CG 5001/CG 551AP

GPIB IEEE-488 The CG5001/CG551AP comply with IEEE Standard 488.1-1987 and with Tektronix *Standard Codes and Formats.*

The Tektronix CG 5001/CG 551AP Programmable Oscilloscope Calibration Generators can be used as a part of a computerized system for the calibration and verification of major oscilloscope parameters, including:

- Vertical Gain
- Horizontal Timing and Gain
- Vertical Bandwidth/Pulse Response Characteristics
- Probe Accuracy and Compensation
- Current-Probe Accuracy
- Calibrator-Output Accuracy

The CG 5001/CG 551AP feature a wide range of functions, all programmable by controller via the GPIB. 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 5001/CG551AP Controller test and calibration system can provide step by step to the operator, significantly reducing the skill level required for scope maintenance.

The CG 5001/CG 551AP can be used in conjunction with the optional Comparator Head to calibrate built-in oscilloscope calibrators. Both the oscilloscope calibrator and the CG 5001 signals are applied to the Comparator Head and simultaneously displayed on the scope's CRT. The CG 5001 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 5001/CG 551AP 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.

Modular construction means that all circuit boards unplug (except the Main Interconnect) for easy exchange if service is required. A signature analysis mode is included to facilitate troubleshooting of the digital portion of the instrument.

CHARACTERISTICS

VOLTAGE (AMPLITUDE MODE)

The standard voltage is used to calibrate vertical display accuracy.
Range—40 μV to 200 V (1-2-5 steps with multiplier).
Multipliers—1, 2, 3, 4, 5, 6, 8, 10 divisions
Polarity—Positive from ground.
Aberrations—Duration 55% of period & >15% ±10 mV of amplitude
Accuracy—+0.25% ± 1 μV.
Frequency—40 mV to 80 mV: 10 Hz to 100 kHz. 100 mV to 10 V: dc or 10 Hz to 100 kHz. 12 V to 200 V: dc or 10 Hz to 10 kHz.
Variable Range—±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 10.
Accuracy—±0.25% ± μA.
Frequency—Dc or 10 Hz to 1 MHz (decade steps).
Droop—≥1%.
Variable Range—±9.9%

LOW EDGE (AMPLITUDE)

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 (50Ω load only) (1-2-5 steps with multipliers).
Multipliers—1, 2, 3, 4, 5, 6, 8 10.
Polarity—Positive or negative transitions to ground.
Risetime (Falltime)—≤1.3 ns.
Aberrations—±2%.
Long Term Flatness—±0.5% after first 10 ns.
Frequency—10 Hz to 1 MHz (decade steps).
Variable Amplitude Range—> ±9.9% from nominal.

HIGH EDGE (AMPLITUDE MODE)

The Low Distortion Pulse obtained in this mode is used to test oscilloscope input amplifier and attenuator compensation.
Range—1.2 V to 100 V p-p ≥ 1 MΩ load (1-2-5 steps with multipliers).
Polarity—Positive transition only (negative voltage to ground).
Risetime—<100 ns.
Aberrations—±2% of squarewave amplitude.
Long Term Flatness—±0.5% after first 500 ns.
Frequency—10 Hz to 100 kHz (decade steps).
Variable Amplitude Range—> ±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 (1-2-5 steps).
X10 Magnifier—Increase marker rate by a factor of ten (0.1 μs to 5 s range).
Accuracy—±0.01% (optional TXCO ±0.0003%).
Amplitude—1 V minimum into 50 Ω.
Variable Range—±9.9%.

SLEWED EDGE (TIMING MODE)

Slewed Edges are used to calibrate the very fastest ranges found on oscilloscope time bases.
Ranges—0.4 ns to 100 ns (1-2-5 steps plus 0.4 ns).
X10 Magnifier—Increases Slewed Edge rate by a factor of ten (5 ns to 100 ns range).
Accuracy—±0.01% (Optional TCXO ±0.0003%).
Edge Position Uncertainty—±40 ps.
Amplitude—>1 V into 50 Ω.
Variable Range—±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.

TIMING REFERENCE OUTPUT EXTERNAL TIMING REFERENCE

Input Frequency—Any integral multiple of 1 MHz up to 5 MHz.
Required Accuracy—±0.001%.
Input Amplitude—1 V to 10 V RMS.
Input Resistance—10 kΩ (nominal).

ENVIRONMENTAL

Meets or exceeds MIL-T-28800C, Class 5 requirements.
Ambient Temperature—Operating: 0°C to +50°C. Nonoperating: −55°C to +75°C.
Altitude—Operating: 4500 m (15,000 ft). Nonoperating: 15,000 m (50,000 ft).
Vibration—Operating: Displacement (p-p) 0.015 inch. Vibration Frequency: 10 Hz to 55 Hz. Total time: 75 minutes.
Relative Humidity—90% to 95% at +50°C for 5 days.
Shock—Nonoperating: 30 g's. ½ sine, 11 ms duration, three shocks in each direction along three major axes; total shocks, 18.
Bench Handling—Operating: 45° 4 inches or point of balance, whichever occurs first.

PHYSICAL CHARACTERISTICS*1

Dimensions	mm	In
Width	203	8.0
Height	124	4.9
Depth	305	12.0
Weights	**kg**	**lb**
Standard	3.9	8.5
Option 01	4.4	9.6
Option 02	4.0	8.7

*1 *Maximum Overall Dimensions (triple compartment plug-in)*

PULSE HEAD (STANDARD ACCESSORY) 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—≤200 ps.
Aberrations—±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 ±5% into 50 Ω.
Variable Range—±10%.

ORDERING INFORMATION

CG 5001 Programmable Calibration Generator **$14,995**
Includes: Output cable assembly (012-0884-00); Pulse head (015-0311-01); Instrument interface guide (070-4616-00); Instruction manual (070-4767-00).
CG 551AP Programmable Calibration Generator **$14,995**

Ordering information continued on next page.

r faster markers. Divided by 10: ormal trigger rate by a factor of ten. y 100: Reduces normal trigger rate r of one hundred.
dge Mode—One trigger per slewed

Modes—Normal: Slaved to output . Divided by 10: One-tenth output . Divided by 100: One-hundredth out- ency.

MING REFERENCE OUTPUT
ERNAL TIMING REFERENCE
equency—Any integral multiple of to 5 MHz.
Accuracy—±0.001%.
mplitude—1 V to 10 V RMS.
sistance—10 kΩ (nominal).

ENVIRONMENTAL

r exceeds MIL-T-28800C, Class nents.
Temperature—Operating: 0°C to onoperating: −55°C to +75°C.
—Operating: 4500 m (15,000 ft). Non- : 15,000 m (50,000 ft).
—Operating: Displacement (p-p) h. Vibration Frequency: 10 Hz to tal time: 75 minutes.
Humidity—90% to 95% at +50°C for

Nonoperating: 30 g's. ½ sine, 11 ms three shocks in each direction along or axes; total shocks, 18.
andling—Operating: 45° 4 inches or balance, whichever occurs first.

SICAL CHARACTERISTICS[1]

ns	mm	In
	203	8.0
	124	4.9
	305	12.0
	kg	**lb**
	3.9	8.5
	4.4	9.6
	4.0	8.7

um Overall Dimensions (triple com- plug-in)

HEAD (STANDARD ACCESSORY)
T EDGE (AMPLITUDE MODE)
Head is used to generate fast rise, tion pulses for testing higher band- tical amplifiers.
—Positive or negative transitions ind.
— ≤200 ps.
ons—±3% of pulse amplitude; not 4% p-p for adjacent peaks.
y—100 Hz to 100 kHz (decade steps).
le—1.1 V peak ±5% into 50 Ω.
Range—±10%.

ERING INFORMATION

Programmable Calibration
$14,995
Output cable assembly (012-0884-00); d (015-0311-01); Instrument interface 70-4616-00); Instruction manual -00).
P Programmable Calibration
$14,995

information continued on next page.

ng Center.

OPTIONS

Option 01—Adds High Accuracy Time Base (TCXO) CG 5001/CG 551AP **+$650**
Option 02—Deletes Pulse Head CG 5001/CG 551AP **−$1,100**

CONVERSION KIT

CG 551AP—Field Modification Kit to convert to CG 5001. Order 040-1041-02 **$180**

MAINFRAME COMPATIBILITY

CG 5001 requires either a TM 5003 or TM 5006. The CG 551AP is a TM 500 version of the CG 5001 and requires a TM 506 Mod JB, TM 515 Mod UB or RTM 506 Mod JB. The CG 5001 is not compatible with TM 500 power module mainframes.

OPTIONAL ACCESSORIES

Comparator Head—Used to calibrate built-in oscilloscope calibrators against the signals available from the CG 5001. Both the oscilloscope calibrator and CG 5001 standard amplitude signals are applied to the Comparator Head and simulataneously displayed on the oscilloscope CRT. The CG 5001 signals are then varied to obtain congruent displays. Errors are then displayed on the CG 5001 readout. Order 015-0310-01 **$690**

Remove Variable—Permits remote operation of the following front panel controls: Units/Div, Variable-Fixed Button, Continue Pushbutton and the VAR. Order 015-0309-01 **$475**

Pulse Head—(When purchased separately). Order 015-0311-01 **$1,495**

Rigid Circuit Board Extender—Order 067-0975-00 **$125**

Flexible Circuit Board Extender—Troubleshooting Aid Order 067-0974-00 **$380**

SG 502 Oscillator

- **5-Hz to 500-kHz Sine Waves and Square Waves**
- **Low-Distortion Sine Wave**
- **5-V RMS Open Circuit—600-Ω Source**
- **0- to 40-dB Output Variable Plus 0 to 70 dB in 10-dB Steps**

The SG 502 Oscillator features a wide frequency range of 5 Hz to 500 kHz with low distortion (0.035% between 20 Hz and 50 kHz) and is desirable for general test purposes. Other SG 502 features include 70-dB amplitude control plus a simultaneous fixed-amplitude square wave.

CHARACTERISTICS

SINE WAVE

Frequency Range—5 Hz to 500 kHz in 5-decade steps. Accurate within 5% of dial setting from 5 Hz to 50 kHz; within 10% of dial setting from 50 to 500 kHz.

Amplitude Response (1-kHz Reference)—Flatness: 0.3 dB over entire range.
Attenuation: selectable from 0 to 70 dB in 10-dB steps with pushbuttons. Accurate within 0.2 dB for each step selected, additive. An uncalibrated control provides continuous variation from 0 to −40 dB.
Harmonic Distortion—<0.035% (−70 dB) from 20 Hz to 50 kHz. <0.15% from 50 to 500 kHz ($R_L \geq 600\ \Omega$).
Maximum Output Voltage—5 V RMS open circuit; 2.5 V RMS into 600 Ω.
Output Impedance—600 Ω, grounded.

SQUARE WAVE

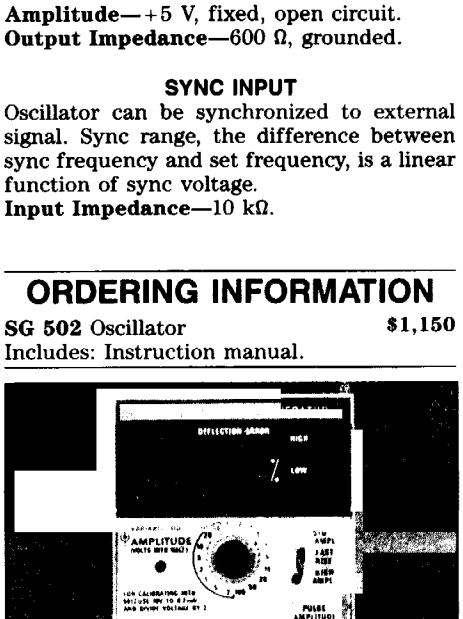
Frequency Range and Accuracy—Same as sine wave. The square wave switches on the 0° phase of sine out.
Rise Time and Fall Time—50 ns or less.
Amplitude—+5 V, fixed, open circuit.
Output Impedance—600 Ω, grounded.

SYNC INPUT

Oscillator can be synchronized to external signal. Sync range, the difference between sync frequency and set frequency, is a linear function of sync voltage.
Input Impedance—10 kΩ.

ORDERING INFORMATION

SG 502 Oscillator **$1,150**
Includes: Instruction manual.



NEW PG 506A Calibration Generator

- **Three Square-Wave Output Modes**
- **10 Hz to 1 MHz**
- **Direct Readout of Oscilloscope Deflection Error**

The PG 506A Calibration Generator provides three modes of square-wave output, selectable dc outputs, and a variable-amplitude output with front-panel digital indication of oscilloscope deflection error. Simultaneous, plus and minus low-level,

fast-rise (amplitude waves are Hz through transient r rent loop calibration generated mode. Its the calibra aligns witl sions. Sco read direc in percent verificatio

An option a clean, f transient r loscopes a driven by exceeding pulse is a ohms, whi 125 ps; ab 1 GHz sys

The optio designed f Standard allows you tant fou amplitude through 1 nient use that can amplitude ment is 5 PG 506A curacy of quirement greater th

CI
AMP
Period—Fi
Amplitude
1-2-5 sequer
100 μV p-p
Error Rea
0.1%.

Period—1
steps with
Variable ex
Symmetry
HI
Rise Time
minated in
Amplitude
to at least
less to at l
Leading-E
50 mV p-p,
minated in