

OSCILLOSCOPE CALIBRATION INSTRUMENTS



CG 5010 CG 5011 Calibration Generators

- Vertical Gain
- Horizontal Timing and Gain
- Vertical Bandwidth/Pulse Response Characteristics
- Probe Accuracy and Compensation
- Current-Prone Accuracy
- Calibrator-Output Accuracy
- Next-Cal-Date Tracking

OSCILLOSCOPE CALIBRATION INSTRUMENTS

PRODUCT SUMMARY

The TM 5000/TM 500 line of modular Scope Calibration Instruments provides the solution to all of your scope calibration needs.

The CG 5010/CG 5011 fully programmable calibration generators can be used in a computerized system for calibration and verification of all major oscilloscope parameters. The CG 5010 is designed primarily for analog oscilloscope calibration, however, it can also be used for digital oscilloscope calibration and verification up to 500 MHz. The CG 5011 is designed to cover both analog and digital requirements up to 2 GHz. Both are

ideally suited for environments where multiple scopes are maintained, and both are complemented by the new SG 5030 Programmable Leveled Sinewave Generator for oscilloscope bandwidth calibration.

In addition to the programmable instruments, TM 500 offers a complete set of manual calibration instruments that can be configured into a portable test set for in-field oscilloscope service and calibration. These TM 500 Oscilloscope Calibration instruments offer the widest range of standard amplitude square waves, fastest risetimes, lowest aberrations, fastest time marks and widest frequency range of leveled sine waves available in one package.

The TG 501A Time Mark Generator provides time marks from 5 s to 1 ns, plus a variable timing output which allows you to read the scope's percentage timing error directly on a digital display.

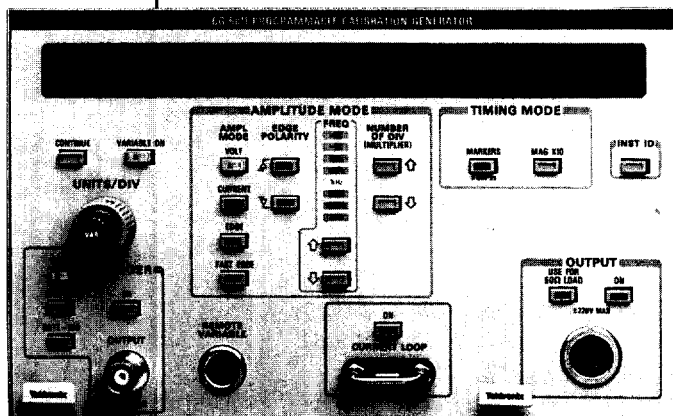
The PG 506A Calibration Generator provides clean, fast-rise square waves and calibrated-amplitude square waves for checking oscilloscope transient response and for setting the vertical-amplifier gain of the oscilloscope respectively. Like the TG 501A, the PG 506A has a variable mode of operation which allows you to read the oscilloscope's calibration error directly in percent from its digital display.

The SG 503 and SG 504 generators provide leveled sine waves for bandwidth checks and triggering performance checks. The range of the SG 503 is 250 kHz to 250 MHz, while the range for the SG 504 is from 245 to 1050 MHz.

The SG 502 Oscillator is perfect for calibration applications where verification of low-frequency rolloff in ac modes and performance measurement of low-frequency-reject triggering modes is required.

OSCILLOSCOPE CALIBRATION INSTRUMENT SELECTION GUIDE

Instrument	Primary Functions	Secondary Functions	Module Width
CG 5010 / CG 5011 Programmable Calibration Generator	Amplitude Calibration and Time Base Calibration	Testing risetime and transient response, attenuator compensation, oscilloscope non-linearity	3 Wide
SG 5030 Programmable Leveled Sinewave Generator	Bandwidth Calibration	Broadband sinewave generation	3 Wide
PG 506A Calibration Generator	Amplitude Calibration	Testing risetime and transient response, attenuator compensation	1 Wide
TG 501A Time Mark Generator	Time Base Calibration	Testing oscilloscope nonlinearity	1 Wide
SG 502 Oscillator	LF Response & Triggering	Low distortion leveled signal source	1 Wide
SG 503 Leveled Sinewave Generator	Bandwidth Calibration	General leveled RF signal source	1 Wide
SG 504 Leveled Sinewave Generator	Bandwidth Calibration	General leveled RF signal source with frequency modulation capability	1 Wide



CG 5010/CG 5011

The Tektronix CG 5010/CG 5011 Programmable Oscilloscope Calibration Generators can be used as a part of a computerized system for the calibration and verification of major oscilloscope parameters.

The CG 5010/CG 5011 are three-wide TM 5000 compatible plugins which feature a wide range of functions, all programmable by controller via the GPIB or

from the front panel. A "Learn" mode allows any manually set function or range to be acquired by a controller. Subsequent use of the resulting program requires a minimum of operator skill and makes data logging an automatic operation.

A CG 5010/CG 5011 computer-based test and calibration system can provide step by step instructions to the operator and archiveable documentation, significantly reducing the skill level and/or time required for scope maintenance.

The CG 5010/CG 5011 can be used in conjunction with the optional Comparator Head to calibrate built-in oscilloscope calibrators. Both the oscilloscope calibrator and the CG 5010/CG 5011 signals are applied to the Comparator Head and simultaneously displayed on the scope's CRT. The CG 5010/CG 5011 signals are then varied to obtain congruent displays. Errors are automatically displayed on the readout.

The Remote Variable option, the Units/Div, Variable-Fixed button, the Continue push-button, and the VAR allow remote operation of the system.

The CG 5010/CG 5011 is designed to greatly reduce your maintenance costs. Built in self test routines and hardware check the operation of all major circuits each time power is turned on.

GPIB*
IEEE-488

*The CG 5010/5011 Calibration Generators comply with IEEE Standard 488.1-1987 and Tek Standard Codes and Formats.



CHARACTERISTICS

VOLTAGE (AMPLITUDE MODE)

The standard voltage is used to calibrate vertical display accuracy.

Range – 40 μ V to 200 V, 1 M Ω load; 40 μ V to 5 V, 50 Ω load (1-2-5 steps with multiplier).

Multipliers – 1, 2, 3, 4, 5, 6, 8, or 10.

Polarity – Positive from ground.

Aberrations – Less than $\pm 15\%$ of Amplitude (± 10 mV).

Accuracy – $\pm (0.25\% + 1 \mu\text{V})$.

Frequency – 40 μ V to 80 mV: 10 Hz to 10 kHz. 100 mV to 10 V: + dc or – dc, 10 Hz to 100 kHz. 12 V to 200 V: + dc or – dc, 10 Hz to 10 kHz.

Variable Range – $\pm 9.9\%$

CURRENT (AMPLITUDE MODE)

The standard current is used to calibrate current probes.

Range – 1 mA to 100 mA (1-2-5 sequence).

Multipliers – 1, 2, 3, 4, 5, 6, 8, or 10.

Aberrations – Less 5% of period and less than $\pm 15\%$ of Amplitude ($\pm 100 \mu\text{A}$).

Accuracy – $\pm (0.25\% + 2 \mu\text{A})$.

Frequency – Dc or 10 Hz to 1 MHz (decade steps).

Droop – $\leq 1\%$ p-p.

Variable Range – $\pm 9.9\%$

LOW EDGE AND HIGH EDGE (AMPLITUDE MODE)

The Low Distortion Pulse obtained in this mode is used to test oscilloscope input amplifier and attenuator compensation.

Range – 20 mV to 1 V p-p 50 Ω , Low Edge

1.2 V to 100 V p-p 1 M Ω load, High Edge (1-2-5 steps with multipliers).

Multipliers – 1, 2, 3, 4, 5, 6, 8, or 10.

Aberrations – $\pm 2\%$ of square wave Amplitude

Accuracy – $\pm 3\%$.

Polarity – Positive or negative transitions to ground (Low Edge). Positive transitions only (High Edge).

Risetime/Falltime – ≤ 1.3 ns (Low Edge). ≤ 100 ns (High Edge).

Long Term Flatness – $\pm 0.5\%$ after first 500 ns (Low Edge). $\pm 0.5\%$ after first 10 ns (High Edge).

Frequency – 10 Hz to 1 MHz in decade steps. (Low Edge). 10 Hz to 100 kHz in decade steps. (High Edge).

Variable Amplitude Range – $\geq \pm 9.9\%$ from nominal.

MARKERS (TIMING MODE)

The markers obtained in this mode are used to calibrate oscilloscope time bases.

Range – 10 ns to 5 s (CG 5010 only); 0.5 ns to 5 s (CG 5011 only) (1-2-5 steps).

X10 Magnifier – Increases marker rate by a factor of ten (0.1 μ s to 5 s range only).

Accuracy – 0.01%. With Opt. 01, $\pm 0.0003\%$ (+15°C to +50°C).

Amplitude (CG 5010) – 1 V minimum into 50 Ω .

(CG 5011) – 1 V minimum 5 s to 2 ns, 350 mV minimum: 1 ns, 100 mV minimum: 0.5 ns.

Variable Range – $\pm 9.9\%$

SLEWED EDGE (TIMING MODE – CG 5010 ONLY)

Slewed Edges are used to calibrate the very fastest ranges found on analog oscilloscope time bases.

Ranges – 0.4 ns and .5 ns to 100 ns (1-2-5 steps).

X10 Magnifier – Increases Slewed Edge rate by a factor of ten (5 ns to 100 ns range only).

Accuracy – 0.01%. With Opt. 01 $\pm 0.0003\%$ (+15°C to +50°C).

Edge Position Uncertainty – ± 40 ps.

Amplitude – 1 V into 50 Ω

Variable Range – $\pm 9.9\%$

TRIGGER OUTPUT

The oscilloscope under test is normally triggered externally from this source.

Output Amplitude – 1 V minimum into 50 Ω .

Trigger Rate (Marker Mode) – Normal: Slaved to marker rate from 100 ns to 5 s; remains at 100 ns for faster markers. Divided by 10: Reduces normal trigger rate by a factor of ten. Divided by 100: Reduces normal trigger rate by a factor of one hundred.

Slewed Edge Mode – One trigger per slewed edge.

All Other Modes – Normal: Slaved to output frequency. Divided by 10: One-tenth output frequency. Divided by 100: One-hundredth output frequency.

REFERENCE FREQUENCY

Output Frequency – 1 MHz with internal time base accuracy.

Output Amplitude – TTL compatible.

Input Frequency – 1, 2, 3, 4 or 5 MHz.

Input Amplitude – 1 V to 10 V RMS

Required Accuracy – $\pm 0.001\%$.

FAST EDGE (AMPLITUDE MODE)

The Pulse Head is used to generate fast rise, low-distortion pulses for testing higher bandwidth vertical amplifiers.

Polarity – Positive or negative transitions from ground.

Risetime – ≤ 150 ps.

Aberrations – $\pm 3\%$ of pulse amplitude; not to exceed 4% p-p for adjacent peaks.

Frequency – 100 Hz to 100 kHz (decade steps).

Amplitude – 1.1 V peak $\pm 5\%$ into 50 Ω .

Variable Range – $\pm 10\%$

GENERAL

Environmental – Operating. 0°C to +50°C.

Non-Operating – 20°C to +65°C.

Power Consumption – 65 VA.

ORDERING INFORMATION

CG 5010 Programmable Calibration Generator	\$17,500
Includes: Output cable assembly (012-0884-00); Pulse head (015-0611-00); Instrument interface guide (070-7747-00); Instruction manual (070-7745-00); Programmer's Reference Manual (070-7748-00); Service Manual (070-7746-00).	
CG5011 Programmable Calibration Generator.	\$18,995
Includes: Same as above	
Opt. 01 – Adds High Stability Time Base	+\$650
Opt. 02 – Deletes Pulse Head	-\$1,100

OPTIONAL ACCESSORIES

Comparator Head – Order 015-0310-01.	\$885
Remote Variable – Order 015-0309-01.	\$590
Pulse Head – (When purchased separately.) Order 015-0311-01.	\$1,935
Rigid Circuit Board Extender – Order 067-0975-00.	\$170
Flexible Circuit Board Extender – Trouble Shooting Aid – Order 067-0974-00.	\$585