REV	ECN	BY	DATE	APP

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: CALIBRATION PROCEDURE
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		Elaine
	DO NOT SCALE DWG	MODEL NO. 183,184,185	DWG NO. / REV
	SCALE	CODE IDENT 23338	SHEET 1 OF 7

2.0 Calibration Instructions

The following paragraphs provide complete sequential calibration procedures for Model 183, 184 and 185. Each calibration adjustment is independent of its following adjustment settings; an adjustment, however, may be dependent on previous adjustment setting.

2.1 Main Circuit Board Calibration

2.1.1 Preliminary Procedures

Before connecting the unit to an ac source, set the front panel controls as follows:

FREQ (Hz)	X10K
Frequency Dial(s)	5
FREQ (Hz) VERNIER	Max. CW (CAL)
SYMMETRY	NORMAL
GEN MODE	CONT (LIN. Model 185)
WAVEFORM	⊓⊔ (no offset)
AMPLITUDE (dB)	-20
AMPLITUDE VARIABLE	Max. CW
SWEEP MODE	SWEEP START
SWEEP TIME	OFF (Model 185), 100s (Model 183 and 184)

NOTE: If the unit has never been calibrated before, set all calibration pots to center of rotation.

2.1.2 Power Supply Regulation

1. Before connecting the unit to an ac source, check the ac line voltage to make sure the 115/230 and HI/LO switches are set at the correct position as shown in the following:

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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

Connect a voltmeter ground lead to GND side of C84 (a 100 uF capacitor), and the other lead to "+" side of C84 (the +15 volt supply).

3. Connect ac power and turn on the generator. Adjust potentiometer R206 in power supply to obtain +15Vdc±50mV.

4. Check voltage at the "-" side of C88 (a 100 uF capacitor). It should be -15Vdc±150mV.

5. Check voltage at the "+" side of C80 (a 100 uF capacitor). It should be +5V±250mV.

6. Keep the generator covered and allow the unit to warm up for at least 30 minutes before doing the following calibration. Also keep cover closed whenever possible during calibration.

2.3 Amplifiers Offset Adjustment

1. Set GEN MODE to TRIG and WAVEFORM to ∿. Adjust R192 for 0 volt ±5mV at amplifier output (emitter of Q19).

2. Set AMPLITUDE(dB) to 0, VARIABLE to maximum CCW (amplitude minimum). Adjust R156 for 0 volt ±10mV at the 50Ω OUT (into 50 ohm load).

3. Set AMPLITUDE VARIABLE to maximum CW. Adjust R124 for 0 volt ±10mV at the 50Ω OUT.

4. Repeat steps 2 and 3 once.

2.4 Time Symmetry Adjustment

1. Set GEN MODE to CONT (LIN, Model 185), WAVEFORM to , FREQ(Hz) at X1K. Connect the 50Ω OUT signal to both channels, A and B, of a dual channel oscilloscope.

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2. Set the oscilloscope time base to 20uS/division, scope trigger to internal and alternate, Channel A at Normal and Channel B at Inverted.

3. Adjust frequency dial until the oscilloscope screen is filled by approximately one cycle (5 kHz). Then switch ON the "X10 Sweep Magnifier" of the scope (see set-up and display in the following figure).

4. Adjust R32 until the square wave time symmetry to better than 0.1%, (the space "a" is less than 1/10th of a division).

5. Turn OFF the scope "X10 Sweep Magnifier". Set the generator FREQ(Hz) to X100K. Adjust the frequency dial and VERNIER until the oscilloscope screen is filled by approximately one cycle (5 kHz).

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6. Use similar procedure as above, and adjust R35 for better than 0.1% symmetry.

7. Repeat steps 1 through 6 once.

8. With the generator still set at the same condition in step 5, adjust R13 for minimum frequency shift while shorting and opening the VCG IN connector to ground.

2.5 Sine Distortion Adjustment

1. Set FREQ(Hz) to X1K, VERNIER at CAL, dial at 5, WAVEFORM to Connect the 50Ω OUT to a distortion analyzer loaded with a 50 ohm terminator.

2. Adjust R68 and R71 for minimum sine distortion. It should be less than 0.16%, otherwise follow procedure below to select R111 and R112.

3. Connect a 10 KΩ trim pot in each location marked R111 and R112. Adjust the two trim pots and also R68 and R71 to obtain less than 0.16% distortion. Remove the pots, measure the resistance and replace with standard 1/8W resistor. R111 and R112 are not necessary, having the same resistance.

   If 0.16% distortion still cannot be achieved, remove both R110 and R113 and connect a 500 ohm trim pot in each location. Adjust the two trim pots and R68 and R71 for less than 0.16% distortion. Replace the pots with standard 1/8W resistors.

4. Check distortion at 1 kHz and 10 kHz. It should be less than 0.2%.

2.6 High Frequency Distortion

1. Set FREQ(Hz) to X1M, dial to 1 and WAVEFORM to . Adjust the square wave rise time to minimum with minimum overshoot, using C64.

2. Set WAVEFORM to , FREQ(Hz) to X1M. Check sine distortion in a spectrum analyzer. All harmonic should be below -32 dB from 1 MHz to 5 MHz. If specification is not met, do the follcwing.

3. Mostly, the sine distortion problem, also frequency dial accuracy at X1M range, is 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.

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To check the flatness of the triangle peak voltage, a high frequency oscilloscope and a X10 scope probe (exceed 150 MHz bandwidth) should be used. Scope probe should be correctly compensated and its ground lead length should keep to minimum.

2.7 Frequency Calibration

1. Set WAVEFORM to , FREQ(Hz) to X10K and dial to 5. Adjust output frequency to 50kHz±100Hz, using R21.

2. Set FREQ(Hz) to X1M. Adjust output frequency to 5MHz±20kHz, using C22 (change C23 to different value to achieve the calibration if necessary).

3. Repeat steps 1 and 2 once.

4. Set FREQ(Hz) to X100K. Adjust output frequency to 500kHz±1kHz, using C17. (Change C16 to different value to achieve the calibration if necessary.)

5. Check frequency range accuracy from X100 to X10K, typically better than 1% and no worse than 2%.

6. Set FREQ(Hz) to X10, dial to obtain 1 Hz square wave. Adjust the square wave time symmetry to less than 0.1%, using R92.

7. Set dial to 5, adjust output frequency to 50 Hz (or 20mS±40uS), using R88.

≈ 27K-64K

8. Check frequency range accuracy (dial at 5) for X.001 to X1 ranges.

9. Check frequency dial accuracy at X1M and X1M ranges.

10. Model 185 only, set FREQ(Hz) to X10K, dial at 0.5 (LOG scale), GEN MOD to CONT(LOG), adjust output frequency to 5kHz±50Hz, using R26.

50K ± 5000 2000

3.0 Model 185 Sweep Circuit Calibration

1. Set FREQ(Hz) to X1K, SWEEP MODE to SWP STOP, SWP STOP dial to 5, SWP START dial to maximum CW. Adjust generator frequency at 50Ω OUT to 5kHz±10Hz, using R81 on Sweep Board.

2. Rotate the SWP START dial forward and back and adjust R3 on the main board at the same time to obtain a minimum frequency shift at 50Ω OUT.

3. Repeat step 1 once.

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4. Connect the signal at SWEEP OUT to oscilloscope, set the sweep speed to 100 Hz approximately. Switch the SWEEP MODE switch between SWEEP STOP and CONT RAMP and adjust the positive peak of the ramp signal equal to the sweep stop voltage level to within ±10mV, using R37 on Sweep Board.

4.0 Model 183 and 184 Sweep Circuit Calibration

1. Connect the signal at SWEEP OUT to oscilloscope, set the sweep speed to 100 Hz approximately. Switch the SWEEP MODE switch between SWEEP STOP and CONT SWEEP and adjust the positive peak of the ramp signal equal to the sweep stop voltage level to within ±10mV, using R12 on Sweep Board.

5.0 Model 183 Crystal Control Board Calibration

1. Set FREQ(Hz) to X100K, dial at 4, GEN MODE to XCG. Adjust C on the XCG board to obtain 400,000 Hz ±5 Hz (LED should be ON when generator locks to the crystal frequency).

2. Check that the generator locks to the crystal frequency at or near every mark on the dial. If not, it may be due to the frequency dial not calibrated, misaligned, or R on the XCG board may not be properly selected.

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REV	ECN	BY	DATE	APP

PRELIMINARY

DELIVERED

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ECN _____

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: QUALITY CONTROL SPECIFICATION
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO. 183,184,185	DWG NO. A182-501 REV
	SCALE	CODE IDENT 22229	SHEET 1 OF 2

1.0 Purpose

This specification is used in the Wavetek Quality Control Department as a guide for checking out the generator performance and to ensure the generator is operating to its satisfactory condition prior to shipping.

2.0 General Specification

Unless otherwise specified in the following paragraphs, the generator should meet all the published specifications in the manual or the Specification Control Drawing No.

3.0 Additional Specifications

3.1 Output Amplitude

Maximum output of ~, ⊓⊔, ⋀⋁ is greater than 19.6 Vp-p into an open circuit, and greater than 9.8 Vp-p into 50 ohm load up to 10 kHz.

AMPLITUDE VARIABLE will vary output voltage by at least 20 dB, 10:1.

3.2 PULSE OUT

Voltage at the PULSE OUT is from 0 volt, +250 mV to greater than 3.5 volt into open circuit.

3.3 Frequency Accuracy

±1.6% of full scale from X.01 to X100K range, LIN mode.

With dial at maximum CW, at least 1/1000th of range frequency is obtainable by adjusting the VERNIER.

~~±5%~~ 10 of setting with dial at 0.5 and ~~±10%~~ 20 setting with dial from 0.~~0005~~ .05 to 5.0, (LOG mode Model 185 only).

3.4 XCG Frequency Accuracy

When each mark on the dial is lined up with the frequency index, the generator frequency will lock to the crystal reference frequency.

Frequency is accurate to ±0.005% of setting.

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3.5 Sine Wave Distortion

Less than 0.3% from 50 Hz to 50 kHz. All harmonics below -32 dB from 1 MHz to 5 MHz.

3.6 Time Symmetry (SYMMETRY at NORMAL and FREQ(Hz) X100 to X10K)

Less than 0.5% from 1:1 to 10:1 of range.

Less than 3% from 10:1 to 1000:1 of range.

Less than 5% from 1000:1 to 100,000:1 of range on LOG mode, Model 185.

3.7 Time Symmetry (SYMMETRY ON)

Frequency accuracy is ±20% with dial at 5. Maximum symmetry ratio is 17:1 or 1:17 minimum, with dial at 5.

Symmetry ratio varied with dial setting is normal in these models.

3.8 Trigger Baseline Variation VS Frequency

Check trigger baseline at ∿ waveform, TRIG MODE, AMPLITUDE maximum CW and 0 dB and output loaded with a 50 ohm terminator.

Voltage less than ±50 mVdc, dial at 5. Voltage variation less than 100 mV from top to 1/1000 of frequency range.

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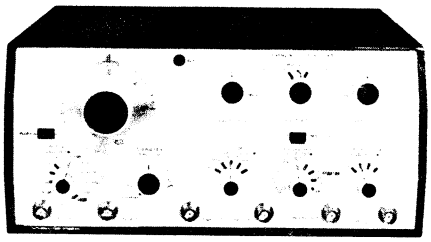
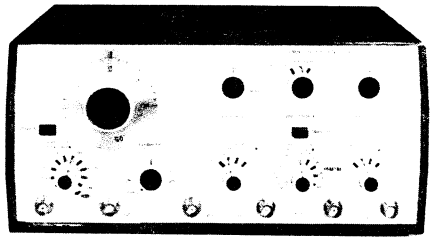
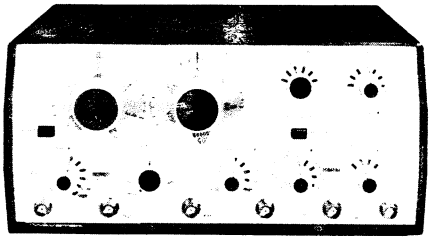
A182-501	



Model 183
5 MHz XCG/Sweep Generator



Model 184
5 MHz Sweep Generator
With Linear Sweep



Model 185
5 MHz Lin/Log Sweep Generator

Specifications

MODELS 183/184/185

VERSATILITY

Waveforms
Sine ∿, triangle △, square ⊓, positive pulse ⎍, negative pulse ⎎, ramp ◿, TTL pulse ⎍ and DC.

Operating Modes
Continuous, triggered, gated, and sweep. (Model 183 has XCG mode also.)

Frequency Range
0.0001 Hz to 5 MHz in 10 overlapping ranges.
Model 185 Only: Logarithmic distribution of 0.005 Hz to 5 MHz in 5 overlapping 5 decade ranges.

Frequency Vernier Range
Linear Mode: 1% of range.
Logarithmic Mode: 5% of range.

Main Output
∿, △, ⊓ selectable and variable from 20V p-p max (10V p-p into 50Ω). ⎍, ⎎ selectable and variable to ±10V max (±5V into 50Ω). into 50Ω).
Voltage Attenuation 0 to −80 dB: To −60 dB in 20 dB steps, plus 20 dB vernier.

TTL Pulse Output
TTL pulse at generator frequency; rise and fall times typically 15 ns. Symmetry variable. Drives up to 20 TTL loads.

DC Offset and DC Output
Waveform offset and DC output selectable through 50Ω output. Adjustable between ±10V max (±5V into 50Ω load) as offset or Vdc output.

GCV Output
0 to +5V open circuit. Proportional to frequency of main generator; 1 kΩ impedance. For use as a horizontal drive signal.

VCG — Voltage Controlled Generator
Input Range: 0 to ±5V.
Input Impedance: 5 kΩ (Models 183 and 184); 10 kΩ (Model 185).
Output Frequency: Up to 1000:1 (linear mode); 100,000:1 (logarithmic mode, Model 185).
Linear Slew Rate: 2% of range per μs.
Logarithmic Slew Rate: 0 to 80% of range in 40 μs; 80 to 100% of range in 200 μs.
Linearity: 0.0001 Hz to 50 kHz, 0.5%.
Logarithmic Response: 1 decade per volt.

Sweep
Sweep start and stop frequencies are held for precise sweep limit adjustment.
Models 183 and 184: Continuous linear sweep of frequency; sweep time of 100s to 1 ms.
Model 185: Linear (3 decades max) or logarithmic (5 decades max); up or down in frequency; continuous, in series of 10 steps, or triggered for one sweep or one step; sweep/step time of 100s to 100 μs in 6 ranges.
Sweep Output: +7.5V peak (open circuit) ramp or stair step, 600Ω.

Trigger
Input Range: 1V peak-to-peak ±10V.
Impedance: 10 kΩ, 33 pF.
Pulse Width: 50 μs minimum.
Repetition Rate: 5 MHz maximum.

HORIZONTAL PRECISION

Dial Accuracy
0.005 Hz to 5 MHz ±2% of full scale.
0.0005 Hz to 0.005 Hz ±4% of reading, and ±2% of full scale. (See XCG precision specification.)

Time Symmetry
±1% from 0.005 to 500 kHz.

VERTICAL PRECISION

Amplitude Change With Frequency (Sine)
Less than:

0.1 dB	0 to 100 kHz
0.2 dB	100 kHz to 1 MHz
1 dB	1 MHz 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
*Amplitude, dc offset, and frequency in linear mode.

Amplitude Symmetry
0 to 1 MHz, 1% of amplitude range.

XCG PRECISION (Model 183 Only)

Accuracy
±0.01% of each XCG setting.

Lock Time

X 1K thru top range	Less than 500 ms
X 100 range	Less than 5s
X 10 range	Less than 50s

WAVEFORM PURITY

Sine Distortion
Less than:
0.5% for 10 Hz to 100 kHz
1% for 0.005 Hz to 1 MHz
All harmonics at least 30 dB down for 1 MHz to 5 MHz.

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.

ENVIRONMENTAL

Specifications apply at 25°C ±5°C. Instrument will operate from 0°C to +50°C.

MECHANICAL

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

Weight
8.5 lb/3.9 kg net; 12 lb/5.5 kg shipping.

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

NOTE: Specifications apply from 10 to 100% of a selected frequency range and with symmetry control off. Symmetry and vernier affect frequency calibration. Maximum possible asymmetry is dependent upon frequency setting.

ORDER INFORMATION

(FOB San Diego)

Model 183	$695
Model 184	$495
Model 185	$595

Terms ½% 10 days, net 30 days

WAVETEK
9045 Balboa Ave., San Diego, CA 92123 Tel: (714) 279-2200
P.O. Box 651, San Diego, CA 92112 TWX: 910-335-2007

MODIFICATION OF MAIN BOARD 182-110A

The following modifications were done on 182-110A P.C. board and became 182-110B:

1. Oscillation shown on output waveforms, more obvious at -60 dB output. Fixed by adding a 61.9 ohm series with C38 in the H.Y. switch.

2. Oscillation shown on triangle waveforms only when X.1, X.01 or X.001 range is selected. Fixed by adding a 0.01 uF between R97 and R98 in the capacitance multiplier.

3. Added a 100 pf in parallel with R52 to improve the triangle waveform at X1 MHz range.

4. Generator is free running with distorted triangle waveform at TRIG and GATED mode.

   a. Free running with SYM control at NORMAL means that the SYM pot is defective.

   b. Free running at a particular setting of the SYM control means the SYM control pots are very far from tracking and should be replaced. However, the pot can be used in Model 142. A 1.5 Kohm resistor was added to the emitter of Q8 to allow less dependence on the tracking of the SYM pot.

5. A 0.01 uF capacitor was added to the base emitter of Q4 to reduce the noise at the GCV OUT.

6. A 47 pf was added across R4 to improve the fast sweep response.

7. R138 was removed and a 0.01 uF was added to R146 to improve the high frequency waveform when amplitude VARIABLE is at maximum CCW position. Distorted square wave if the 0.01 uF capacitor is removed.

8. A 100 ohm resistor was added in series with R148 and R151 to smooth the peak of the sine waveform at low level, amplitude VARIABLE at maximum CCW position.

Modification to 182-110A - continued

9. Excess frequency jittering at 1/1000 of the frequency range - fixed by disconnecting the group path near the MODE switch.

10. Generator is free running at TRIG mode with the trigger level set at a particular position. The squaring circuit was modified.

11. Trigger base line oscillation - fixed by adding a 33 pf to the base of Q42.

12. The two 33 pf caps were removed in the power supply's circuit because they do harm more than good on power supply noise.

Kwok S. Lo
4/11/75

13.) RINGING ON +5V SUP (183) C74 ON MAIN BRD
CHANGED TO 0.1 μF