

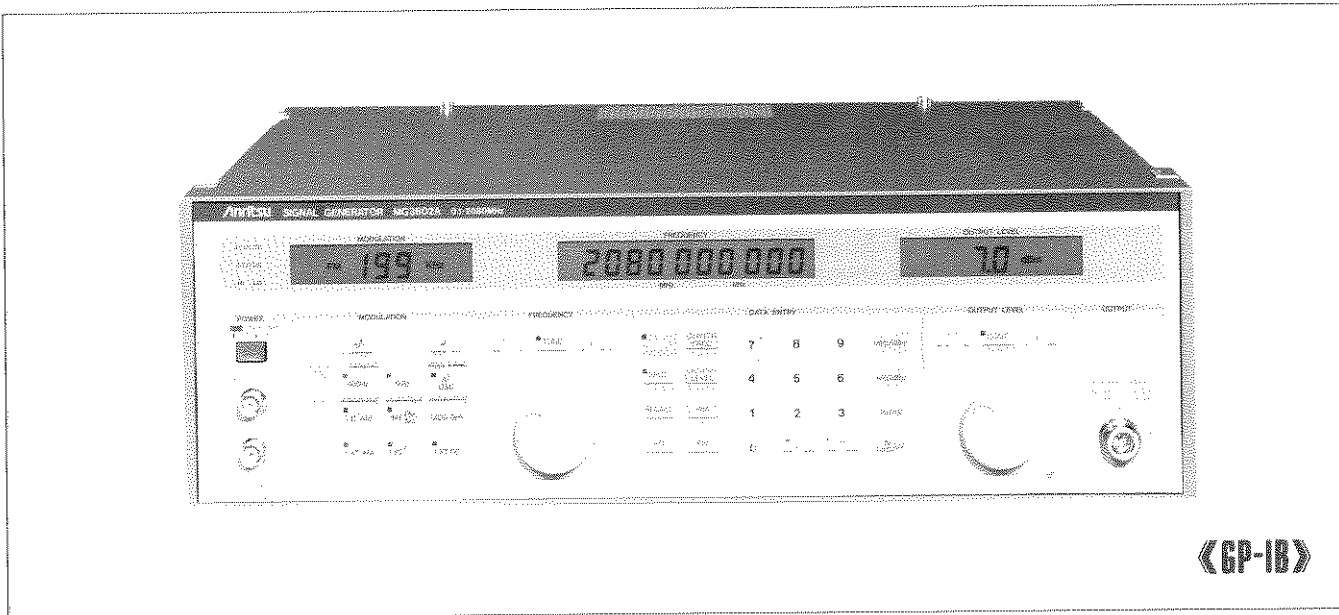
FREQUENCY SYNTHESIZERS, SIGNAL GENERATORS

SIGNAL GENERATOR

MG3601A, MG3602A

0.1 to 1040 MHz

0.1 to 2080 MHz



The MG3601A/3602A are synthesized signal generators with wide settable frequency ranges from 0.1 to 1040 MHz (MG3601A) and 0.1 to 2080 MHz (MG3602A).

Its basic characteristics such as frequency stability, output level accuracy, SSB phase noise, and residual FM are excellent and it has many modulation functions: AM, FM, ϕ M, and video. These features make the MG3601A/3602A suitable for various functional evaluations of receivers and wide use as general-purpose signal sources.

Also, since memory and other functions can be externally-controlled via GP-IB (standard), it enables labor-saving measurement and automation.

Features

- Excellent signal purity
SSB phase noise: ≤ -123 dBc/Hz (fc: 500 MHz, Δf : 20 kHz), Residual FM: ≤ 4 Hz (fc: 500 MHz)
- Many output level units
Various level units such as dBm, dB μ V, mV, μ V, dB μ Vemf, mVemf, μ Vemf are provided.

- Continuously variable output levels for convenient squelch sensitivity measurement
- Built-in wideband audio frequency synthesizer for easy testing of demodulation frequency characteristics (Option)
- Excellent frequency accuracy at DC FM as result of self-calibration
- Reverse power protection up to 50 W
- Excellent operability as a result of relative value display, frequency memory (100 frequencies), and function memory (30 sets of panel settings)

Main applications

- Receiver performance evaluation
Mobile radio equipment, car telephone, CB, AM/FM radio, TV, pager, and interphone
- High-frequency component parts performance evaluation, and IC/tuner/filter/demodulator testing
- Calibration signal source
EMI, EMC and power measurements of radio equipment very low power

Specifications

• Common to MG3601A/3602A (≤ 1040 MHz)

Carrier frequency	Frequency range	0.1 to 1040 MHz		
	Resolution	10 Hz		
	Accuracy	Same as those of the reference oscillator		
	Reference oscillator	Frequency	100 MHz	
		Stability	Aging rate: 2×10^{-6} /year Temperature characteristics: 5×10^{-6} (for 0 to 50°C change of temperature at reference oscillator) Note: Better aging rate of up to 2×10^{-9} /day are available as options.	
	External reference input	10 MHz, ≥ 2 Vp-p into 50 Ω load		
	External reference output	10 MHz, TTL level		
Setting	Keyboard, rotary encoder or GP-IB			

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Output	Level range	-133 to +13 dBm (-20 to +126 dB μ Vemf)	
	Resolution	0.1 dB	
	Accuracy	± 1 dB (≥ -10 dBm), ± 1.5 dB (≥ -123 dBm), ± 2 dB (< -123 dBm)	
	Frequency characteristics	≤ 1 dB (at 0 dBm)	
	Impedance	50 Ω , VSWR: ≤ 1.5 (at $\leq +3$ dBm), N-type connector	
	Radiation interference	≤ 1 μ V (terminated with 50 Ω load, measured at 25 mm from the front panel with a two-turn 25 mm diameter loop antenna)	
	Setting	Keyboard, rotary encoder or GP-IB	
Signal purity	Harmonics	≤ -25 dBc (2nd or 3rd harmonics)	
	Non-harmonic spurious	≤ -60 dBc (>5 kHz from carrier)	
	SSB phase noise	In CW mode, at 20 kHz offset ≤ -117 dBc/Hz (0.1 MHz \leq fc < 130 MHz, 520 MHz \leq fc \leq 1040 MHz) ≤ -123 dBc/Hz (260 MHz \leq fc < 520 MHz) ≤ -129 dBc/Hz (130 MHz \leq fc < 260 MHz) where fc is carrier frequency	
	Residual AM	$\leq 0.03\%$ (-76 dBc) [at ≥ 150 kHz carrier frequency, demodulation band 50 Hz to 15 kHz]	
	Residual FM	Frequency range	Demodulation band
		0.3 to 3 kHz	50 Hz to 15 kHz
	520 MHz \leq fc \leq 1040 MHz 0.1 MHz \leq fc < 130 MHz	7 Hz (50 dB)	16 Hz
	260 MHz \leq fc < 520 MHz	4 Hz (55 dB)	8 Hz
	130 MHz \leq fc < 260 MHz	2 Hz (61 dB)	4 Hz
	Measured by rms detector Values in parentheses are relative values compared with 3.5 kHz deviation.		
Amplitude modulation	Modulation factor	0 to 100% at output levels $\leq +7$ dBm	
	Resolution	1%	
	Accuracy	\pm (indicated value $\times 0.04 + 2$)% at 1 kHz internal modulation frequency, $\leq 90\%$ modulation factor	
	Internal modulation frequency	400 Hz, 1 kHz (20 Hz to 50 kHz modulation is possible using optional built-in AF oscillator.) Accuracy: ≤ 100 ppm	
	External modulation	20 Hz to 50 kHz at AC couple (± 1 dB bandwidth) DC to 50 kHz at DC couple (± 1 dB bandwidth) Input level: approx. 1 Vrms/600 Ω	
	Distortion	$\leq 1\%$ at 30% modulation factor, $\leq 3\%$ at 60% modulation factor (for 1 kHz internal modulation frequency)	
	Incidental FM	≤ 200 Hz peak at 1 kHz modulation frequency, 30% AM, 0.3 to 3 kHz demodulation bandwidth	
Frequency modulation	Frequency modulation range	0 to 199 kHz, 0 to 99.9 kHz (130 to 260 MHz) FM not specified for fc-(Δ fpk) < 100 kHz	
	Resolution	10 Hz at 0 to 9.99 kHz, 100 Hz at 10 to 99.9 kHz, 1 kHz at 100 to 199 kHz	
	Accuracy	$\pm 5\%$ of indicated value at 1 kHz modulation frequency except residual FM	
	Internal modulation frequency	400 Hz, 1 kHz (20 Hz to 100 kHz modulation is possible using optional built-in oscillator) Accuracy: ≤ 100 ppm	
	External modulation frequency range	AC mode: 20 Hz to 100 kHz (± 1 dB bandwidth) DC mode: DC to 100 kHz (± 1 dB bandwidth)	
	Distortion	$\leq 1\%$ (at 1 kHz modulation frequency, 22.5 kHz deviation)	
	Incidental AM	$\leq 0.1\%$ (at ≥ 500 kHz carrier, 1 kHz modulation frequency, 20 kHz deviation)	
	Center frequency accuracy at DC FM mode ¹	$\leq \pm 500$ Hz (fc: 500 MHz) for 3-minute period after calibration and after 2-hour warm-up compared with frequency of AC FM mode	
	Calibration function	Automatic self calibration possible	
Phase modulation	Phase modulation range	0 to 9.99 rad. (Indicates max. 999 rad. at internal modulation mode)	
	Resolution	0.01 rad. (0 to 9.99 rad.), 0.1 rad. (10 to 99.9 rad.), 1 rad. (100 to 999 rad.)	
	Accuracy	$\pm 5\%$ of indicated value (at 1 kHz internal modulation frequency except residual FM)	
	Internal modulation frequency ²	400 Hz, 1 kHz (20 Hz to 100 kHz modulation is possible using optional built-in oscillator.) The MG3601A displays phase deviation (radian) derived from frequency deviation and modulation frequency of FM. Therefore, max. phase deviation is given as (max. deviation)/(modulation frequency).	
	External modulation frequency	200 Hz to 8 kHz (± 1 dB bandwidth) Input level: approx. 1 Vrms/600 Ω	

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Video modulation ³ (option)	Input signal	Video composite signal		
	Input level	1 V _{p-p} /75 Ω (Pedestal level: 0 V, White level: positive voltage)		
	Modulation factor	When the specified voltage video signal is applied, modulated wave includes the signal as follows. White level: approx. 12.5% of carrier peak Pedestal level: approx. 75% of carrier peak		
	Carrier level accuracy	±3 dB at peak level		
Functions	Modulation signal output	Output level: approx. 1 V _{rms} /600 Ω		
	Simultaneous modulation	INT/EXT: AM/FM (φM), FM (φM)/AM, FM (φM)/FM (φM) INT/INT, EXT/EXT: AM/FM (φM)		
	Reverse power protection	≤50 W and ≤±50 Vdc		
	Other functions	Relative value indication	Relative value display of carrier frequency and level is possible.	
		Continuously variable output mode	0.1 dB step adjustment of output level is possible with no output interruption in a ±5 dB range around an arbitrary level.	
		Frequency memory	Stores and recalls up to 100 frequencies	
		Function memory	Stores and recalls up to 30 sets of panel settings	
External control	GP-IB: SH1, AH1, T6, L4 TE0, LE0, SR1, RL1, PP0, DC1, DT0, C0			
General	Ambient temperature, rated range of use	0° to 50°C		
	Power	AC 100 V ±10%, 50/60 Hz, ≤100 VA		
	Dimensions and mass	132.5H × 426W × 451D mm, <16 kg		
Options	Option 01 Reference oscillator (10 MHz)	Aging rate: 2 × 10 ⁻⁸ /day (after 24-hour warm-up) Starting characteristics: 1 × 10 ⁻⁷ /day (after 30-min. operation), 5 × 10 ⁻⁸ /day (after 60-min. operation) Temperature characteristics: ±5 × 10 ⁻⁸ (0° to 50°C)		
	Option 02 Reference oscillator (10 MHz)	Aging rate: 5 × 10 ⁻⁹ /day (after 24-hour warm-up) Starting characteristics: 7 × 10 ⁻⁸ /day (after 30-min. operation), 3 × 10 ⁻⁸ /day (after 60-min. operation) Temperature characteristics: ±5 × 10 ⁻⁸ (0° to 50°C)		
	Option 03 Reference oscillator (10 MHz)	Aging rate: 2 × 10 ⁻⁹ /day (after 24-hour warm-up) Starting characteristics: 2 × 10 ⁻⁸ /day (after 60-min. operation) Temperature characteristics: ±1.5 × 10 ⁻⁸ (0° to 50°C)		
	Option 04 AF oscillator	Frequency: 20 Hz to 100 kHz Resolution: 0.1 Hz Frequency accuracy: ≤100 ppm		
	Option 05 Video modulation	See Video modulation		
	Option 06 External modulation polarity switching	The relationship between the voltage polarity of the external modulation signal and the deviation increment and decrement can be selected as reversed or non-reversed.		
	Option 07 External FM modulation factor display	Display range: 0 to 102% of modulation factor set value Accuracy: ±4% (excluding modulation accuracy)		

¹ After 2-hour warm up, compared with frequency AC FM mode

² Internal phase modulation frequency display indicates value converted from FM frequency to radians.

³ Double sideband (AM) modulation

• MG3602A (>1040 MHz)

Carrier frequency	Frequency range	Up to 2080 MHz
	Resolution	20 Hz
Output	Level range	Up to +7 dBm (-20 to +120 dB _μ Vemf)
	Accuracy	±1.5 dB (≥ -10 dBm), ±2 dB (≥ -123 dBm), ±3 dB (< -123 dBm)
	Frequency characteristics	≤1.5 dB
	Impedance	50 Ω, VSWR ≤1.8 (at ≤ -3 dBm)
Signal purity	Subharmonics (1/2 f _c , 3/2 f _c)	≤ -30 dBc
	Non-harmonic spurious	≤ -54 dBc (>5 kHz apart from carrier)
	SSB phase noise	≤ -110 dBc/Hz at 20 kHz offset
	Residual FM	15 Hz (0.3 to 3 kHz demodulation), 32 Hz (50 Hz to 15 kHz demodulation)
Amplitude modulation	Modulation factor	0 to 100% (at ≤ +1 dBm)
	Accuracy	±(indicated value × 0.04 + 2)% at 1 kHz internal modulation frequency, <60% modulation factor
	External modulation	20 Hz to 30 kHz at AC couple (±1 dB bandwidth), DC to 30 kHz at DC couple (±1 dB bandwidth)
	Distortion	≤2.5% at 30% modulation factor (at 1 kHz internal modulation frequency)
Function	Incidental FM	≤400 Hz peak (at 1 kHz internal modulation frequency, 30% modulation, 0.3 to 3 kHz demodulation bandwidth)
	Reverse power protection	≤25 W and ≤±50 Vdc

Specifications except above are same as the specifications (common to MG3601A/3602A, ≤1040 MHz).

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Ordering information

Please specify model/order number, name and quantity when ordering.

Model/Order No.	Name	Remarks
MG3601A MG3602A	Main frame Signal Generator Signal Generator	0.1 to 1040 MHz 0.1 to 2080 MHz
J0025 J0127 J0017 F0012 W0243AE W0244AE	Accessories supplied Coaxial Cord, 1 m: 1 pc Coaxial Cord, 1 m: 1 pc Power Cord, 2.5 m: 1 pc Fuse, 3.15 A: 2 pcs MG3601A Operation Manual: 1 copy MG3602A Operation Manual: 1 copy	S-5DWP+5D-2W+S-5DWP BNC-P+RG-58A/U+BNC-P With 3-pole to 2-pole conversion adaptor T3.15A250V
MG360□A-01 MG360□A-02 MG360□A-03 MG360□A-04 MG360□A-05 MG360□A-06 MG360□A-07	Options Reference Oscillator Reference Oscillator Reference Oscillator AF Oscillator Video Modulation External Modulation Polarity Switching External FM Modulation Factor Display	Aging rate: $\leq 2 \times 10^{-8}$ /day Aging rate: $\leq 5 \times 10^{-9}$ /day Aging rate: $\leq 2 \times 10^{-9}$ /day 20 Hz to 100 kHz, 0.1 Hz resolution
J0007 J0008 Z-164A MP659A MP614A	Optional accessories GP-IB Cable, 1 m GP-IB Cable, 2 m T-Pad Four-Port Junction Pad 50 Ω ↔ 75 Ω Impedance Transformer	408JE-101 408JE-102 DC to 1000 MHz 40 to 1000 MHz 10 to 1200 MHz