

AUDIO ANALYSIS



SG 5010/SG 505

Low-Distortion Oscillators

- 10 Hz to 100 kHz Sine Wave Output
- Ultra-Low Distortion: 0.0008% THD (Typically 0.0003%)
- Floating or Grounded Output
- 600 Ω Source Impedance
- Vernier Frequency Control
- Fully Balanced Output to 28 dBm (SG 505 Option 02)
- Selectable Source Impedance (SG 505 Option 02)
- Intermodulation Test Signal (Options 01 and 02)

SG 5010/SG 505

The SG 5010 and SG 505 Oscillators generate an ultra-low distortion sine wave from 10 Hz to 163.8 kHz (SG 505 to 100 kHz) with less than 0.0008% and 0.0032% THD respectively. The THD is typically less than 0.0003% in the 20 Hz to 20 kHz range.

The SG 5010 offers the full benefits of TM 5000 configurability, GPIB compatibility, and compliance with Tektronix Standard Codes and Formats. It generates five waveforms: sine wave, square wave, SMPTE/DIN intermodulation test signal, CCIF intermodulation test signal, and sine wave burst. All of these signals may be swept in frequency or amplitude. The five-digit LED display indicates parameter values and units plus indicators for the remote and addressed states. Three source impedances are selectable and the output signal can be grounded or floating, balanced or unbalanced. Output amplitude is programmable from 0.2 mV to 21.2 V peak equivalent V RMS, supplying up to 28 dBm into a 600 ohm load.

On the SG 505, a FREQUENCY Hz dial provides frequency adjustment within each band. A FREQ VERNIER control permits extremely fine frequency adjustment (to $\pm 1\%$) range. Distortion is less than or equal to 0.0008% from 20 Hz to 20 kHz. An OUTPUT LEVEL switch, calibrated in 10 dBm into a 600 ohm load, selects eight level steps at the OUTPUT. The SYNC OUT connector provides approximately 200 mV RMS fixed amplitude and ground-referenced sine wave signal at the same frequency as the OUTPUT.

The SG 505 Option 01 adds an intermodulation test function. The Intermodulation Test Signal pushbutton mixes an internally selectable 60 or 250 Hz sine wave with the normally selected frequency in a 4:1 amplitude ratio. The composite peak-to-peak amplitude is calibrated to be identical with the peak-to-peak amplitude of the OUTPUT signal in the normal oscillator mode.

The SG 505 Option 02 adds the Option 01 (intermod) and changes the SG 505 to have a balanced output with an amplitude range of +22 dBm to -68 dBm; the variable attenuator provides a continuous adjustment from CAL. A front panel control selects a source resistance of 600, 150, or 50 ohms.

CHARACTERISTICS (SG 505)

MAIN OUTPUT

The following characteristics are common to the standard SG 505 and SG 505 with Option 01.

Frequency Range – 10 Hz to 100 kHz in four overlapping bands. Accurate within 3% of dual setting (with Vernier at center). Vernier Range is at least $\pm 1\%$ of frequency setting.

Calibrated Output – Selectable from +10 to -60 dBm into 600 Ω in eight 10 dB steps. Accurate to within 0.2 dB at 0 dBm and 1 kHz. Step accuracy is 0.1 dB/10 dB step. An uncalibrated control provides continuous variation from at least +2.2 dB to <-10 dB from calibrated position.

Amplitude Response – Level flatness ± 0.1 dB from 10 Hz to 20 kHz (1 kHz ref); within 0.2 dB from 20 to 100 kHz (excluding > -60 dB output-level range).

Harmonic Distortion – < 0.0008% (-102 dB) THD from 20 Hz to 20 kHz (typically 0.0003%); 0.0018% (-95 dB) THD from 10 to 20 Hz, and from 20 to 50 kHz 0.0032% (-90 dB) THD from 50 to 100 kHz ($R_L \geq 600 \Omega$).

Output Impedance – 600 $\Omega \pm 2\%$; floating or grounded through $\approx 30 \Omega$. Output impedance does not change with Output On/Off selection. Maximum floating voltage ± 30 V peak.

Maximum Output Voltage – At least 6 V RMS open circuit; 3.16 V RMS (+10 dBV or +12.2 dBm) into 600 Ω .

SYNC OUTPUT Signal – 200 mV RMS $\pm 20\%$ sine wave to 20 kHz, at least 120 mV RMS at 100 kHz.

Frequency – Same as main output.

Impedance – Nominally 1 k Ω , ground referenced and isolated from main output.

REAR INTERFACE SIGNALS

Buffered Main Output – Buffered version of actual output signals from front-panel connector. $\approx 600 \Omega$ output impedance.

Sync Output – Same as front-panel Sync Output except output impedance is $\approx 50 \Omega$.

SG 505 WITH OPTION 01 IM TEST SIGNAL

LF Frequency – Internally selectable 60 Hz (± 1 Hz) or 250 Hz (± 3 Hz).

Main Output – Composite p-p output within 0.2 dB of normal oscillator mode output.

Residual IMD – < 0.0005% from 2.5 to 10 kHz.

Sync Output – LF signal component only, 200 mV RMS $\pm 20\%$.

SG 505 WITH OPTION 02 BALANCED OUTPUT PLUS IM

Calibrated Balanced Output – Selectable from +22 to -68 dBm into 600 Ω in ten 10 dB steps. Accurate to within 0.2 dB at +22 dBm and 1 kHz. Step accuracy is ± 0.1 dB/10 dB step or 20 dB step change. An uncalibrated control provides continuous variation from <-10 to +0.3 dB from calibrated position.

Harmonic Distortion – < 0.0008% (-102 dB) THD from 20 Hz to 20 kHz (typically 0.0003%); 0.0018% (-95 dB) THD from 10 to 20 Hz, and from 20 to 50 kHz; 0.0056% (-85 dB) THD from 50 to 100 kHz ($R_L \leq 600 \Omega$).

Output Impedance Selectable – 600 $\Omega \pm 2\%$, 150 $\Omega \pm 2\%$, or 50 $\Omega \pm 3\%$ floating or grounded through $\approx 30 \Omega$. Output impedance does not change with Output On/Off selection. Impedance to CT is 1/2 the selected impedance. Maximum floating voltage ± 25 V peak.

Maximum Output Voltage – At least 21 V RMS open circuit; 19.45 V RMS (+28 dBm) into 600 Ω from 50 Ω .

Balance – $\leq 0.5\%$ mismatch of output open-circuit voltages referenced to CT for $f \leq 20$ kHz with output grounded.

AUDIO ANALYSIS



CHARACTERISTICS (SG 5010)

AVAILABLE FUNCTIONS

Sine wave, square wave, SMPTE/DIN 4:1, SMPTE DIN 1:1, CCIF, Sine-Wave Burst, IHF Burst (± 20 dB or OFF between bursts), External Input (Amplifier Mode).

FREQUENCY RANGE AND ACCURACY

Sine Wave, Sine-Wave Burst— SMPTE/DIN: 10 Hz to 163.80 kHz $\pm 0.01\%$. CCIF Center Frequency: 2.500 to 163.80 kHz $\pm 0.01\%$. Square Wave: 10 Hz to 16.380 kHz $\pm 0.01\%$.

Resolution in Above Functions— 10.00 to 163.80 Hz: 0.01 Hz; 163.9 Hz to 1.6380 kHz: 0.1 Hz; 1.639 to 16.380 kHz: 1.0 Hz; 16.39 to 163.80 kHz: 10.0 Hz.

SMPTE Lower Tone, CCIF Offset From Center

Frequency— Selectable From: 40, 50, 60, 80, 100, 125, 250, 500 Hz, all $\pm 2\%$.

Sine Distortion (Load 600 Ω THD Including 2nd Through 5th Harmonics)—

20 Hz to 20 kHz: 0.001% (-100 dB).

20 to 50 kHz: 0.0032% (-90 dB).

10 to 20 Hz and 50 to 100 kHz: 0.01% (-80 dB).

100 to 163.8 kHz: 0.032% (-70 dB) any individual harmonic.

Sine Flatness— 20 Hz to 20 kHz: 0.05 dB; 10 Hz to 163.8 kHz: 0.2 dB.

Square-Wave Rise Time— 1.5 μ s $\pm 10\%$.

Burst Range— 1 to 65535 cycles On, 1 to 65535 cycles Off. Off Level either 20 dB or zero. All switching at sine-wave zero crossing. Triggered, gated, or free-running burst modes available.

OUTPUT LEVEL RANGE AND ACCURACY

Balanced— Into Open Circuit: 200 μ V to 21.2 V RMS. Into 600 Ω : -72.45 to $+28.05$ dBm.¹

Unbalanced— Into Open Circuit: 200 μ V to 21.2 V RMS. Into 600 Ω : -72.45 to $+22.05$ dBm.¹

Resolution— 0.05 dB in dBm mode, 0.25% or better in volts mode.

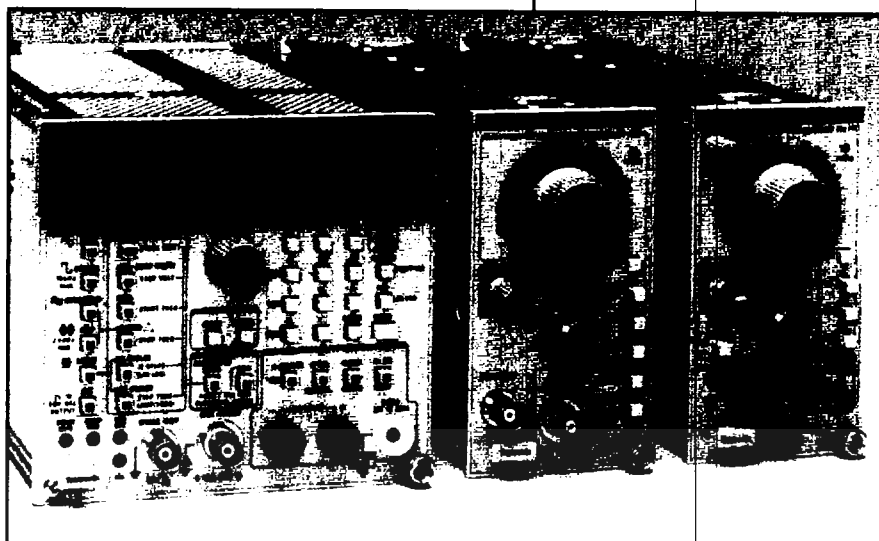
Level Accuracy (Sine Wave)— 20 Hz to 20 kHz $\pm 2\%$ (0.2 dB); 10 Hz to 163.8 kHz $\pm 3\%$ (0.3 dB).

¹ $R_L = 50 \Omega$. For $R_L = 150 \Omega$, subtract 1.25 dBm; for $R_L = 600 \Omega$, subtract 5.35 dBm.

OUTPUT IMPEDANCE AND CONFIGURATION

50 $\Omega \pm 3\%$, 150 $\Omega \pm 2\%$, or 600 $\Omega \pm 1\%$, balanced or unbalanced, floating or grounded.

External Input— A floating single-ended input is provided for accessing the variable-gain stage and high-level output amplifier, enabling the use of custom test signals. Input impedance is 20 k Ω ; a 2 V RMS input (2.83 V peak maximum) provides a calibrated output.



SYNC OUTPUT

A ground referenced TTL-compatible signal is provided that allows stable oscilloscope display of all functions. In sine and square wave modes, the output is at the signal frequency. In the IM modes, the sync output is at the lower or offset frequency. In both burst modes, the sync signal follows the burst envelope.

SWEEP MODE

Linear or logarithmic sweep of amplitude or frequency in any function. Sweep is composed of discrete steps. The following sweep functions are programmable via GPIB or from the front panel: swept parameter (frequency or amplitude), linear or log sweep, number of steps up to 99, time per step from 0.1 to 25 s, start frequency or voltage, and stop frequency or voltage. Start and stop frequencies or voltages can be anywhere within the range of the generator, and sweep direction can be upward or downward. Pen lift and ramp outputs are available for interface to an analog plotter.

STORED SETUPS

Ten different complete front-panel setups can be stored in the nonvolatile internal memory and recalled from front-panel pushbuttons or via the GPIB. Additionally, the front-panel settings at power down are retained and used at power up.

PROGRAMMABILITY

All functions, parameters, and modes can be controlled over the GPIB using simple English-like commands. All settings can be interrogated, with the resulting response usable as a command to return the instrument to that setting (Learn mode). The GPIB address can be displayed and changed from the front panel.



ORDERING INFORMATION

SG 5010 Programmable Oscillator. **\$4,795**
Includes: Instruction manual (070-4331-00), Instrument Interface Guide (070-4790-00), Reference Guide (070-4330-00).

SG 505 Oscillator. **\$1,250**
Includes: Instruction manual (070-2823-00).

SG 505 OPTIONS

Opt. 01—IM Test Signal **+\$225**
Opt. 02—Balanced Output plus IM. Includes: Cable assembly for sync output (175-1178-00) **+\$730**

SOFTWARE RECOMMENDATIONS

EZ-TEST PC—Order S45F030 **\$1,995**

IBM BASICA Program Available with GURU II Package: AUDIDDEM BAS.

* The SG 5010 complies with IEEE Standard 488.1-1987, and Tektronix Standard Codes and Formats