	Triangle wave
3	WAVEFORM	⊓	Square wave
4	WAVEFORM	⎍	Positive pulse

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Table 2-1. Performance Checkout (Continued)

Step	Control	Position/Operation	Observe at 50Ω OUT
5	WAVEFORM	⊔	Negative pulse
6	SYMMETRY	cw	Frequency ÷ 10, decreasing negative pulse width
7	SYMMETRY	ccw	Decreasing positive pulse width
8	SYMMETRY	NORMAL	– – –
9	WAVEFORM	∿ (OFFSET)	Sine wave, 1 kHz
	Frequency		
10	FREQ Range	X 1M	Frequency = 1 MHz
11	FREQ VERNIER	ccw	Frequency decreases 1%
12	FREQ VERNIER	CAL	– – –
13	START FREQ Dial	5	Frequency = 5 MHz
14	GEN MODE	CONT (LOG)	Frequency = 5 MHz
15	START FREQ Dial	0.00005	Frequency = 50 Hz
16	GEN MODE	CONT (LIN)	Frequency = 50 kHz
17	FREQ Range	X100K thru X.001	Decrease in frequency
18	FREQ Range	X1K	Frequency = 50 Hz
19	START FREQ Dial	1	– – –
	Amplitude		
20	AMPLITUDE Range	–60 dB	10 mV p-p
21	AMPLITUDE VARIABLE	ccw	1 mV p-p
22	AMPLITUDE Range	0	1V p-p
23	DC OFFSET	cw	Positive slew; about +5V positive peak
24	DC OFFSET	ccw	Negative slew; about –5V negative peak
25	WAVEFORM	∿ (Not OFFSET)	Triangle wave
	Trigger & Gate		
26	GEN MODE	TRIG (LIN)	0 Vdc
27	MAN TRIG	Press	Generate one cycle

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Table 2-1. Acceptance Check (Continued)

Step	Control	Position/Operation	Observe at 50Ω OUT
28	GEN MODE	GATED (LIN)	0 Vdc
29	MAN TRIG	Press and hold	Continuous ∿ waveform
30	MAN TRIG	Release	0 Vdc
	Sweep		
31	GEN MODE	SWEEP (LIN)	Frequency sweep from START FREQ setting to STOP FREQ setting every 1s.*
32	SWEEP MODE	TRIG RAMP	Start frequency = 1 kHz
33	MAN TRIG	Press	Generate one sweep
34	SWEEP MODE	CONT STEP	Frequency step 1/11 of sweep range every 1s, reset after 10th step.
35	SWEEP TIME VARIABLE	Full ccw	10s steps
36	SWEEP TIME Range	1s▮100 ms	1s steps
37	SWEEP MODE	SINGLE STEP	– – –
38	MAN TRIG	Press	One step

*This is a good time to check the other outputs by disconnecting the cable at 50Ω OUT and connecting to SWP OUT: observe a 7.5 V ramp waveform. Connect to GCV OUT: observe a ramp plus dc. Connect to Pulse OUT; observe 2.4 V positive pulse. Reconnect cable to 50Ω OUT and continue with step 32.

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SECTION 3
OPERATION

3.1 CONTROLS AND CONNECTORS

The generator front panel controls and connectors are shown in figure 3-1 and keyed to the following descriptions:

(1) POWER Switch

Power is turned on and off with the POWER push-button. The START FREQ dial index (1A) lights when power is turned on.

(2) START FREQ Dial

Frequency settings of the dial multiplied by frequency range (18) determine output frequency. In frequency sweep operation, this dial determines the frequency from which sweep is started.

(3) STOP FREQ Dial

This dial is used in sweep mode only. Frequency settings of the STOP FREQ dial multiplied by frequency range (18) determines the frequency at which sweep is stopped. (See figure 3-2.) Setting this dial for values greater than the START FREQ dial (2) settings define upward sweeping frequencies, and setting it for lower values than start frequency settings define downward sweeps.

(4) SWEEP MODE Selector

The SWEEP MODE selector is enabled by the GEN MODE selector (14) set to SWEEP. The STOP FREQ dial index (4A) turns on when SWEEP mode is selected. An internally-generated

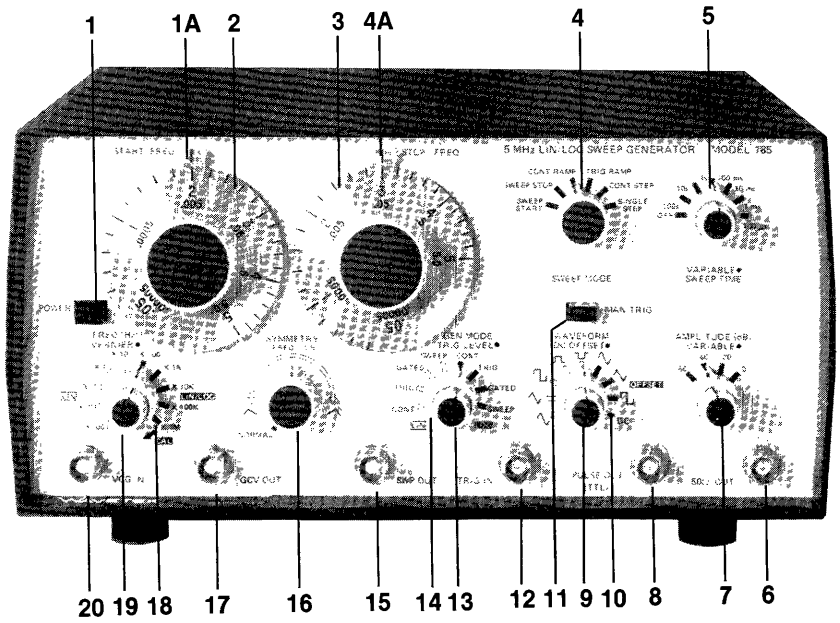


Figure 3-1. Front Panel Controls and Connectors

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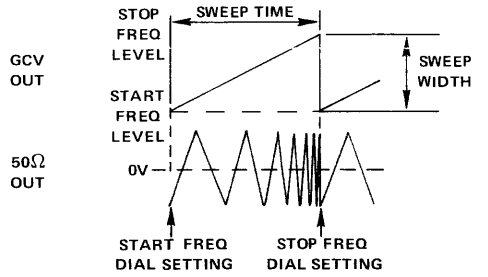


Figure 3-2. Effect of Sweep Time and Width on Output Frequency

voltage ramp becomes an internal VCG input. The start frequency of the generator is determined by the START FREQ dial (2) and the stop frequency is determined by the STOP FREQ dial (3). The SWEEP START and SWEEP STOP settings will hold the output signal at the start and stop frequencies, respectively, while the START FREQ (2) and STOP FREQ (3) dials are adjusted. CONT RAMP allows frequency sweeping to occur at the rate set by (5). TRIG RAMP allows triggering by (11) or (12) of a single sweep. CONT STEP allows 10 equal frequency steps (11 levels), the first level set by (2), the last by (3). Step duration is set by (5) (see figure 3-3). Single step allows triggering by (11) or (12) of a single step in frequency.

(5) SWEEP TIME Control

Frequency of the internal sweep ramp, and thus, the sweep repetition rate, is governed by the SWEEP TIME control (see figure 3-2). The large knob, when rotated to a detent line, determines the range controlled by the VARIABLE knob. The range values are shown on either side of the detent line. In OFF position, the ramp generator is turned off.

(6) Main Output Connector

Maximum output of 10V p-p signals into a 50Ω load (20V p-p open circuit) is provided at the 50Ω OUT connector; all generator mode signals are delivered at this connector. See (7) for amplitude of output.

(7) AMPLITUDE Control

The AMPLITUDE switch affects waveforms, dc output and waveform dc offset. The VARIABLE control affects waveforms only. Maximum waveform amplitude is with the 0 dB setting of the AMPLITUDE control and with the VARIABLE control fully cw (see table 3-1). Amplitude is decreased 20 dB with VARIABLE control fully ccw.

Table 3-1. Maximum Voltage at 0 dB

Function	Open Circuit	50Ω Termination
∿ , ⩘ , ⊓	20V p-p	10V p-p
⎍	0 to +10V	0 to +5V
⎎	0 to −10V	0 to −5V
DC	±10V	±5V

(8) Synchronizing Pulse Output Connector

A fixed amplitude (0 to about 5V) TTL pulse of the generator frequency is provided at the PULSE OUT connector. This output can be used as a synchronizing reference for the main output (6). Phase of the waveforms relative to the sync output is shown in figure 3-4.

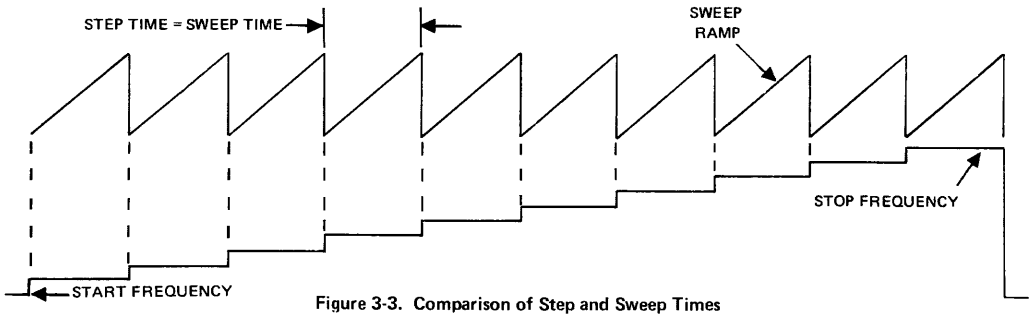


Figure 3-3. Comparison of Step and Sweep Times

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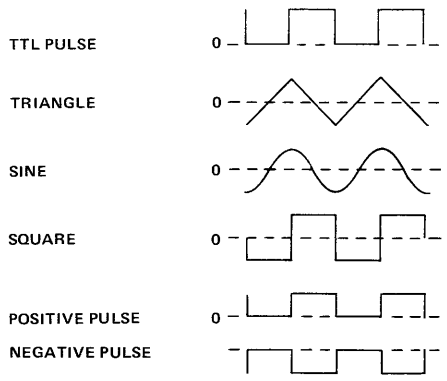


Figure 3-4. Pulse/Waveform Phase Relationship and Waveform Reference Lines

(9) DC OFFSET Control

Offset of waveforms and dc voltage are controlled by the DC OFFSET control. The WAVEFORM switch (10) must be in one of the four right-hand settings. Center of the waveform reference (figure 3-4) is skewed positive with clockwise rotation, negative with counterclockwise rotation. Offset and dc voltage maximums are ±5V (50Ω terminated). See figure 3-5 for restrictions.

(10) WAVEFORM Selector

Sine ∿, triangle △, and square ⊓ waveforms, and positive and negative square pulse trains ⎍, ⎎ are selected for output by the WAVEFORM selector, with or without dc offset. When set for dc offset, the inner knob (9) controls the ±5V (50Ω terminated) offset. DC is selected for dc output with voltage controlled by the inner knob (9).

(11) Manual Trigger Control

In TRIG mode (14), the MAN TRIG pushbutton is used to trigger a single cycle of waveform output and, in the GATED mode, to gate the output of waveforms until released.

NOTE

The TRIG LEVEL control (13) must be fully CCW.

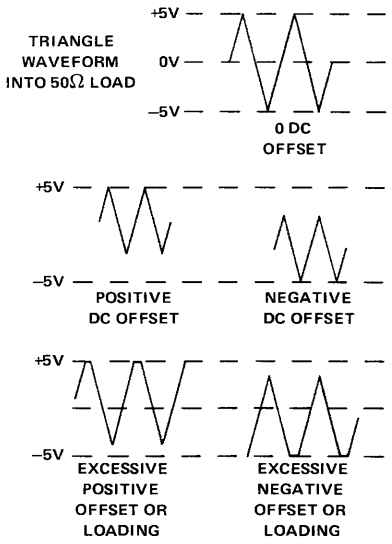


Figure 3-5. DC OFFSET Control

(12) Remote Trigger Input Connector

The TRIG IN connector accepts voltage level inputs that trigger and gate the generator. (See (14) and (4).) The trigger level control (13) determines the level at which the TRIG IN input is accepted for triggering or gating. A positive-going excursion through a voltage level, which can be set in the range of –7.5V to +7.5V by the TRIG LEVEL control triggers or gates the generator operation.

A negative-going dc excursion through the trigger level ends gated operation. Figure 3-6 shows triggering and gating of the generator waveforms at time t1. Once triggered or gated, a full cycle of the selected waveform is output to its completion: when gating is removed at time t2, for example, the last full cycle of waveform completes itself at time t3.

(13) Trigger Level Control

The TRIG LEVEL control determines the level at which the input at the TRIG IN connector (12) is accepted as a trigger in the generator trigger and gated modes. (See (14) and (4).) The trigger level can be varied from fully clockwise, where a positive-going excursion thru –7.5V is a trigger, to fully counterclockwise, where a positive-going excursion thru +7.5V is a trigger.

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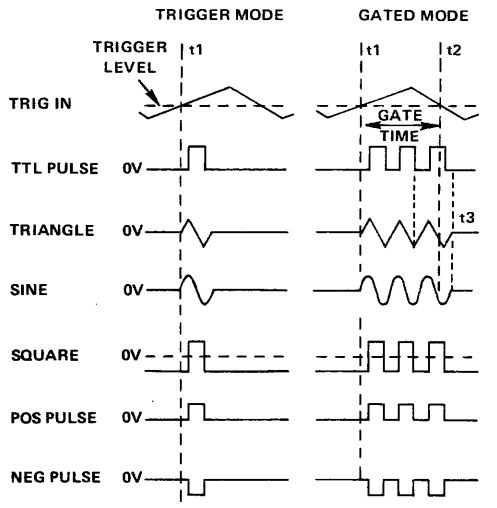


Figure 3-6. Generator Trigger and Gated Control

(14) Generator Mode Selector

Linearly (LIN) or logarithmically (LOG) calibrated control of continuous (CONT), triggered (TRIG), or GATED frequencies or the sweep or step modes of frequency (SWEEP) is selectable as the generator mode of operation by the GEN MODE selector.

Generator modes are:

1. Continuous – An uninterrupted output of the selected waveform at the selected frequency and amplitude.

2. Triggered – One cycle of the selected waveform at the selected frequency and amplitude when the trigger signal is detected at TRIG IN (12) or when manually triggered at (11) .

3. Gated – A burst of the selected waveform at the selected frequency and amplitude, which starts when the gate signal is detected at TRIG IN (12) and lasts through the completion of the last cycle started before the removal of the gate signal, or starts and stops when manually gated at (11) .

4. Sweep – One of several modes controlled by (4) . Main generator frequencies may be swept up and down or stepped up and down. Sweep and step may be continuous or triggered.

(15) Sweep Ramp Output Connector

The internal sweep generator ramp is available at the SWP OUT connector. Ramp frequency is varied by the SWEEP TIME control. (See figure 3-2.) Output is a 0 to +5V ramp, 600Ω source impedance.

(16) Waveform SYMMETRY Control

Normal symmetrical output results when SYMMETRY is set to NORMAL; an asymmetrical, or unbalanced, waveform results when SYMMETRY is set between ◺ and ◿ . (Asymmetric operation reduces generator frequency to approximately 1/10th the normal output.) Figure 3-7 shows the effect of SYMMETRY control on the waveforms.

NOTE

When SYMMETRY control is used, the output frequency is different from the dial indicated frequency. The maximum symmetry ratio obtainable also depends on the frequency dial setting. Typical examples are shown in tables 3-2 and 3-3.

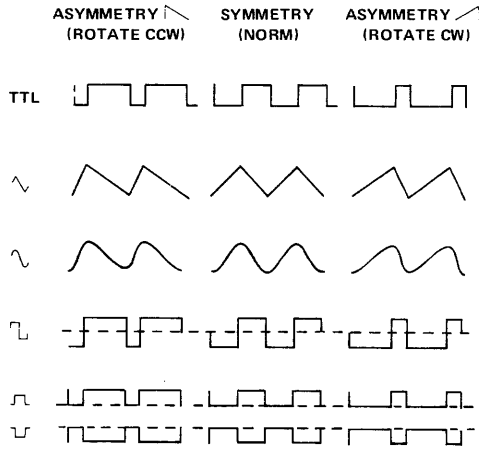


Figure 3-7. Effect of SYMMETRY Control

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Table 3-2. Linear Dial Setting

Frequency Range	X 100K					
Dial Setting	5	4	3	2	1	0.5
Indicated Frequency	500 kHz	400 kHz	300 kHz	200 kHz	100 kHz	50 kHz
Output Frequency	54 kHz	44 kHz	33 kHz	23 kHz	12 kHz	6.5 kHz
Maximum Symmetry Ratio	18:1	18:1	18:1	17:1	16:1	15:1

Table 3-3. Logarithmic Dial Setting

Frequency Range	X 100K					
Dial Setting	5	0.5	0.05	0.005	0.0005	0.00005
Indicated Frequency	500 kHz	50 kHz	5 kHz	500 Hz	50 Hz	5 Hz
Output Frequency	53 kHz	7.6 kHz	1.7 kHz	420 Hz	63 Hz	6 Hz
Maximum Symmetry Ratio	18:1	15:1	9:1	2.2:1	1.2:1	1:1

(17) GCV Output Connector

GCV OUT provides dc excursions of 0 to about +5V which represent the output frequency in the selected range. Source impedance is 1 kΩ.

(18) Frequency Range Control

The selected range settings of the FREQ selector, multiplied with the frequency dial (2) setting determine output frequency. LIN settings are for linear modes only. LIN/LOG settings are for linear or logarithmic modes.

(19) Frequency VERNIER Control

The frequency is as labeled on (18) and (2), when the VERNIER control is set fully clockwise to CAL (calibrated). Rotating the VERNIER control counterclockwise decreases output frequency. The range is approximately 1% of the selected frequency range.

(20) VCG Input Connector

DC voltage excursions of 0 to ±5 volts at the VCG IN connector control frequency within the selected range. Positive inputs increase frequencies set by the frequency dial (2) and range control (18), and negative inputs decrease the frequencies. Input impedance is 10 kΩ. Frequency excursions of 1000:1 (linear mode) and 100,000:1 (logarithmic mode) are possible.

3.2 OPERATION

Operation is discussed in terms of continuous, triggered, gated, sweep (and step) and VCG.

3.2.1 Signal Termination

Proper signal termination, or loading, of the generator connectors is necessary for its specified operation. For example, the proper termination of the main output is shown in figure 3-8. Placing the 50Ω terminator, or 50Ω resistance, in parallel with a higher impedance matches the receiving

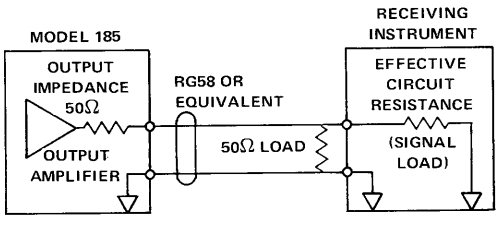


Figure 3-8. Signal Termination

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instrument input impedance to the generator output impedance, thereby minimizing signal reflection or power loss on the line due to phase angle mismatch.

The input and output impedance of the generator connectors are listed below:

Connector	Impedance
50Ω OUT	50Ω
TRIG IN	10 kΩ
PULSE OUT (TTL)	
SWP OUT	600Ω
VCG IN	10 kΩ
GCV OUT	1 kΩ

*The PULSE OUT connector can drive up to 20 Transistor-Transistor Logic (TTL) loads (low level between 0V and 0.4V, and high level between 2.4V and 5V).

3.2.2 Continuous Operation

Basic, or continuous, operation of the generator involves turning on power, selecting a continuous output mode, selecting a waveform, and setting the output signal frequency and amplitude. When operation is critical, allow a one-half hour warm-up period. The following steps demonstrate use as a basic function generator:

Step	Control/Connector	Setting
1	50Ω OUT	Connect circuit (refer to paragraph 3.2.1).
2	PULSE OUT	Use for external synchronization, if required.
3	GEN MODE	CONT (LIN or LOG).
4	WAVEFORM	Choose one of the left-hand set of waveforms. If dc or dc offset is desired, use right-hand set.
5	SYMMETRY	NORMAL or desired asymmetry. (Affects frequency calibration.)
6	FREQ	As desired for frequency range.
7	START FREQ Dial	As desired for exact frequency.
8	FREQ VERNIER	CAL, unless extreme frequency accuracy is required, in which case, monitor with a frequency counter.
9	AMPLITUDE	As desired.
10	AMPLITUDE VARIABLE	As desired.
11	DC OFFSET	As desired (step 4, right-hand set of waveforms must be chosen).

3.2.3 Trigger Mode

Operation as a triggered one cycle generator is as for a basic function generator, only the operating mode is triggered (TRIG) instead of continuous (CONT), and a manual or remote trigger (MAN TRIG, TRIG IN) is used to start the single cycle of waveform. Perform the steps given in paragraph 3.2.2, only set the GEN MODE control in step 3 to TRIG. Refer to paragraph 3.2.4 for triggering.

NOTE

The generator sweep circuit can be used as source of repetitive trigger inputs.

3.2.4 Triggering

Manual trigger as follows:

Step	Control/Connector	Setting
1	TRIG LEVEL	Full ccw.
2	MAN TRIG	Press for each cycle desired.

Remote trigger as follows:

Step	Control/Connector	Setting
1	TRIG LEVEL	Rotate the TRIG LEVEL control cw to set negative thresholds as low as −7.5V through which a positive-going TRIG IN connector input can pass to provide triggering. CCW sets positive thresholds of up to +7.5V through which a positive-going TRIG IN level can pass to provide triggering.

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Step	Control/Connector	Setting
2	TRIG IN	Apply a positive-going voltage (through the threshold set in the preceding step) to the TRIG IN connector to provide remote triggering.

CAUTION

Avoid voltages greater than ±50V at TRIG IN to prevent damage to the generator.

3.2.5 GATED (or Tone Burst) Mode

Operation as a gated or tone burst generator is as for a triggered generator, only the operating mode is GATED, and releasing the MAN TRIG or removing the remote trigger voltage ends the burst of output waveform. Perform the steps of paragraph 3.2.2, only set the GEN MODE control to GATED. Refer to paragraph 3.2.4 for triggering.

3.2.6 SWEEP Mode

The generator can be set for a repetitive sweep (CONT RAMP), triggered sweep (TRIG RAMP), repetitive stepping (CONT STEP) or single steps (SINGLE STEP) of output frequencies within a given range. Operation is like continuous mode, only a separately controlled, internal ramp generator or step generator provides an additional VCG input to control frequency. (This internally-generated ramp or step is also available at the SWP OUT connector.) The sweep or step rate is controlled by the SWEEP TIME control. Perform the steps given in paragraph 3.2.2, only set the GEN MODE control in step 3 to SWEEP and include the following steps:

Step	Control/Connector	Setting
1	SWEEP MODE	SWEEP START.
2	START FREQ Dial	Desired start sweep/step frequency.
3	SWEEP MODE	SWEEP STOP.
4	STOP FREQ Dial	Desired stop sweep/step frequency.
5	SWEEP MODE	Desired mode.
6	SWEEP TIME	As desired.

For triggering in TRIG RAMP mode, refer to paragraph 3.2.4.

3.2.7 Voltage Control — VCG

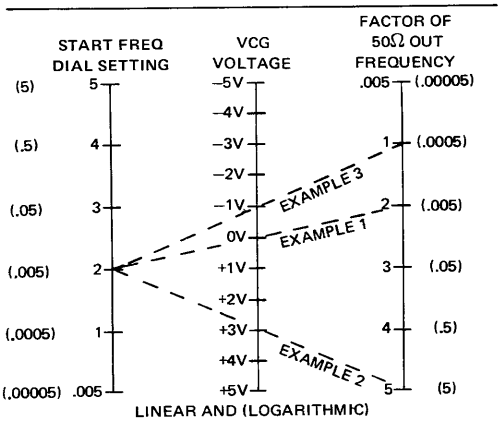
Operation with voltage control can be done in any mode but is usually done in continuous mode; the frequency within a particular range is additionally controlled with dc levels within ±5V, injected at the VCG IN connector. Perform the steps given in paragraph 3.2.2, only set the frequency dial to determine a reference from which the frequency is to be voltage controlled:

1. For frequency control with positive dc inputs at VCG IN, set the dial for a lower limit from which frequency is to be increased.

2. For frequency control with negative dc inputs at VCG IN, set the dial for an upper limit from which frequency is to be decreased.

3. For modulation with an ac input at VCG IN, set the dial at the desired center frequency. Do not exceed the maximum dynamic range of the selected frequency range.

Figure 3-9 is a nomograph with examples of the frequency dial effect as a reference for VCG IN voltages. Example 1 shows that with 0V VCG input (2nd column), frequency (3rd column) is as determined by the frequency dial setting of 2 (1st column). Example 2 shows that with a positive VCG input, output frequency is increased. Example 3 shows



NOTE

The FREQ VERNIER must be rotated full ccw for 1000:1 linear range. Leave the FREQ VERNIER on CAL for 100,000:1 logarithmic range.

Figure 3-9. VCG Voltage-to-Frequency Nomograph

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that with a negative VCG input, output frequency is decreased. (Note that the Factor of 50Ω OUT Frequency column must be multiplied by the frequency range in order to give the actual 50Ω OUT frequency.) For full 1000:1 linear mode VCG sweep of the generator frequencies, set the FREQ VERNIER full ccw.

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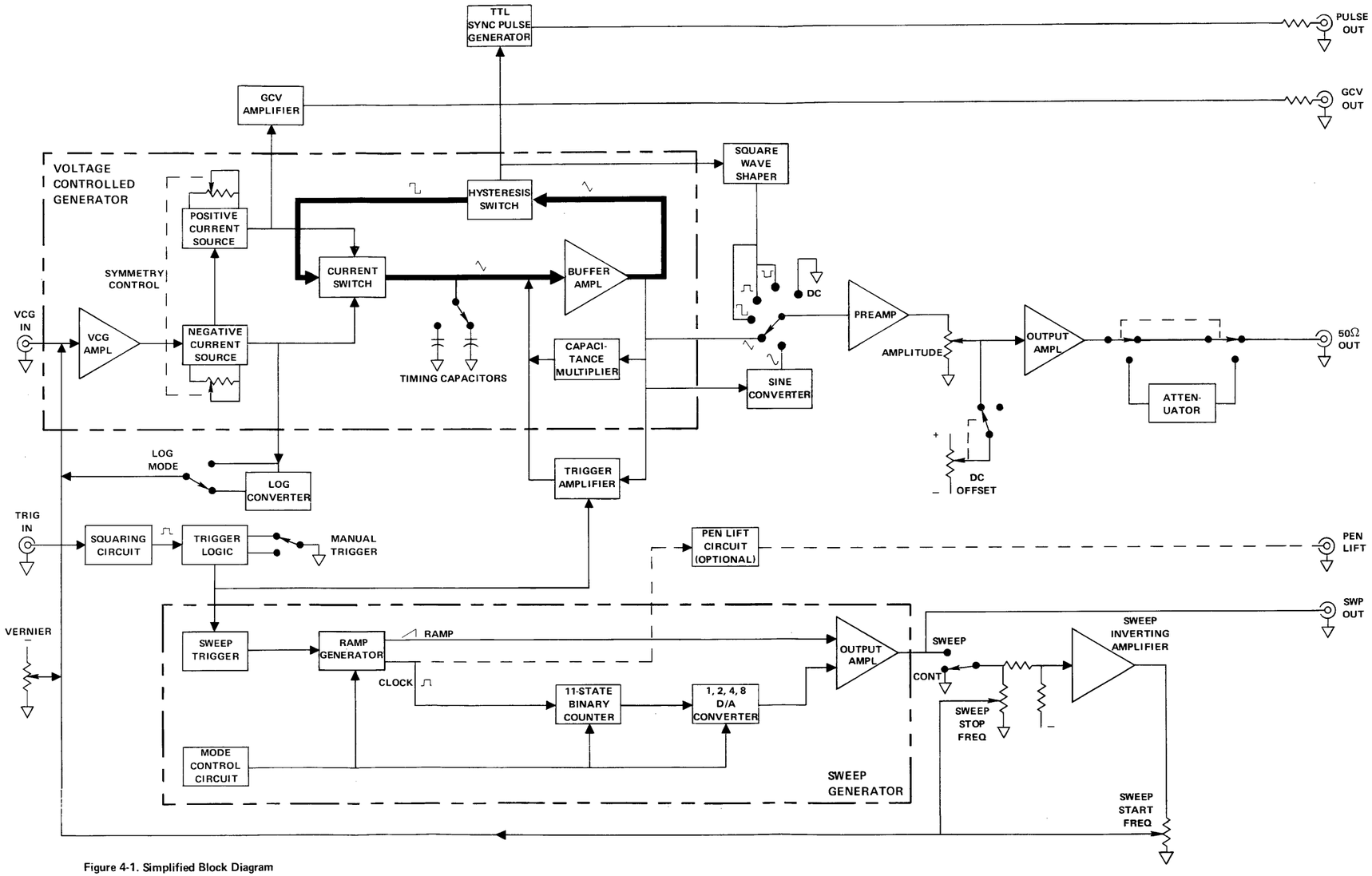


Figure 4-1. Simplified Block Diagram

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SECTION 4
CIRCUIT DESCRIPTION

4.1 VOLTAGE CONTROLLED GENERATOR

The heart of the generator consists of the positive and negative current sources, the current switch, timing capacitors, triangle amplifier, and hysteresis switch (figure 4-1).

The positive and negative current sources generate equal but opposite polarity currents which charge and discharge the timing capacitor selected by the range selector. The current switch, which is controlled by the hysteresis switch, selects either the positive or the negative current as the input to the capacitor. Since the capacitor is being charged by a current source which changes polarity periodically, the voltage across the capacitor forms a triangle waveform. This waveform is fed through the triangle buffer amplifier to the hysteresis switch. The hysteresis switch determines when the triangle waveform reaches predetermined positive and negative peak values. When this occurs, the output of the hysteresis changes state and causes the current switch to select the opposite polarity current. The output of the hysteresis switch is a square wave whose edges correspond to the triangle peak values.

The magnitude of the current produced by the current sources is dependent upon the output of the VCG amplifier. By varying the output of the VCG amplifier, the frequency of the triangle and square waveforms may be controlled.

In order to generate sine waves, the triangle waveform is sine shaped in the sine converter circuit with nonlinear elements. The waveform switch selects the waveform of interest and a portion of the signal is selected by the amplitude potentiometer and applied to the output amplifier. The output amplifier is capable of driving a 50Ω load and may be dc offset. The amplifier output is routed to a 50Ω attenuator which can provide 60 dB of attenuation in 20 dB steps. An additional 20 dB of attenuation can be obtained from the amplitude control.

The square wave from the hysteresis switch is also applied to the TTL sync pulse generator, whose square wave output is TTL compatible.

To change frequency ranges, different timing capacitors may be selected by the frequency range switch. On the very slow frequencies the capacitance multiplier becomes active. This circuit senses the capacitor charging current and then subtracts a certain percentage of it from the capacitor. As a result, the capacitor does not charge as fast, and the frequency, as a result, is lower.

Several things can affect the frequency of the generator by varying the output of the VCG amplifier. One is the start frequency dial of the function generator (also called the sweep start frequency dial). When the generator is in the continuous mode, the sweep inverting amplifier generates a positive reference voltage which is applied to the start frequency potentiometer. A percentage of this voltage is applied to the VCG amplifier as an input. In addition to the frequency dial, the frequency vernier feeds in a voltage to the VCG amplifier. The range of the vernier is approximately 1% of the full scale frequency. Finally, an external voltage applied to the VCG input can control the frequency of the generator loop. The VCG input allows frequency modulation of the generator by an external signal.

A log converter can be switched into the feedback loop from the negative current source to the VCG amplifier. This log converter forces the current generators to generate currents that are logarithmically related to the VCG input signal. The relationship is approximately one decade of current change per volt of VCG input change.

Under normal conditions the generator loop runs with the positive and negative current sources balanced. This results in symmetrical sine, triangle and square waveforms, or in the case of the square waveform, a duty cycle of 50%. By varying the symmetry control, the current sources may be unbalanced which results in the generation of asymmetrical waveforms. This allows the generation of pulses, ramps, and other waveshapes.

In the trigger mode, the generator is stopped by the trigger amplifier. This amplifier compares the output of the triangle amplifier to ground. Its output draws just the right amount of current away from the capacitor to keep it at zero volts. This level is known as the trigger baseline. When an external signal is applied to the trigger input, it is shaped into a fast rise time pulse by the squaring circuit and is applied to the trigger logic circuit. This circuit in turn shuts off the trigger amplifier for one cycle of the output waveform. Trigger input may also be made manually by the manual trigger switch.

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The trigger logic circuit also allows the generator to run in the gated mode. In this mode the generator will run as long as the trigger input signal is positive. When it goes negative, the generator will continue to run until the last cycle is complete and then remain at the trigger baseline level.

Either linear ramp sweep or a 10 step staircase waveform may be selected as the sweep signal. The sweep signal is then applied to the sweep stop frequency dial. It is also inverted and offset by the sweep inverting amplifier and applied to the sweep start frequency dial. By summing these two signals in the VCG amplifier, the sweeping start and stop frequency limits are independently controlled. Depending on the dial settings, sweeping may be in either direction; i.e., up or down in frequency.

The sweep generator in the 185 can be operated either in the continuous or triggered mode. When triggered, either a single ramp or a single step is generated each time a trigger pulse is present. A sweep output signal can drive X-Y recorders or other devices.

The GCV output is an analog output voltage proportional to the instantaneous output frequency of the generator. This is from the GCV amplifier which senses the positive current source output and generates a voltage proportional to the current.

4.2 SWEEP GENERATOR

A variable rate ramp generator is the main element of the sweep generator. The ramp generator may operate either continuously, or in a triggered mode. In the triggered mode, a single ramp cycle is generated each time a trigger input pulse is received from the trigger circuit. An output amplifier provides signal insertion and precise zero level of the ramp signal.

The pulse output of the ramp generator drives an 11-state binary counter and an optional pen lift circuit. The pen lift circuit provides a pen lift signal for an external X-Y recorder.

The 11-state binary counter drives a binary weighted D/A converter. The output amplifier acts as a summing amplifier for the D/A converter whose output is a staircase waveform.

The mode control circuit has control of all the circuit blocks and is used to control sweep generator modes.

NOTE

The completion of the calibration procedure returns the instrument to correct alignment.

CALIBRATION LIMITS AND TOLERANCES ARE NOT INSTRUMENT SPECIFICATIONS

Instrument specifications are given in Section 1 of this manual.

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SECTION 5
CALIBRATION

5.1 FACTORY REPAIR

Wavetek maintains a factory repair department for those customers not possessing the necessary personnel or test equipment to maintain the instrument. If an instrument is returned to the factory for calibration or repair, a detailed description of the specific problem should be attached to minimize turnaround time.

5.2 REQUIRED TEST EQUIPMENT

Spectrum Analyzer . . . . . 600 kHz to 5 MHz
Voltmeter . Microvolt dc measurement (0.01% accuracy)
Oscilloscope, Dual Channel . . . 150 MHz bandwidth
Distortion Analyzer . . . . . To 600 kHz
Counter . . . . . To 1 MHz (0.1% accuracy)
50Ω Load . . . . . ±0.1% accuracy

5.3 REMOVING GENERATOR COVER

For main circuit board access, invert the instrument, remove the four screws in the cover, and lift off the bottom cover.

5.4 CALIBRATION

After referring to the following preliminary data, perform calibration, as necessary, per table 5-1. If performing partial calibration, check previous settings and adjustments for applicability.

1. Unless otherwise noted, all measurements made at the 50Ω OUT connector should be terminated into a 50Ω (±0.1%) load.

2. Test Points (TPs) and adjustments are on the main board unless noted otherwise.

3. Before connecting the unit to an ac source, check the ac line circuit to make sure the 115/230 and HI/LO switches are set at the correct position (see paragraph 2.2).

4. Start the calibration by setting the front panel switches as follows:

FREQ Range . . . . . X 10K
START FREQ 5
FREQ VERNIER . . . . . CAL
SYMMETRY . . . . . NORMAL
GEN MODE . . . . . CONT (LIN)
WAVEFORM . . . . . ⊓ (No Offset)
AMPLITUDE 0
AMPLITUDE VARIABLE . . . . . Max cw
SWEEP MODE . . . . . SWEEP START
SWEEP TIME . . . . . OFF

5. Allow the unit to warm up at least 30 minutes for final calibration.

Table 5-1. Calibration Chart

Step	Check	Tester	Cal Points	Control Settings	Adjust	Desired Results	Remarks
1	Power Supply Regulators	Voltmeter	C84 (+)	–	R206	+15 Vdc ±50 mV	Ground is C84 (–).
2			C88 (–)			–15 Vdc ±150 mV	
3			C80 (+)			+5V ±250 mV	
Cover the instrument and allow a 30 minute warm-up. Keep covered as much as possible during calibration.							
4	Amplifier Offset	Voltmeter	Q19 emitter	GEN MODE: TRIG (LIN) WAVEFORM: ∿	R192	0V ±5 mV	∿ amplifier output.

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Table 5-1. Calibration Chart (Continued)

Step	Check	Tester	Cal Points	Control Settings	Adjust	Desired Results	Remarks
5	Amplifier Offset		50Ω OUT		R124	0V ± 10mV	
6				AMPLITUDE VARIABLE: max ccw	R156		Repeat steps 5 and 6
7	Time Symmetry	Dual channel scope		GEN MODE: CONT (LIN) WAVEFORM: ⊓ FREQ: X 1K Dial: 5 Scope time base: 20 μs/div	R32	Time symmetry < 0.1%	Follow procedure in figure 5-1.
8				FREQ: X 100K Dial: .05	R35		Follow procedure in figure 5-1.
9							Repeat steps 6 and 7.
10	VCG Zero			Same as for step 7	R13	Minimum frequency shift while shorting and opening VCG IN BNC to ground	
11	Sine Distortion	Distortion analyzer (with 50Ω termination)		FREQ: X 1K VERNIER: CAL Dial: 5 WAVEFORM: ∿	R68, R71	Distortion < 0.16%	If minimum distortion cannot be met, refer to table 6-1.
12				Dial: 1		Distortion < 0.2%	If adjustment was necessary, repeat step 10.
13				FREQ: X 10K			
14	High Freq Sine Distortion			FREQ: X 1M Dial: 1 WAVEFORM: ⊓	C64	Minimum rise time with minimum overshoot	
15		Spectrum analyzer		WAVEFORM: ∿	None	All harmonics below −32 dB from 1 to 5 MHz	If not, refer to table 6-1.
16	Frequency	Counter		WAVEFORM: ⊓ FREQ: X 10K Dial: 5	R21	50 kHz ±100 Hz	
17				FREQ: X 1M	C22	5 MHz ±20 kHz	Repeat steps 15 and 16.
18				FREQ: X 100K	C17	500 ±1 kHz	Change C16 if necessary

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Table 5-1. Calibration Chart (Continued)

Step	Check	Tester	Cal Points	Control Settings	Adjust	Desired Results	Remarks
19	Frequency	Counter	50Ω OUT	FREQ: X 100	None	500 ±10 Hz	
20				FREQ: X 1K		5 kHz ±100 Hz	
21				FREQ: X 10K		50 ±1 kHz	
22	Time Symmetry	Dual channel scope		FREQ: X 10 Scope time base: 0.1s/div	R92	Time symmetry < 0.1%	Follow procedure in figure 5-1.
23	Frequency	Counter		Dial: 5	R88	50 ±0.1 Hz or 20 ms ±40 μs	Change R87 if necessary.
24				FREQ: X .001	None	5 mHz ±0.3 mHz 189 to 213 sec	
25				FREQ: X .01		.05 Hz ± 1 mHz or 20s ± 400ms	
26				FREQ: X .1		0.5 Hz ± 10mHz or 2s ± 40ms	
27				FREQ: X 1		5 Hz ± 100mHz or 0.2s ± 4ms	
28				FREQ: X 1K Dial: 5, 4, 3, 2, 1, .5		Dialed Freq ±100 Hz	
29				FREQ: X 1M Dial: .5, 1, 2, 3, 4, 5		Dialed Freq ± 100kHz	
30		Oscilloscope		FREQ: X 10K START FREQ: .5 inner scale. GEN MODE: CONT (LOG)	R26	5 kHz ±50 Hz	

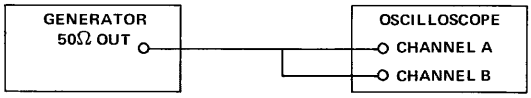
Remove the four screws attaching the main board to the long standoffs. Put the bottom cover on, but do not insert the screws. Place the instrument on its feet and remove the top cover for sweep board access. Steps 32 and 33 will require a similar maneuver for component access.

31	Sweep	Oscilloscope	50Ω OUT	FREQ: X 1K SWEEP MODE: SWEEP STOP STOP FREQ: 5 START FREQ: max cw	Sweep board R51	5 kHz ±10 Hz	

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Table 5-1 Calibration Chart (Continued)

Step	Check	Tester	Cal Points	Control Settings	Adjust	Desired Results	Remarks
32	Sweep	Oscilloscope	50Ω OUT	No change	Main board R3	Minimum frequency shift while rotating START FREQ dial thruout range	Repeat step 30.
33			SWP OUT	SWEEP TIME: 10 ms ▌1 ms SWEEP TIME VARIABLE: full ccw	Sweep board R37	SWEEP STOP amplitude = CONT RAMP amplitude ±10 mV	Switch SWEEP MODE to ensure results.

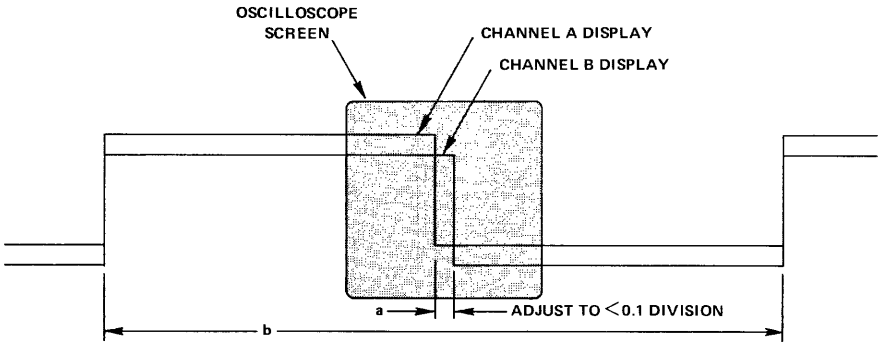


1. ADJUST OSCILLOSCOPE.

   TRIGGER: INTERNAL AND ALTERNATE
   CHANNEL A: NORMAL
   CHANNEL B: INVERTED

2. ADJUST START FREQ/VERNIER FOR ONE CYCLE ON SCOPE.

3. SWITCH X 10 SWEEP MAGNIFIER ON.



TIME SYMMETRY = 100 a/b%
SPECIFICATION: ±0.1%

Figure 5-1. Time Symmetry Measurement

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SECTION 6
TROUBLESHOOTING

6.1 INTRODUCTION

This section is organized as follows:

Circuit Board Access
Basic Techniques
Troubleshooting Individual Components
Troubleshooting Guide

(Refer to paragraph 5.2 for required test equipment.)

NOTE

Wavetek maintains a factory repair department for those customers not possessing the necessary personnel or test equipment to maintain the instrument. If an instrument is returned to the factory for calibration or repair, a detailed description of the specific problem should be attached to minimize turnaround time.

6.2 CIRCUIT BOARD ACCESS

Turn the instrument over, remove the four screws in the bottom cover and remove the bottom cover. For sweep board access, remove the four screws holding the main board to its long standoffs, place the instrument right side up and remove the top cover.

6.3 BASIC TECHNIQUES

Troubleshooting requires no special technique. Listed below are a few reminders of basic electronic fault isolation.

1. Check control settings carefully. Many times a seemingly malfunction is an incorrect control setting, or a knob that has loosened on its shaft.

2. Check associated equipment connections. Make sure that all connections are securely connected to the correct connector.

3. Perform the calibration procedure. Many out-of-specification indications can be corrected by performing specific calibration procedures.

4. Visually check the interior of the instrument. Look for such indications as broken wires, charred components, and loose leads.

6.4 TROUBLESHOOTING INDIVIDUAL COMPONENTS

6.4.1 Transistor

A transistor is defective if more than one volt is measured across its base emitter junction in the forward direction.

A transistor when used as a switch may have a few volts reverse bias voltage.

If the collector and emitter voltages are the same, but the base emitter voltage is less than 500 mV forward voltage (or reversed bias), the transistor is defective.

A transistor is defective if its base current is larger than 10% of its emitter current (calculate currents from voltage across the base and emitter series resistors).

6.4.2 Diode

A diode is defective if there is greater than 1 volt (typically 0.7 volt) forward voltage across it (except Zener and LED).

6.4.3 Operational Amplifier

The "+" and "–" inputs of an operational amplifier will have less than 15 mV voltage difference when operating under normal conditions.

If the output voltage stays at maximum positive, its "+" input voltage should be more positive than its "–" input voltage, or vice versa; otherwise, the operational amplifier is defective.

6.4.4 FET Transistor

No gate current should be drawn by the gate of an FET transistor. If so, the transistor is defective.

The gate-to-source voltage is always reverse biased under a normal operating condition; e.g., the source voltage is more positive than the gate voltage for 2N5485, and the source

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voltage is more negative than gate voltage for a 2N5462. Otherwise, the FET is defective.

6.4.5 Capacitor

Shorted capacitors have zero volts across their terminals.

Opened capacitor can be located (but not always) by using a good capacitor connected in parallel with the capacitor under test and observing the resulting effect.

6.5 TROUBLESHOOTING GUIDE

Table 6-1 provides a list of possible malfunction symptoms, their probable causes, and the prescribed remedies. Localize the fault to a specific stage by checking the parameters given for the test points. Then check the dc operating voltages at the pins of solid-state devices. Check associated passive elements with a high input impedance ohmmeter (power off) before replacing a suspected semiconductor element.

Table 6-1. Troubleshooting Guide

Symptom	Corrective Procedures
POWER SUPPLY PROBLEM	
Blown fuse	1. Check that the HI/LO and 115/230 switches at the rear panel are set correctly. (Refer to paragraph 2.2.) 2. Replace fuse; if fuse blows again, refer to the following steps. 3. Examine circuit boards and wiring for source of short circuit. 4. Use an ohmmeter to detect possible short circuits between power supply and ground and between individual power supplies. 5. Isolate each part of the circuit by unplugging the sweep board and unsoldering the jumpers along the power supply path. Plug in the sweep board and replace the jumpers one-by-one to isolate the overloading circuit. Frequently, a shorted capacitor is the problem.
±15V supply voltage below normal	Isolate the power supply from most of the generator circuits by unsoldering the two jumpers near the "+" end of C81 on the main circuit board. If supply voltage returns to normal, there is an extra loading current from a generator circuit; otherwise, troubleshoot the power supply circuitry.
±15V supply voltage above normal	Power supply circuit malfunction.
+5V regulator voltage abnormal	Isolate the regulator from generator circuits by unsoldering any leads at E15, E16 and E17. If regulator voltage returns to normal, there is an extra loading current from a generator circuit; otherwise, the trouble is in the regulator. Replace IC10.
Index (lighted indicator) on front panel abnormally bright or dim	HI/LO switch at the rear panel is not set correctly. (Refer to paragraph 2.2.)
OUTPUT WAVEFORM PROBLEM	
No output waveform at 50Ω OUT and PULSE OUT (GEN MODE at CONT)	1. Ensure power supply voltages are normal. 2. Temporarily remove Q44 on main board. If generator runs, problem is in the trigger and gate logic circuit. Otherwise, trouble is in the generator loop.

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Table 6-1. Troubleshooting Guide (Continued)

Symptom	Corrective Procedures
No output waveform at 50Ω OUT, but PULSE OUT normal, or all waveforms greatly distorted	Set the AMPLITUDE VARIABLE full ccw and set WAVEFORM to DC. If the output voltage at 50Ω OUT can be adjusted to ±10V into open circuit with the DC OFFSET control, the problem is in the preamplifier; otherwise, check the output amplifier.
Both waveform amplitude and frequency jittering	1. Power supply out of regulation due to ac line voltage being too low. Check line voltage. Make sure the HI/LO switch setting on rear panel is correct. (Refer to paragraph 2.2.) 2. Power supply malfunction. (Refer to Power Supply Problem.)
Distorted sine and square waveforms, but triangle waveform normal	Sine converter and square shaper malfunction. Check for defective diode. *NOTE* *If a diode is bad, the entire set of eight diodes should be replaced with a new matched set, or select a diode that gives minimum sine distortion at 1 kHz.*
Half of sine and square waveforms missing	1. Defective diodes CR17 or CR21. 2. Defective switch wafer or loose contact of SW3-A and SW3-B.
Distorted triangle and sine waveforms at one particular frequency range	1. Check for defective timing capacitor of the range (C15 thru C23). 2. Check C8 thru C10, C13, C25 and C94, if distortion shown at X 1 MHz range.
Distorted waveform or generator not running when X .001 Hz thru X 10 Hz selected	Capacitance multiplier malfunction.
Sine distortion out of specification at frequency below 500 kHz	1. Square wave time symmetry is not calibrated correctly. 2. Defective component in sine converter and square shaper. *NOTE* *If a diode is bad, the entire set of eight diodes should be replaced with a new matched set, or select a diode that gives minimum sine distortion at 1 kHz.* 3. Resistor R109, R111, R112 or R114 is out of tolerance. Connect 10 kΩ trim potentiometers in locations marked R111 and R112. Adjust the two trim potentiometers and also R68 and R71 to obtain less than 0.16% distortion. Remove the potentiometers, measure the resistance and replace with standard 1/8W resistors. If 0.16% distortion still cannot be achieved, remove both R110 and R113 and connect a 500Ω trim potentiometer in each location. Adjust the two trim potentiometers R68 and R71 for less than 0.16% distortion. Replace potentiometers with standard 1/8W resistors. 4. If sine distortion is OK at 1 kHz, but out of specification at 10 kHz, check for defective C31, C32, C38, Q6 and Q14.

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Table 6-1. Troubleshooting Guide (Continued)

Symptom	Corrective Procedures
Sine distortion out of specification at frequency greater than 500 kHz	1. Check square wave for slow rise/fall time. If so, check for defective capacitor in the preamplifier and output amplifier. 2. Frequency dial accuracy and sine distortion problems at X 1M range are due to the excess peaking or roll-off of the triangle waveform. Capacitors C28 and C35, also C29 and C34, need to be selected for maximum flatness of the triangle peak voltages at emitter of Q19. To check the flatness of the triangle peak voltage, a high frequency oscilloscope and a X 10 scope probe (> 150 MHz bandwidth) should be used. The oscilloscope probe should be correctly compensated and its ground lead length should keep to minimum. 3. If triangle is distorted, check for defective capacitors C8 thru C10, C13, C25 and C94. 4. Check for defective diodes CR10 or CR11.
TIME SYMMETRY PROBLEM	
Positive slope of triangle remains constant when frequency dial varied	1. Defective Q5, Q6, C9, IC3 and associated circuitry. 2. Defective Q9 thru Q12 and CR6 thru CR9.
Negative slope of triangle remains constant when frequency dial varied	1. Defective IC3 and associated circuitry. 2. Defective Q9 thru Q12 and CR6 thru CR9.
Symmetry cannot be adjusted to specification	Defective Q6, Q14, R33, R34, R40 and R41.
Symmetry worse at low frequency end of dial	Check for high leakage components Q6, Q9 thru Q12 and Q14.
Symmetry out of specification at X 10 frequency range or below	Defective IC6 and associated circuitry.
FREQUENCY ACCURACY PROBLEM	
Frequency accuracy out of specification at X 1 kHz range	1. Mismatched dial and potentiometer, if frequency is out of specification at the same portion of the dial in every range. Ensure that the number or the back of the dial matches the number on the potentiometer. 2. Defective dial potentiometer. 3. VCG amplifier (IC2) or current source (IC3) is saturated when frequency dial is set to the top (5.0). Check for defective Q1, Q6, IC2 and associated circuitry.
Frequency accuracy out of specification at X 10K and X 100 kHz ranges	Check for defective C30 thru C33, C38 and R61 thru R66.
Frequency accuracy out of specification at X 1 MHz range	Check for defective C25, C28, C29, C34, C35, R60, R67, CR10 and CR11.

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Table 6-1. Troubleshooting Guide (Continued)

Symptom	Corrective Procedures
Frequency accuracy out of specification at X .001 to X 10 Hz ranges	1. R90 and R94 thru R96 are mismatched. Defective R97. 2. Defective IC5, IC6 and associated circuitry. 3. If triangle is distorted when dial is set to the top (5.0), defective regulator Q22 and Q23.
MODE OF OPERATION PROBLEM	
Output not in agreement with GEN MODE switch setting	Trigger and gate logic circuit or IC8 malfunction.
Generator running in trigger or gated mode	If voltage at pin 11 of IC8 is 0 to 0.4V (logic zero) when TRIG mode is selected, the problem is in the trigger amplifier (Q42 thru Q45). Otherwise, troubleshoot IC8, IC9 and associated circuitry.
Generator can be triggered by operating MAN TRIG switch, but not by external signal	Squaring circuit malfunction.
LOG CONVERTER PROBLEM	
Frequency varies much less than 5 decades when varying the dial with log frequency selected	1. Defective R18 and R225 in the log converter. 2. Defective Q2, Q3 and associated components.
Frequency jittering when log frequency selected	Defective R28 and C7 in the log converter.
FREQUENCY SWEEP PROBLEM (Unless otherwise specified, all components on sweep board)	
STOP FREQ dial accuracy out of specification	1. If the 11-state counter is not set at the 11th step, it is malfunctioning. 2. If the amplifier output (junction of CR11 and R53) is not at its maximum (+7.5V approximately), the D/A converter or output amplifier is malfunctioning. 3. Sweep inverting amplifier on main board is malfunctioning; its gain should be −1. 4. Defective dial potentiometer or mismatched dial and potentiometer.
Generator frequency not sweeping and no ramp signal output at SWP OUT (GEN MODE at SWEEP and SWEEP MODE at CONT RAMP)	1. If voltage at pin 9 of IC2 is not 0V, IC6, R9, R14, C1 or SW2-A defective. 2. If ramp signal is not seen at pin 6 of IC1, ramp generator malfunctioning; otherwise, problem is in IC3.

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Table 6-1. Troubleshooting Guide (Continued)

Symptom	Corrective Procedures
Generator frequency not stepping and no staircase signal at SWP OUT (SWEEP MODE at CONT STEP)	1. If no clock pulse is seen at pin 3 of IC4 in the 11-state counter, the ramp generator is not running. 2. IC4 or IC6 is malfunctioning.
Number of steps at SWP OUT not 10	IC4, IC5, IC6 or 11-state counter is malfunctioning.
Staircase missing step or looks as if steps are random	D/A converter Q10 thru Q13 is malfunctioning.
Main generator output not oscillating at stop frequency as indicated by STOP FREQ dial (SWEEP MODE at SWEEP STOP)	Q8 is defective.

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SECTION 7
PARTS AND SCHEMATICS

7.1 DRAWINGS

The following assembly drawings (with parts lists) and schematics are in the arrangement shown below.

7.2 ORDERING PARTS

When ordering spare parts, please specify part number, circuit reference, board, serial number of unit, and if applicable, the function performed.

7.3 ADDENDA

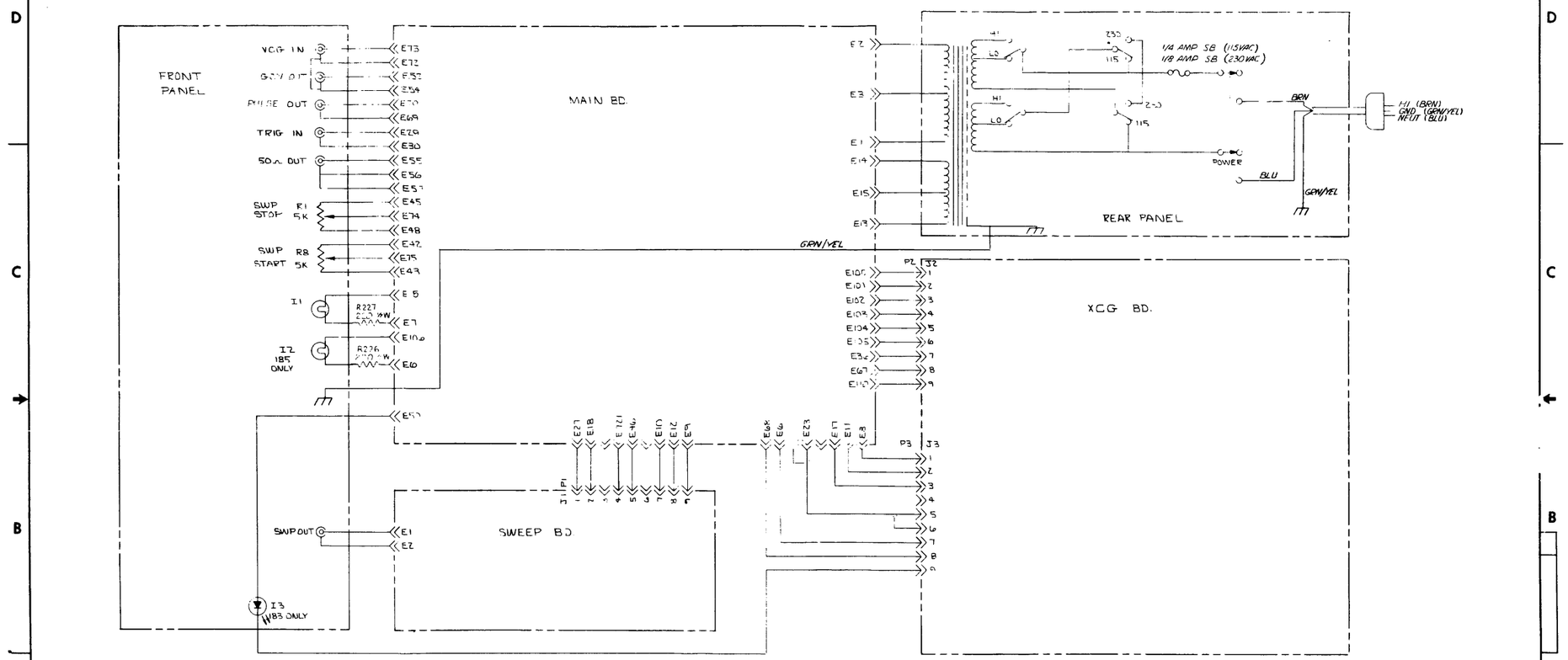
Under Wavetek's product improvement program, the latest electronic designs and circuits are incorporated into each Wavetek instrument as quickly as development and testing permit. Because of the time needed to compose and print instruction manuals, it is not always possible to include the most recent changes in the initial printing. Whenever this occurs, addendum pages are prepared to summarize the changes made and are inserted immediately inside the rear cover. If no such pages exist, the manual is correct as printed.

	Drawing No.
CHASSIS	
Schematic	0004-00-0054
Assembly Drawing	0102-00-0317
Parts List	1101-00-0058
MAIN BOARD	
Schematic	0103-00-0126
Assembly Drawing	0101-00-0126
Parts List	1100-00-0129
SWEEP BOARD	
Schematic	0103-00-0124
Assembly Drawing	0101-00-0124
Parts List	1100-00-0124

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REV	ECN	BY	DATE	APP
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B	ECN 1719	BA	3-18-86	
C	FAULT UPDATE ECN 1744	BA	7-14-86	



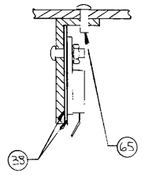
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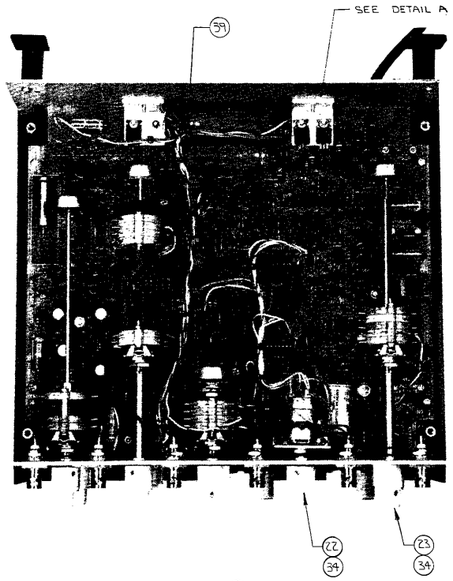
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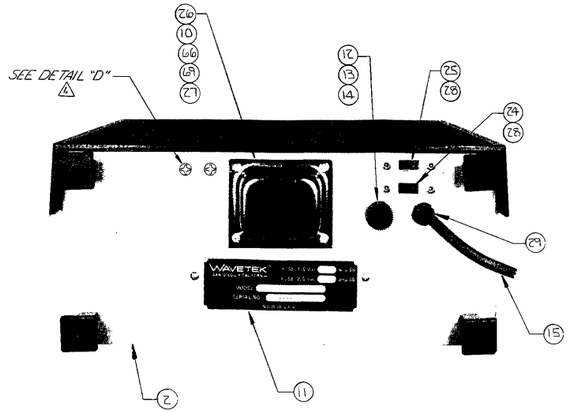
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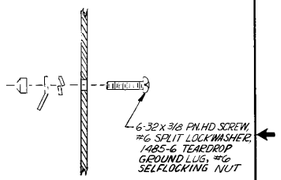
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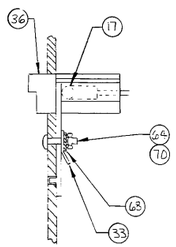
DETAIL A



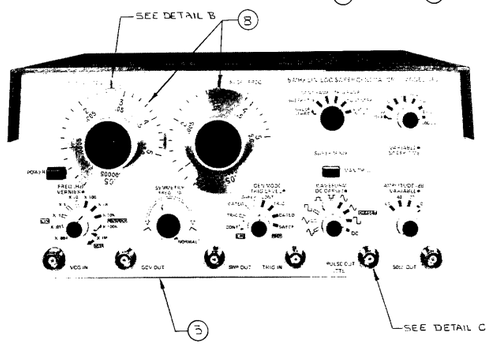


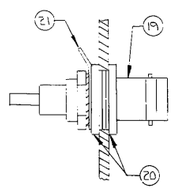


DETAIL "D"
GROUND LUG INSTL.
(2 PLACES)

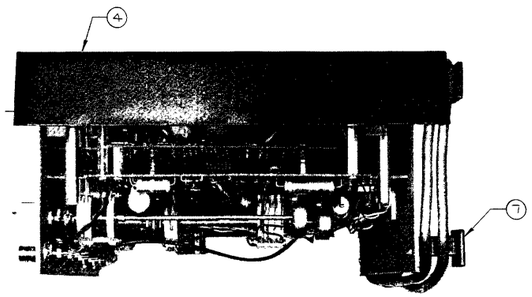


DETAIL B





DETAIL C



⚠ ALL CONNECTIONS TO BE MECHANICALLY SECURE TO LUGS PRIOR TO SOLDERING GROUND WIRES.

NOTE UNLESS OTHERWISE SPECIFIED

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	SCALE	CODE IDENT 23338	SHEET 1 OF 1

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG CHASSIS	0102-00-0317	WVTK	0102-00-0317	1
NONE	DIAL ASSY	185-026	WVTK	1201-00-0026	2
26	TRANSFORMER	5600-00-0022	WVTK	1204-00-0483	1
10	END BELL	110-333	WVTK	1400-00-0174	1
36	PLATE, NAME	139-305	WVTK	1400-00-2180	1
NONE	INDICATOR, DIAL	180-303	WVTK	1400-00-4970	2
1	COVER, TOP	180-300-1	WVTK	1400-00-5000	1
NONE	EXPANDER	180-301	WVTK	1400-00-5010	2
NONE	POST	180-302	WVTK	1400-00-5020	4
2A	COVER, BOTTOM	180-300-2	WVTK	1400-00-5030	1
2	PANEL, REAR	182-301	WVTK	1400-00-5113	1
NONE	CORD HOLDER	1400-00-5409	WVTK	1400-00-5409	1
3	PANEL, FT	1400-00-8740	WVTK	1400-00-8740	1
11	I.D. LABEL	1400-00-9110	WVTK	1400-00-9110	1
NONE	BNC CONN	KC-7946	KING	2100-01-0002	6
NONE	SOLDER LUG	1497	SMITH	2100-04-0012	6
27	SOLDER LUG	1483-6	SMITH	2100-04-0025	4
NONE	CONN	60598-9	AMP	2100-05-0017	2

WAVETEK PARTS LIST	TITLE STD CHASSIS	ASSEMBLY NO. 1101-00-0058 PAGE: 1	REV A

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NONE	STD KNOB	RB-67-1-SB-M	ROGAN	2400-01-0008	2
NONE	COAX KNOB SET	RB-67-1-SB+0-M-9	ROGAN	2400-01-0009	5
NONE	LAMP	7876	JKL	2400-02-0013	2
12	FUSE, 1/4A, 250V, S-B	313.250	LITFU	2400-05-0008	1
14	FUSE HOLD	031.1633/031.1666	SCHUR	2400-05-0012	1
NONE	BUSHING NYLINER	4L2FF	THOMN	2800-01-0002	7
NONE	STANDOFF, MALE/FEMALE 1.750 H., .250 HEX 8-32	1475-M03-F05-832	UNICP	2800-02-0010	4
NONE	STANDOFF, MALE/FEMALE 2.375 H., .250 HEX 4-40	1495-M03-F05-440	UNICP	2800-02-0011	4
6	BAIL ASSY W/FT	180-500	WVTK	2800-08-0010	1
61	SPEEDNUT, SELF RETAIN	C7494-632-4	TINN	2800-09-0003	6
NONE	WASHER, SHOULDER	2668	SMITH	2800-27-0004	12
29	STRAIN RELIEF BUSH	SR6W-1	HEYCO	2800-37-0003	1
24	SW ASSY SLIDE HI-LO	SW422-FT-MK	UID	5105-00-0001	1
25	SWITCH ASSY SLIDE	46256-LF	SWCFT	5105-00-0002	1
NONE	SOLDER GUARD	46256-LF-SG	SWCFT	5105-09-0001	2
15	PWR CORD	0-7789-008-GY	PACRD	a001-80-0004	1

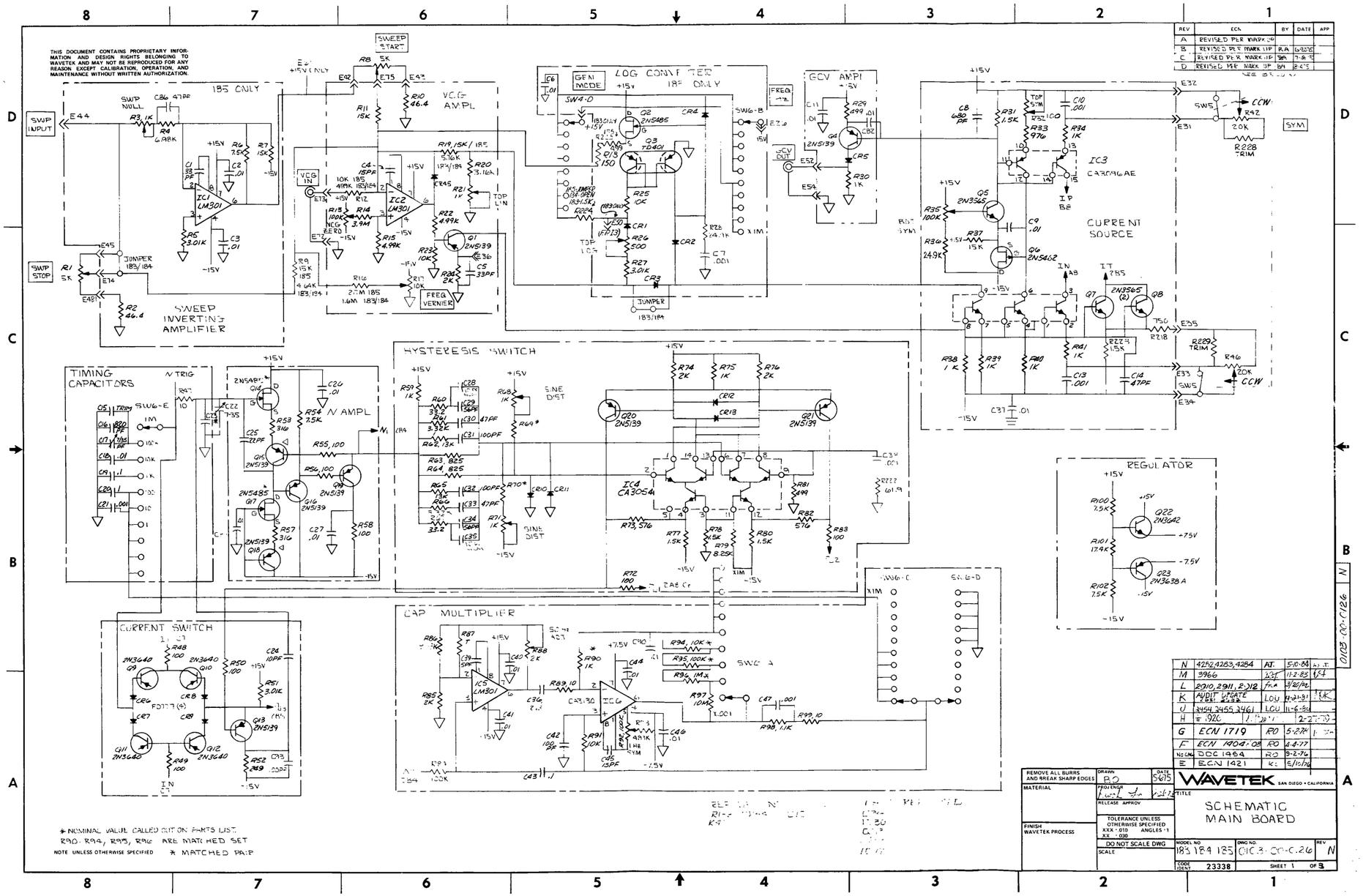
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REV	ECN	BY	DATE	APP

SWEEP A

SWEEP GENERATOR

SWEEP AMPLIFIER

OUTPUT AMPLIFIER

SQUARING CIRCUIT

TRIGGER AND GATE LOGIC

TTL SYNC PULSE GENERATOR

MAIN TRIG

SV REGULATOR

± 15V POWER SUPPLY

SCHEMATIC MAIN BOARD

* FD 777 MATCHED SET OF 8

NOTE UNLESS OTHERWISE SPECIFIED

△ MATCHED PAIR

REMOVE ALL BURRS AND BREAK SHARP EDGES

MATERIAL

FINISH WAVETEK PROCESS

TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030

DO NOT SCALE DWG

SCALE

DRAWN 5-6-85

PROJ ENGR

RELEASE APPROV

WAVETEK SAN DIEGO • CALIFORNIA

MODEL NO 183 184 185

DWG NO 0103-00-0126

REV N

CODE IDENT 23338

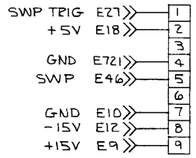
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0103-00-0126 N

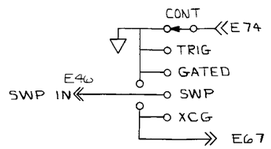
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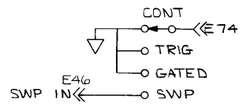


P1 TO SWEEP BD.
ALL MODELS



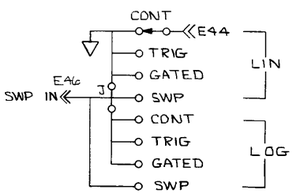
SW4 - A

GEN MODE SWITCH
MODEL 183



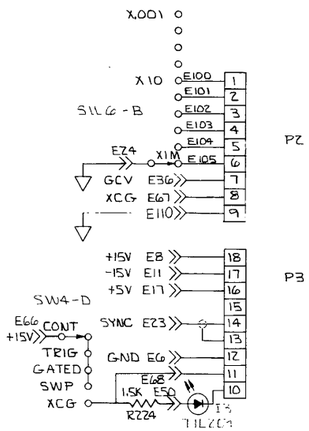
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GEN MODE SWITCH
MODEL 184

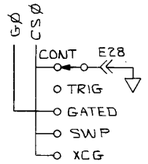


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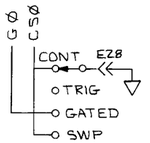
GEN MODE SWITCH
MODEL 185



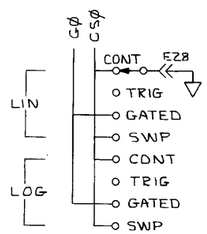
CONNECTORS TO XCG BD.
183 ONLY



SW4-C



SW4-C



SW4-C

NOTE: UNLESS OTHERWISE SPECIFIED

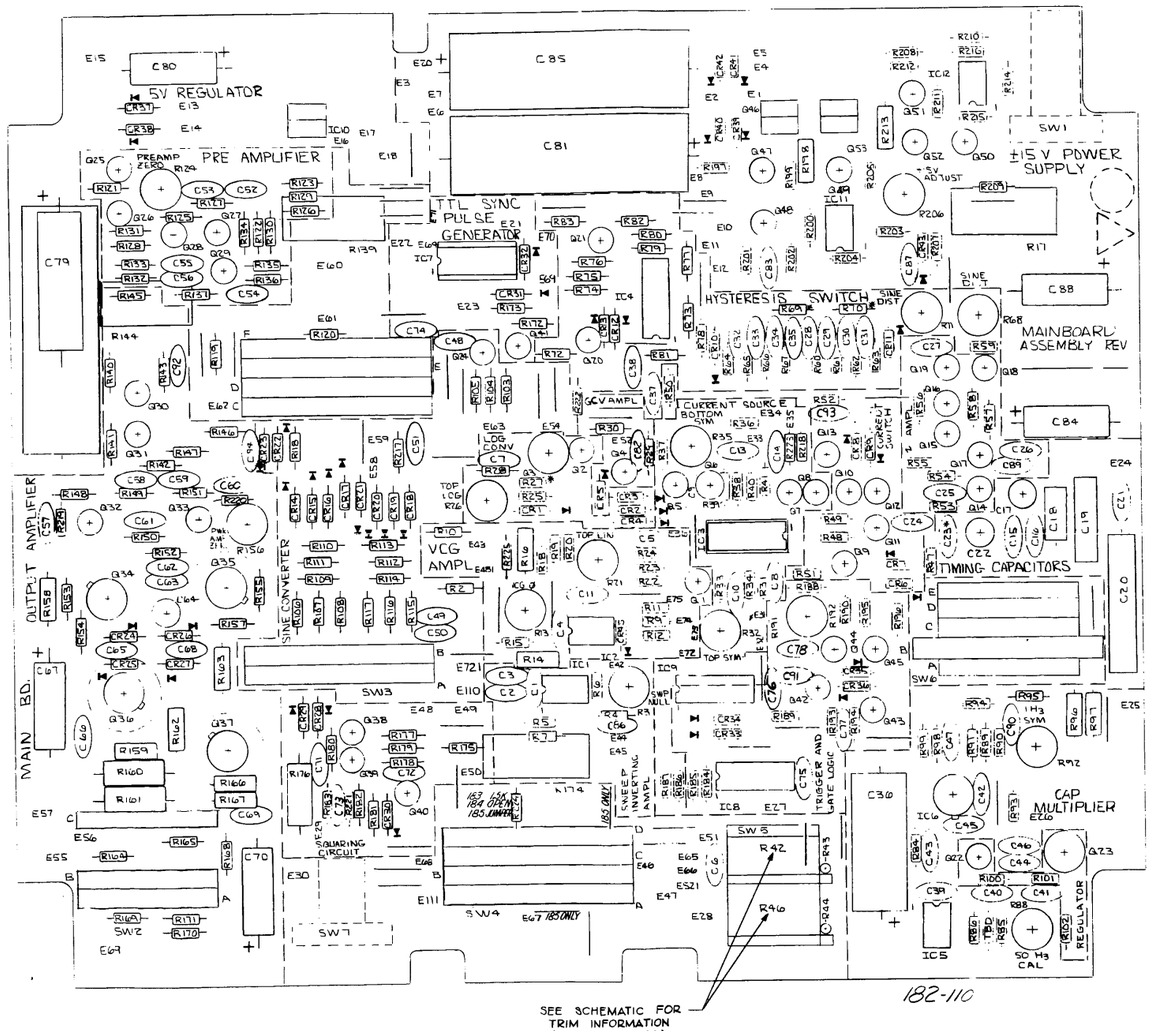
REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE 5-6-85	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE
	RELEASE APPROV		SCHEMATIC MAIN BOARD
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX : 010 XX : 030 ANGLES : 1		
	DO NOT SCALE DWG	MODEL NO 183,184,185	DWG NO 0103-00-0126 REV N
	SCALE	CODE IDENT 23338	SHEET 2 OF 3

N 0103-00-0126

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E721 WAS E72
E481 " E48
E521 " E52
E111 WAS E9
E110 ADDED TO
HOLE UNDER E721

REV	ECN	BY	DATE	APP
A	REVISED PER ENG MARK-UP	BA	8-4-75	
B	ECN 1521	RO	2-16-77	
C	ECN 1604; 1608	RO	4-4-77	
D	ECN 1719	RO	5-2-78	K. Fo
F	2611-2603	LNT	5-8-81	K. Fo
F	2294, 2237, 2634, 2632	LOU	5-30-81	RK
G	2910, 2911, 2912	TAK	11/1/82	
H	3966	WT	11/4/83	WT



4. * NOMINAL VALUE CALLED OUT IN PARTS LIST.
3. CR3 IS JUMPER IN MODELS 183, 184
2. SOLDER R227 AT E7 LOCATION ON 183, 184, 185
ADD R226 AT E111 ON MODEL 185.
1. 9 PIN MOLEX TO CRYSTAL BD TO BE WIRED BACKWARDS SO THAT BROWN WIRE IS PIN 9 AND WHITE WIRE IS PIN 1.

MASTERLEVEL 3-23-84

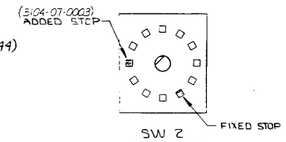
DRAWN BA	DATE 7-14-75	WAVETEK
PROJ ENGR		TITLE SILKSCREEN ASSEMBLY PRINT (MAIN BOARD)
RELEASE APPROV		
SCALE 2/1	MODEL NO. 183 184 185	DWG NO. 0101-00-0126 REV H
	23338	SHEET 1 OF 2

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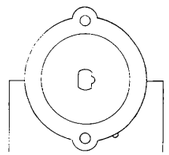
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REV	ECN	BY	DATE	APP

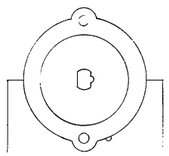
△3 ADD SHRINK SLEEVE TO SWITCH POT (R194) SHAFT. TO PREVENT SHORTING.



SW 2
5104-99-0004
(MADE FROM 5104-01-0003)



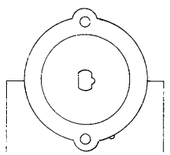
SW2-A
5104-02-0013



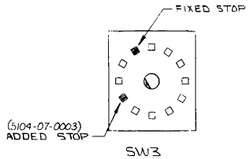
SW2-B
5104-02-0013



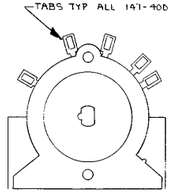
SW. PLATE
1400-00-2130



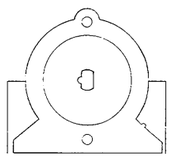
SW2-C
5104-02-0013



SW3
5104-99-0044
(MADE FROM 5104-01-0007)



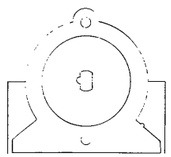
SW3-A
5104-02-0015



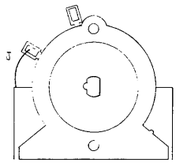
SW3-B
5104-02-0015



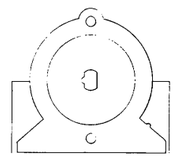
SW. PLATE
1400-00-2130



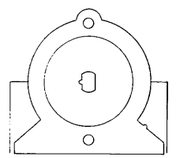
SW3-C
5104-02-0015



SW3-D
5104-02-0015



SW3-E
5104-02-0015



SW3-F
5104-02-0015

MODEL 185 ONLY

SW4
5104-99-0016
(MADE FROM 5104-99-0042)

MODEL 184 ONLY

SW4
5104-99-0015
(MADE FROM 5104-99-0042)

MODEL 183 ONLY

SW4

SW4-A
5104-02-0015

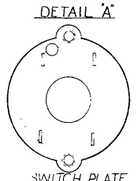
SW4-B
5104-02-0015

SW4-C
5104-02-0015

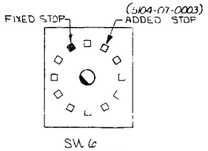
SW4-D
5104-02-0015

SWITCH PLATE
1400-00-2130

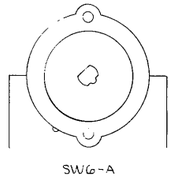
DETAIL "A"



SWITCH PLATE
(1400-00-2130)

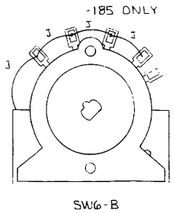


SW6
5104-99-0023
(MADE FROM 5104-01-0007)

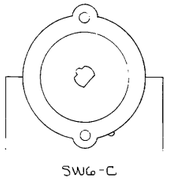


SW6-A
5104-02-0013

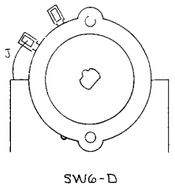
-185 ONLY



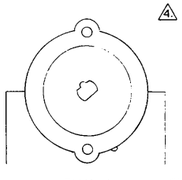
SW6-B
5104-02-0015
(147-SW1-1
184-ONLY)



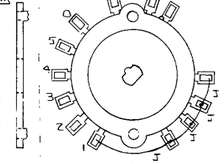
SW6-C
5104-02-0013



SW6-D
5104-02-0008



SW6-E
5104-02-0013



SW. PLATE
1400-00-2130

SW6-B
T105

△4 ADD SWITCH PLATE. AS SHOWN (4 PLACES) SEE DETAIL "A"
△3 ADD SHRINK SLEEVING TO POT SHAFT (SW2)
2. DETENTS & WAFERS ARE THE SAME FOR ALL MODELS EXCEPT AS INDICATED.
1. ALL DETENTS & WAFERS ARE SHOWN FROM FRONT VIEW IN FULL COUNTER CLOCKWISE POSITION.

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN BA	DATE 6/6/75	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE
	RELEASE APPROV		SWITCH DWG MAIN BOARD
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 .XX ±.030 ANGLES ±1		
	DO NOT SCALE DWG	MODEL NO 183-184-185	DWG NO 0101-00-0126 REV H
	SCALE	CODE IDENT 23338	SHEET 2 OF 2

0101-00-0126 H

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REV	ECN	BY	DATE	APP

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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG MAIN	0101-00-0126	WVTK	0101-00-0126	1
NONE	SCHEMATIC MAIN	0103-00-0126	WVTK	0103-00-0126	1
NONE	G.C.DRWG MAIN	0107-00-0126	WVTK	0107-00-0126	1
NONE	ASSY, COAX 8 1/2" 184-185-0120	184-185-1990	WVTK	1207-00-1990	1
NONE	ASSY, LAMP 184-185	184-185-1991	WVTK	1207-00-1991	1
NONE	ASSY, MAIN BOARD HARNESS 185-1523	185-1994	WVTK	1207-00-1994	1
NONE	ASSY, SWEEP HARNESS 185-0129	185-1995	WVTK	1207-00-1995	1
NONE	ASSY, LAMP 185-0129	185-1996	WVTK	1207-00-1996	1
NONE	BRKT	133-305	WVTK	1400-00-1673	1
NONE	PLATE,SW	008-004	WVTK	1400-00-2130	3
181	SPRING REF: 3200-01-0001	147-383	WVTK	1400-00-3750	1
NONE	BRKT,HEAT SINK	182-308	WVTK	1400-00-5143	2
NONE	ROD,POWER	182-309	WVTK	1400-00-5150	1
NONE	BRKT,POWER ROD	182-310	WVTK	1400-00-5163	2
C39 C62 C63 C92	CAP,CER,5PF,1KV	DD-050	CRL	1500-00-5011	4
C24 C73 C78	CAP,CER,10PF,1KV	DD-100	CRL	1500-01-0011	3

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO	QTY/PT
C31 C32 C42 C75 C93	CAP,CER,100PF,1KV	DD-101	CRL	1500-01-0111	5
C10 C13 C21 C38 C47 C7	CAP,CER, 001MF,1KV	DD-102	CRL	1500-01-0211	6
C11 C2 C26 C27 C3 C37 C40 C41 C44 C46 C48 C49 C50 C52 C53 C54 C55 C56 C58 C59 C6 C61 C65 C68 C72 C77 C82 C83 C87 C89 C9 C90 C94	CAP,CER,MN, 01MF,50V	CAC022S0103I100A	CORNG	1500-01-0310	33
C43 C57 C60 C66 C69 C74 C76	CAP,CER,MON, 1MF,50V	CAC03Z5U1042050A	CORNG	1500-01-0405	7
C4 C45	CAP,CER,15PF,1KV	DD-150	CRL	1500-01-5011	2
C25T C28T C35T	CAP,CER,22PF,1KV	DD-220	CRL	1500-02-2011	3
C1 C5 C71 C91	CAP,CER,33PF,1KV	DD-330	CRL	1500-03-3011	4
C14 C30 C33 C86	CAP,CER,47PF,1KV	DD-470	CRL	1500-04-7011	4
C29 C34	CAP,CER,56PF,1KV	DD-560	CRL	1500-05-6001	2
C51	CAP,CER,68PF,1KV	DD-680	CRL	1500-06-8001	1
C8	CAP,CER,680PF,1KV	DD-681	CRL	1500-06-8111	1
C23T	CAP,MICA,47PF,500V	DM15-470J	ARCO	1500-14-7000	1
C15	CAP,MICA,82PF,500V	DM15-820J	ARCO	1500-18-2000	1

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 2

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C16	CAP,MICA,820PF,300V	DM15-821F	ARCO	1500-18-2101	1
C67 C70 C80	CAP,ELECT,100MF,16V	500D1070016DC7	SPRAG	1500-31-0101	3
C81 C85	CAP,ELECT,1000MF,35V	39D10860359L6	SPRAG	1500-31-0212	2
C79 C84 C88	CAP,ELECT,250MF,16V	500D2570016DF7	SPRAG	1500-32-5101	3
C36	CAP,MYLR,2MF,200V	2MFW205K	AMRAD	1500-42-0504	1
C64	VARI,3.5-13PF,250V	7S-TRIKO-02 3.5/13PF	TRIKO	1500-51-3000	1
C17 C22	VARI,7-35PF,250V	7S-TRIKO-02 7/35 PF	TRIKO	1500-53-5000	2
	CAP SET,POLYC MIXED MATCHED SET	180-501	WVTK	1509-80-0008	1
C18	CAP,POLYC,.01MF,100V PART OF 1509-80-0008 QTY(1)				
C19	CAP,POLYC,.1MF,100V PART OF 1509-80-0008 QTY(1)				
C20	CAP,POLYC,1MF,100V PART OF 1509-80-0008 QTY(1)				
2	MAIN	182-110	WVTK	1700-00-0126	1
NONE	CONN,9PIN	09-50-7091	MOLEX	2100-02-0051	1
173	SKT.IC.14 PIN	DILB14P/108	BURND	2100-03-0066	1

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	SKT.IC.16 PIN	DILB16P-108	BURND	2100-03-0067	1
NONE	SOLDER LUG	1497	SMITH	2100-04-0012	2
NONE	PIN	08-50-0105	MOLEX	2100-05-0025	9
NONE	HEAT SINK	207	WAKE	2800-11-0001	4
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	1
NONE	TRANSIPAD	10160	METRS	2800-11-0004	4
R156 R32	POT.TRIM.100	91AR100	BECK	4600-01-0103	2
R144	POT.CONT.1K	180-401	WVTK	4600-01-0207	1
R192 R206 R21 R3 R68 R71	POT.TRIM.1K	91AR1K	BECK	4600-01-0209	6
R139 R17	POT.CONT.10K	182-401	WVTK	4600-01-0312	2
R13 R35 R92	POT.TRIM.100K	91AR100K	BECK	4600-01-0402	3
R124	POT.TRIM.20	91AR20	BECK	4600-02-0000	1
R88	POT.TRIM.2K	91AR2K	BECK	4600-02-0201	1
R26	POT.TRIM.500	91AR500	BECK	4600-05-0104	1
SW5	POT.SWITCH.20K	DP6407-20K	WVTK	4602-02-0302	1
R174	POT.CONT.10K FROM 4600-01-0307	4609-71-0313	WVTK	4609-71-0313	1

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 4

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO	QTY/PT
R158 R163	RES.C.1/2W,5%,10	RC20GF-100	STKPL	4700-25-0100	2
R198 R213	RES.C.1/2W,5%,3.9	RC20GF-3R9	STKPL	4700-25-0399	2
R159 R162	RES.C.1/2W,5%,8.2	RC20GF-8R2	STKPL	4700-25-0829	2
R97	RES.C.1/2W,5%,10M	RC20GF-106	STKPL	4700-25-1005	1
R226 R227	RES.C.1/2W,5%,220	RC20GF-221	STKPL	4700-25-2200	2
R16	RES.C.1/2W,5%,2.7M	RC20GF275	STKPL	4700-25-2704	1
R14	RES.C.1/2W,5%,3.9M	RC20GF-395	STKPL	4700-25-3904	1
R176	RES.C.1W,10%,10K	RC32GF-103	STKPL	4700-35-1002	1
R105 R177 R189 R196 R219 R220 R48 R49 R50 R55 R56 R58 R72 R83	RES.MF,1/8W,1%,100	RN55D-1000F	TRW	4701-03-1000	14
R121 R125 R140 R142 R30 R34 R38 R39 R40 R41 R59 R75	RES.MF,1/8W,1%,1K	RN55D-1001F	TRW	4701-03-1001	12
R12 R127 R202 R210 R23 R25 R91	RES.MF,1/8W,1%,10K	RN55D-1002F	TRW	4701-03-1002	7
R84	RES.MF,1/8W,1%,100K	RN55D-1003F	TRW	4701-03-1003	1
R47 R89 R99	RES.MF,1/8W,1%,10	RN55D-10R0F	TRW	4701-03-1009	3
R98	RES.MF,1/8W,1%,1.1K	RN55D-1101F	TRW	4701-03-1101	1
R131 R134	RES.MF,1/8W,1%,1.21K	RN55D-1211F	TRW	4701-03-1211	2

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 5

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R119 R122	RES.MF,1/8W,1%,124	RN55D-1240F	TRW	4701-03-1240	2
R108 R117 R62 R65	RES.MF,1/8W,1%,13K	RN55D-1302F	TRW	4701-03-1302	4
R155 R18	RES.MF,1/8W,1%,150	RN55D-1500F	TRW	4701-03-1500	2
R182 R223 R31 R77 R78 R80	RES.MF,1/8W,1%,1.5K	RN55D-1501F	TRW	4701-03-1501	6
R11 R175 R184 R185 R186 R187 R19 R37 R7 R9	RES.MF,1/8W,1%,15K	RN55D-1502F	TRW	4701-03-1502	10
R154 R157	RES.MF,1/8W,1%,15	RN55D-15R0F	TRW	4701-03-1509	2
R101	RES.MF,1/8W,1%,17.4K	RN55D-1742F	TRW	4701-03-1742	1
R179	RES.MF,1/8W,1%,1.78K	RN55D-1781F	TRW	4701-03-1781	1
R106 R115	RES.MF,1/8W,1%,19.1K	RN55D-1912F	TRW	4701-03-1912	2
R109 R114	RES.MF,1/8W,1%,200	RN55D-2000F	TRW	4701-03-2000	2
R103 R129 R141 R148 R151 R24 R74 R76 R85	RES.MF,1/8W,1%,2K	RN55D-2001F	TRW	4701-03-2001	9
R217	RES.MF,1/8W,1%,21.5	RN55D-21R5F	TRW	4701-03-2159	1
R133 R147 R153 R168 R52	RES.MF,1/8W,1%,249	RN55D-2490F	TRW	4701-03-2490	5
R135 R136 R200 R204 R211	RES.MF,1/8W,1%,2.49K	RN55D-2491F	TRW	4701-03-2491	5

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 6

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: PARTS LIST MAIN
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO: 185	DWG NO: 1100-00-0129 REV: L
	SCALE	CODE IDENT: 23338	SHEET 1 OF 2

BISHOP GRAPHICS/ACCUPRESS REORDER NO. 4-3254

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REV	FCN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R107 R116 R149 R221 R28 R36	RES.MF,1/8W,1%,24.9K	RN55D-2492F	TRW	4701-03-2492	6
R137T	RES.MF,1/8W,1%,27.4	RN55D-27R4F	TRW	4701-03-2749	1
R27T	RES.MF,1/8W,1%,2.87K	RN55D-2871F	TRW	4701-03-2871	1
R188 R5 R51	RES.MF,1/8W,1%,3.01K	RN55D-3011F	TRW	4701-03-3011	3
R120 R53 R57	RES.MF,1/8W,1%,316	RN55D-3160F	TRW	4701-03-3160	3
R20	RES.MF,1/8W,1%,3.16K	RN55D-3161F	TRW	4701-03-3161	1
R123 R152 R61 R66	RES.MF,1/8W,1%,3.32K	RN55D-3321F	TRW	4701-03-3321	4
R130 R132 R60 R67	RES.MF,1/8W,1%,33.2	RN55D-33R2F	TRW	4701-03-3329	4
R118	RES.MF,1/8W,1%,392	RN55D-3920F	TRW	4701-03-3920	1
R146	RES.MF,1/8W,1%,4.64K	RN55D-4641F	TRW	4701-03-4641	1
R10 R145 R2	RES.MF,1.8W,1%,46.4	RN55D-46R4F	TRW	4701-03-4649	3
R104 R171 R173 R181 R199 R201 R209 R212 R225 R29 R81	RES.MF,1/8,1%,499	RN55D-4990F	TRW	4701-03-4990	11
R126 R128 R15 R170 R178 R183 R191 R197 R203 R208 R214 R22 R93	RES.MF,1/8W,1%,4.99K	RN55D-4991F	TRW	4701-03-4991	13
R190 R195	RES.MF,1/8W,1%,51.1	RN55D-51R1F	TRW	4701-03-5119	2

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 7

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	RES.MF,MIXED SET	164-501-89A	WVTK	4789-00-0036	1
R90	RES,MF,1/8W,1%,1K PART OF 4789-00-0036 QTY(1)				
R94	RES,MF,1/8W,1%,10K PART OF 4789-00-0036 QTY(1)				
R95	RES,MF,1/8W,1%,100K PART OF 4789-00-0036 QTY(1)				
R96	RES,MF,1/4W,1%,1M PART OF 4789-00-0036 QTY(1)				
CR43	DIODE	1N4581	MICRO	4801-01-4581	1
CR37 CR38 CR39 CR40 CR41 CR42	DIODE	1N4002	FAIR	4801-02-0001	6
CR6 CR7 CR8 CR9	DIODE	FD777	FAIR	4807-02-0777	4
CR1 CR10 CR11 CR12 CR13 CR2 CR22 CR23 CR24 CR25 CR26 CR27 CR28 CR29 CR3 CR30 CR31 CR32 CR33 CR34 CR35 CR36 CR4 CR45 CR5	DIODE	1N4148	FAIR	4807-02-6666	25
CR14 CR15 CR16 CR17	DIODE,SET,8-FD-777	182-500-98	WVTK	4898-00-0010	1

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 9

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	Q31 QTY:2:4901-05-1390				
	Q14 Q17 TRANS,M/PR,2N5485 QTY:2:4901-05-4850	142-501-53	WVTK	4998-00-0009	1
	SW1 SWITCH ASSY PB	5103-00-0020	WVTK	5102-00-0005	1
	SW7 SWITCH ASSY PB	5103-00-0021	WVTK	5103-00-0021	1
	SW2 DETENT	130-402	WVTK	5104-01-0003	1
	SW6D WAFER	133-SW1-1	WVTK	5104-02-0008	1
	SW2A SW2B SW2C SW6A SW6C SW6E WAFER	142-SW1-1	WVTK	5104-02-0013	6
	SW3A SW3B SW3C SW3D SW3E SW3F SW4A SW4B SW4C SW4D SW4E WAFER	147-400	WVTK	5104-02-0015	11
	SW4 DETENT,MOD FROM 5104-01-0003	5104-99-0042	WVTK	5104-99-0042	1
	SW3 SW6 DETENT MOD FROM 5104-01-0010	5104-99-0044	WVTK	5104-99-0044	2
	IC1 IC2 IC5 IC	LM 301AN	NSC	7000-03-0100	3
	IC11 IC12 IC	LM741CN	NSC	7000-07-4100	2
	IC4 IC	CA-3054	RCA	7000-30-5400	1
	IC3 IC	CA-3096AE	RCA	7000-30-9600	1
	IC6 IC	CA-3130	RCA	7000-31-3000	1

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 11

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R110 R113	RES.MF,1/8W,1%,523	RN55D-5230F	TRW	4701-03-5230	2
R164	RES.MF,1/8W,1%,56.2	RN55D-56R2F	TRW	4701-03-5629	1
R73 R82	RES.MF,1/8W,1%,576	RN55D-5760F	TRW	4701-03-5760	2
R207	RES.MF,1/8W,1%,6.19K	RN55D-6191F	TRW	4701-03-6191	1
R169 R222	RES.MF,1/8W,1%,61.9	RN55D-61R9F	TRW	4701-03-6199	2
R180 R4	RES.MF,1/8W,1%,6.98K	RN55D-6981F	TRW	4701-03-6981	2
R218	RES.MF,1/8W,1%,750	RN55D-7500F	TRW	4701-03-7500	1
R100 R150 R172 R193 R194 R54 R6	RES.MF,1/8W,1%,7.5K	RN55D-7501F	TRW	4701-03-7501	7
R143 R63 R64	RES.MF,1/8W,1%,825	RN55D-8250F	TRW	4701-03-8250	3
R205 R79	RES.MF,1/8W,1%,8.25K	RN55D-8251F	TRW	4701-03-8251	2
R165	RES.MF,1/8W,1%,909	RN55D-9090F	TRW	4701-03-9090	1
R69T R70T R86	RES.MF,1/8W,1%,9.53K	RN55D-9531F	TRW	4701-03-9531	3
R33	RES.MF,1/8W,1%,976	RN55D-9760F	TRW	4701-03-9760	1
R166 R167	RES.MF,1/4W,1%,124	RN60D-1240F	TRW	4701-13-1240	2
R160 R161	RES.MF,1/2W,1%,100	RN65D-1000F	TRW	4701-23-1000	2
R215 R216	RES.SET,2-10K,1/8W QTY:2:4701-03-1002	142-501-64A	WVTK	4789-00-0019	1

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 8

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
CR18 CR19 CR20 CR21	QTY:8:4807-02-0777				
Q35 Q36	TRANS	2N2219A	NSC	4901-02-2191	2
Q34 Q37	TRANS	2N2905A	NSC	4901-02-9051	2
Q5 Q7 Q8	TRANS	2N3565	FAIR	4901-03-5650	3
Q23	TRANS	2N3638A	CARTR	4901-03-6381	1
Q10 Q11 Q12 Q33 Q9	TRANS	2N3640	FAIR	4901-03-6400	5
Q22 Q47 Q48 Q49	TRANS	2N3642	FAIR	4901-03-6420	4
Q28 Q32 Q40	TRANS	2N3646	NSC	4901-03-6460	3
Q38 Q39 Q44 Q45	TRANS	2N3903	NSC	4901-03-9030	4
Q50 Q51 Q52	TRANS	2N4248	FAIR	4901-04-2480	3
Q1 Q13 Q16 Q19 Q20 Q21 Q24 Q27 Q29 Q4 Q41 Q42 Q43	TRANS	2N5139	FAIR	4901-05-1390	13
Q6	TRANS	2N5462	MOT	4901-05-4620	1
Q2	TRANS	2N5485	MOT	4901-05-4850	1
Q46	TRANS	TIP-29	TI	4902-00-0290	1
Q53	TRANS	TIP-30	TI	4902-00-0300	1
Q3	TRANS	WTD-401	WALB	4902-00-4010	1
Q15 Q18 Q25 Q26 Q30	TRANS,M/PR,2N5139	164-501-88	WVTK	4998-00-0005	3

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 10

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
IC7	IC	7400	TI	8000-74-0000	1
IC8	IC	74LS00	TI	8000-74-0010	1
IC9	IC	74LS74	TI	8000-74-7410	1
IC10	VOLTAGE REGULATOR	MA78B05UC	FAIR	8000-78-0500	1

WAVETEK PARTS LIST — TITLE MAIN — ASSEMBLY NO. 1100-00-0129 — REV L — PAGE: 12

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJENGR		TITLE: PARTS LIST MAIN
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 XX ±.030 ANGLES ±1		MODEL NO: 185 — DWG NO: 1100-00-0129 — REV: L
	DO NOT SCALE DWG		CODE IDENT: 23338 — SHEET 2 OF 2
	SCALE		

BISHOP GRAPHICS/ACCUPRESS RECORDSET NO. A-3884

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REV	ECN	Y	DATE	APP
A	PLATED THRU HOLES WERE UP	BA	8-4-5	
B	ECN 4234	AT	5-10-84	

RAMP GENERATOR

TRIGGER

11 STATE COUNTER

PEN LIFT OPTION

RAMP AMP

STEP AMP

OUTPUT AMP

D/A CONV.

SWEEP RANGE: OFF, 100S, 10S, 1S, 100MS, 10MS, 1MS, 1MS

SWP START
SWP STOP
CONT RAMP
TRIG RAMP
CONT STEP
SINGLE STEP

ALL DIODES ARE FD666606

NOTE UNLESS OTHERWISE SPECIFIED

R58
C19
Q15
CR11
IC6

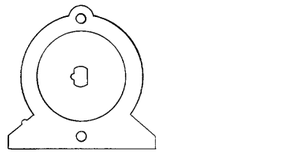
REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN BA	DATE 4-18	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR	1-22-74	TITLE SCHEMATIC SWEEP GENERATOR
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO 185	DWG NO 0103-00-0124 REV B
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

0103-00-0124 B

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REV	ECN		BY	DATE	APPROVAL
B	2233		LDN	3-30-81	
C	2682		LDN	9-21-81	

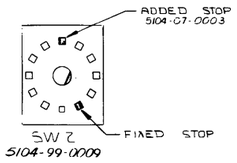
11.050 @ 2 X



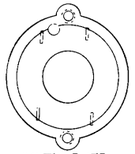
5104-01-0005

SW 2

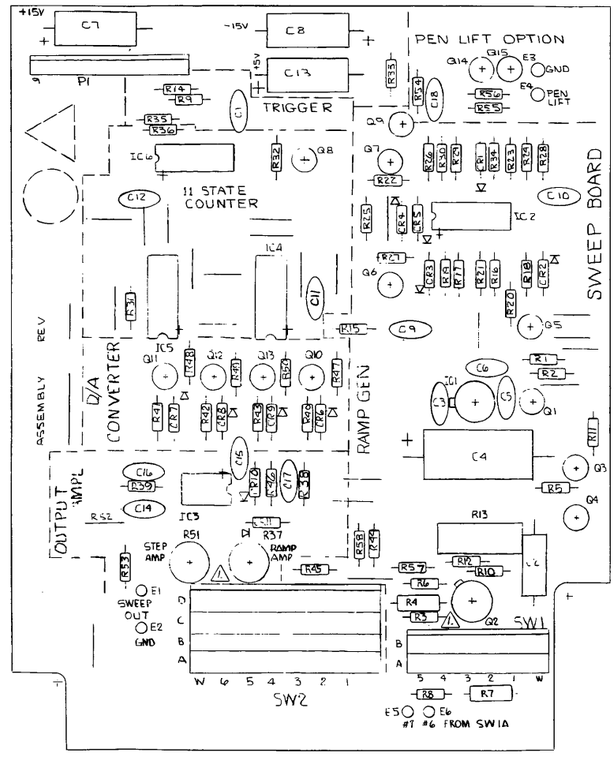
DETENT SHOWN FROM FRONT VIEW
IN FULL COUNTER CLOCKWISE POSITION



SW 2
5104-99-0009

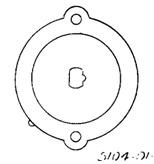


SWITCH PLATE
1400-00-2130
VIEW 'A'



182-115

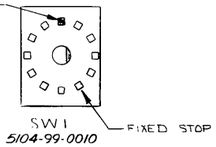
FACE OUTSIDE BORDER



5104-01-0002

SW 1

DETENT SHOWN FROM FRONT VIEW
IN FULL COUNTER CLOCKWISE POSITION



SW 1
5104-99-0010

⚠ ADD SW. PLATE SEE VIEW 'A'
INSTALL SWITCH PLATE BEHIND
WAFER B-SW1 & WAFER D SW2

DRAWN BA	DATE 4-29-75	WAVETEK
ENGR		TITLE: SILKSCREEN ASSEMBLY PRINT (SWEEP PCB)
RELEASE APPROV		
TOLERANCE		
SCALE 2/1	MODEL NO. 185	DWG NO. 0101-00-0124 REV C
	23338	SHEET 1 OF 1

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REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG SWEEP	0101-00-0124	WVTK	0101-00-0124	1
NONE	SCHEMATIC SWEEP	0103-00-0124	WVTK	0103-00-0124	1
NONE	GA DRWG SWEEP	0107-00-0124	WVTK	0107-00-0124	1
NONE	PLATE, SW	008-004	WVTK	1400-00-2130	1
C10 C11 C12 C14 C16 C19 C5 C6 C9	CAP, CER, MON, 1MF, 50V	CAC0325U104Z050A	CORNG	1500-01-0405	9
C1 C15	CAP, CER, 150PF, 1KV	DD-151	CRL	1500-01-5111	2
C17	CAP, CER, 47PF, 1KV	DD-470	CRL	1500-04-7011	1
C3	CAP, CER, 56PF, 1KV	DD-560	CRL	1500-05-6001	1
C13 C7 C8	CAP, ELECT, 100MF, 16V	500D107G016DC7	SPRAG	1500-31-0101	3
C4	CAP, MYLR, 2MF, 200V	2MFW205K	AMRAD	1500-42-0504	1
C2	POLYE, .022MF, 200V	192P22392	SPRAG	1500-42-2304	1
NONE	SWEEP	182-112	WVTK	1700-00-0124	1
P1	CONN, 9PIN	09-60-1091	MOLEX	2100-02-0052	1
NONE	PIN, MALE	60809-2	AMP	2100-05-0020	2
NONE	STANDOFF, SWAGE .625 H, .250 HEX 6-32, .062 MAT'L	1531B-5/8	USECO	2800-02-0004	3
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	1

WAVETEK PARTS LIST — TITLE: SWEEP — ASSEMBLY NO. 1100-00-0124 — REV D — PAGE: 1

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO	QTY/PT
R37 R51	POT, TRIM, 500	91AR500	BECK	4600-05-0104	2
R13	POT, CONT, 10K FROM: 4600-01-0307	4609-71-0313	WVTK	4609-71-0313	1
R4	RES, C, 1/2W, 5%, 10M	RC20GF-106	STKPL	4700-25-1005	1
R20	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	1
R21 R33	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	2
R1 R10 R3 R32 R35 R36 R44 R9	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	8
R40 R8	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	2
R15	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	1
R39 R6	RES, MF, 1/8W, 1%, 1 21K	RN55D-1211F	TRW	4701-03-1211	2
R24	RES, MF, 1/8W, 1%, 12 1K	RN55D-1212F	TRW	4701-03-1212	1
R14 R43	RES, MF, 1/8W, 1%, 12 4K	RN55D-1242F	TRW	4701-03-1242	2
R26 R31 R38	RES, MF, 1/8W, 1%, 1 5K	RN55D-1501F	TRW	4701-03-1501	3
R5	RES, MF, 1/8W, 1%, 15	RN55D-15R0F	TRW	4701-03-1509	1
R34	RES, MF, 1/8W, 1%, 1 78K	RN55D-1781F	TRW	4701-03-1781	1
R30 R47 R48 R49 R50	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	5
R25 R28	RES, MF, 1/8W, 1%, 2 49K	RN55D-2491F	TRW	4701-03-2491	2

WAVETEK PARTS LIST — TITLE: SWEEP — ASSEMBLY NO. 1100-00-0124 — REV D — PAGE: 2

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R42	RES, MF, 1/8W, 1%, 24 9K	RN55D-2492F	TRW	4701-03-2492	1
R23 R29	RES, MF, 1/8W, 1%, 2 87K	RN55D-2871F	TRW	4701-03-2871	2
R11	RES, MF, 1/8W, 1%, 3 01K	RN55D-3011F	TRW	4701-03-3011	1
R19	RES, MF, 1/8W, 1%, 30 1K	RN55D-3012F	TRW	4701-03-3012	1
R58	RES, MF, 1/8W, 1%, 3 16K	RN55D-3161F	TRW	4701-03-3161	1
R16 R17 R2 R22 R27 R45 R46	RES, MF, 1/8W, 1%, 4 99K	RN55D-4991F	TRW	4701-03-4991	7
R41	RES, MF, 1/8W, 1%, 49 9K	RN55D-4992F	TRW	4701-03-4992	1
R53	RES, MF, 1/8W, 1%, 619	RN55D-6190F	TRW	4701-03-6190	1
R57	RES, MF, 1/8W, 1%, 6 98K	RN55D-6981F	TRW	4701-03-6981	1
R12	RES, MF, 1/8W, 1%, 976	RN55D-9760F	TRW	4701-03-9760	1
R7	RES, MF, 1/4W, 1%, 1M	RN60D-1004F	TRW	4701-13-1004	1
CR1 CR10 CR11 CR2 CR3 CR4 CR5 CR6 CR7 CR8 CR9	DIODE	1N4148	FAIR	4807-02-6666	11
Q2	TRANS	2N2219A	NSC	4901-02-2191	1
Q3 Q4	TRANS	2N3640	FAIR	4901-03-6400	2
Q8 Q9	TRANS	2N3646	NSC	4901-03-6460	2
Q1 Q10 Q11 Q12 Q13 Q5	TRANS	2N5139	FAIR	4901-05-1390	8

WAVETEK PARTS LIST — TITLE: SWEEP — ASSEMBLY NO. 1100-00-0124 — REV D — PAGE: 3

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
Q6 Q7					
NONE	WAFER	133-SW1-1	WVTK	5104-02-0008	2
NONE	WAFER	147-400	WVTK	5104-02-0015	4
NONE	DETENT, MOD FROM: 5104-01-0003	5104-99-0042	WVTK	5104-99-0042	2
IC3	IC	LM 301AN	NSC	7000-03-0100	1
IC2	IC	CA-3054	RCA	7000-30-5400	1
IC1	IC	CA-3130	RCA	7000-31-3000	1
IC6	IC	74LS03	TI	8000-74-0310	1
IC4 IC5	IC	74LS74	TI	8000-74-7410	2

WAVETEK PARTS LIST — TITLE: SWEEP — ASSEMBLY NO. 1100-00-0124 — REV D — PAGE: 4

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES
MATERIAL
FINISH WAVETEK PROCESS
DRAWN — DATE
PROJ ENGR
RELEASE APPROV
TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030
DO NOT SCALE DWG
SCALE

WAVETEK SAN DIEGO • CALIFORNIA
TITLE: PARTS LIST SWEEP
MODEL NO: 185 — DWG NO: 1100-00-0124 — REV: D
LOCI 01 NT: 23338 — SHEET 1 OF 1

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