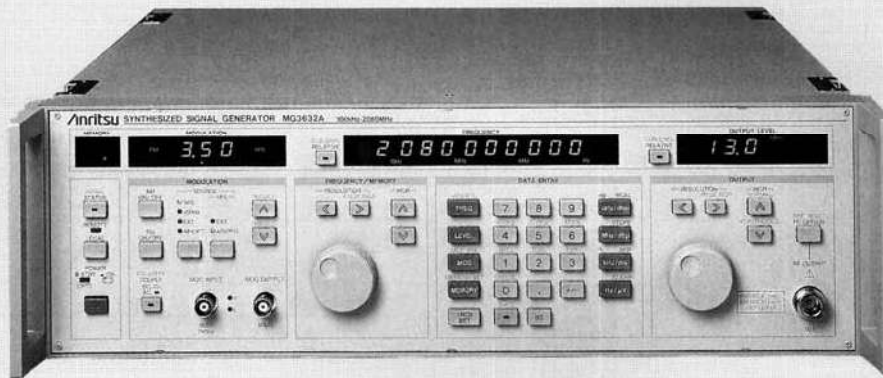


SYNTHESIZED SIGNAL GENERATOR

MG3631A, MG3632A

0.1 to 1040 MHz

0.1 to 2080 MHz



《GP-IB》

The MG3631A/3632A have a high accuracy of level and signal purity, and they are also equipped with amplitude and frequency modulation functions, necessary for radio measurements. Moreover, their frames have been constructed in a manner which emphasizes shielding so as to achieve super-low leakage levels of less than $0.3 \mu\text{V}$. Hence these units can be used reliably in testing highly sensitive radio receivers with built-in antennas.

A function for mixing signals modulated by two separate sources with variable independently-set, modulation factors has been provided. When used with the optional AF generator, tone squelch functions can be tested. Moreover, when used in combination with an MN3650A/B/C digital modulator, either of these units can be used to test new digital systems, such as portable phones, digital cellular and cordless phones.

Features

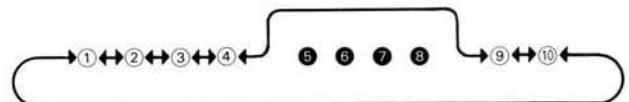
- Excellent signal purity of -124 dBc/Hz (at a frequency of 1 GHz, and offset of 10 kHz)
- Low leakage of $0.3 \mu\text{V}$
- Continuously variable output level
- Memory function for storing 100 panel settings
- Used with digital modulators (MN3650A/B/C, $\pi/4\text{DQPSK}$, GMSK)

Functions

• Memory

Mass-storage memory capable of storing up to one hundred different panel settings is provided. The contents of memory addresses can be selected for display by inputting the address via the numeric keys. Alternatively by using the [↵] and [M] keys and rotary knob, the address contents can be continuously recalled.

In the continuous recall mode, the previously stored memory contents are sequentially recalled. An "address skipping" function is provided, which skips the unused memory addresses, and recalls the contents of the next memory address. For instance, when data is stored in addresses ① through ⑩, if addresses ⑤ through ⑧ are set to be skipped, then data is sequentially recalled from addresses ①, ②, ③, ④, ⑨ and ⑩. The most-recently called memory address can be easily read from the dedicated address display.



• : Memory addresses set to be skipped

• Continuous Adjustment of the Output Level

The MG3631A/3632A have a continuous level adjustment mode, enabling adjustment of the output level over a maximum range of 26 dB even when the attenuation of the programmable attenuator is fixed. This feature is useful for measuring radio squelch sensitivity even when problems caused by momentary signal disruptions occur as the level is being changed. It can also be used to measure a wide variety of other systems.

• Diverse Simultaneous Modulation Options

The MG3631A/3632A have standard oscillators for generating internal modulation signals of 1 kHz and 400 Hz. Simultaneous modulation by an external modulating signal can be easily performed with the mixing modulation function.

When the optional AF oscillator is added, simultaneous modulation by two internal modulating signals can be performed. This system is ideal for testing the tone squelch features of radio equipment. For example, this unit can generate tone squelch standard modulated signals by mixing a 1 kHz artificial-voice modulation signal, having a frequency deviation of 1.4 kHz, with an 88.5 Hz tone modulation signal, having a frequency deviation of 0.35 kHz.

• Remote Control Functions

When the separately sold remote control unit is connected, the panel functions can be set via the remote control unit. In combination with the memory functions, the remote control unit can improve operability on production and inspection lines.

FREQUENCY SYNTHESIZERS, SIGNAL GENERATORS



• GP-IB Program Compatibility

The basic GP-IB program code functions for the MG3631A/3632A are identical to those of the MG3601A/3602A series. Therefore, programs written for the MG3601A/3602A can be down loaded directly into the MG3631A/3632A without modification. The special functions are compatible with MG3633A program code.

Note: Some functions are different and are, therefore, incompatible.

Performance

• Signal Purity

Figure 1 shows the SSB phase noise characteristics for carrier frequencies of 400 MHz and 1 GHz. The effective SSB phase noise levels for an offset frequency of 10 kHz are excellent, at -135 dBc/Hz and -130 dBc/Hz, respectively.

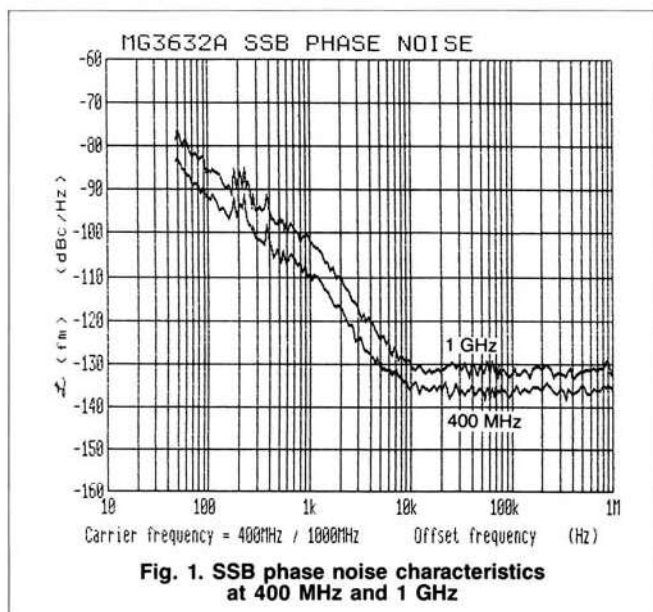


Figure 2 shows the SSB phase noise characteristic at an offset frequency of 10 kHz. The noise level is even lower in the 150 MHz band.

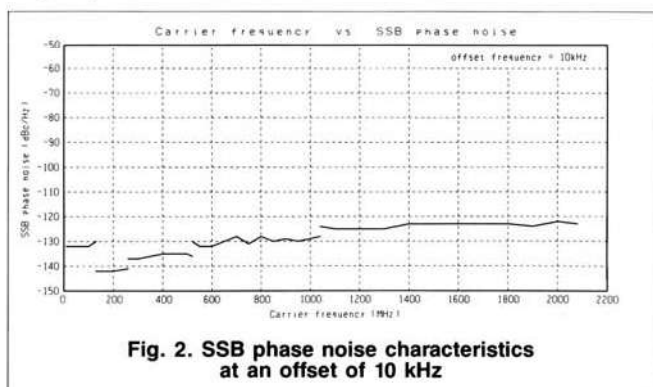
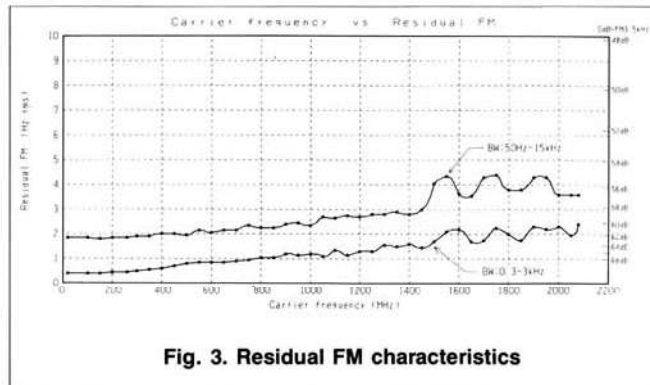
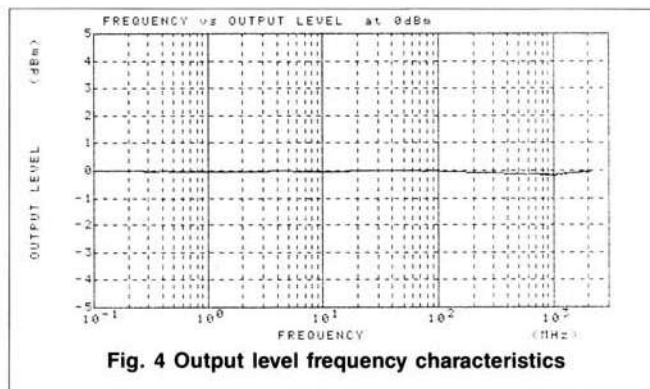


Figure 3 shows the residual FM characteristics for demodulation bands of both 0.3 to 3 kHz and 50 Hz to 15 kHz. The S/N ratio of radio equipment can thus be measured adequately.

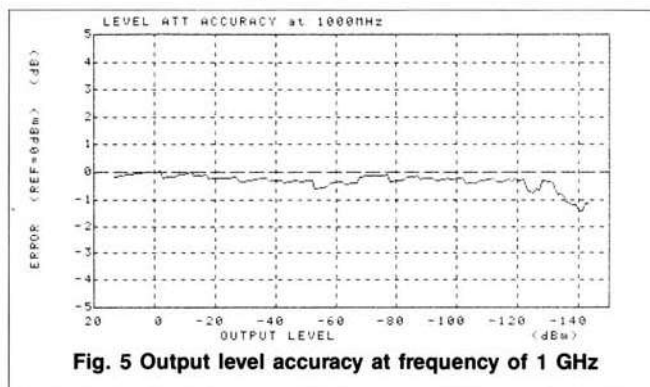


• Output Level

A high output level of $+13$ dBm can be obtained reliably from the MG3631A/3632A over the entire frequency range; hence the units can be used to generate interference signals for two-signal or three-signal tests of radio equipment. It can also be used as a mixer or other local signal source. Moreover, the output level is calibrated by a microcomputer, so that the output frequency characteristic is extremely good. (Fig. 4).



By incorporating a high-accuracy programmable attenuator, accurate signals can be output at levels as low as -143 dBm. Figure 5 shows the output level accuracy.

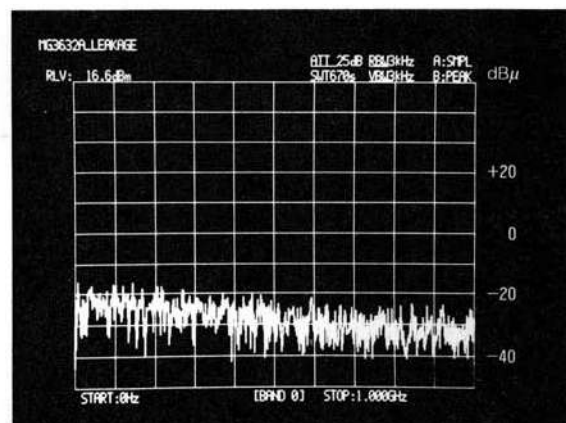


• Leakage

The RF case has been meticulously constructed in a shielded seamless housing. As Fig. 6 shows the leakage level is held to an extremely low $0.3 \mu\text{V}$ ($-10 \text{ dB}\mu$) over all frequencies including carrier frequencies. Consequently, the sensitivity of highly sensitive radio/antenna systems and the attenuation caused by shielding can be measured with high accuracy.

Fig. 6. Leakage characteristics

As measured at a frequency of 1 GHz and output of 0 dBm when the MP752A Termination was connected; measurements were performed at a point 25 mm away from the front panel and display surface, using a two-turn loop antenna with a diameter of 25 mm.



Specifications

Carrier frequency	Range	MG3631A: 0.1 to 1040 MHz (possible setting range: 0 to 1040 MHz) MG3632A: 0.1 to 2080 MHz (possible setting range: 0 to 2080 MHz)			
	Resolution	10 Hz			
	Accuracy	Same as that of the reference oscillator			
	Internal reference oscillator	Frequency: 10 MHz Aging rate: $\pm 2 \times 10^{-7}/\text{day}$ ($2 \times 10^{-9}/\text{day}$ for option 03) Temperature characteristics: $\pm 1 \times 10^{-6}$ (0° to 50°C)			
	External reference signal input	10 MHz ± 10 ppm, TTL level, 50 Ω , BNC connector on rear panel			
	Reference signal output	10 MHz, TTL level, BNC connector on rear panel			
	Switching time	≤ 150 ms (Time from last command until frequency has stabilized to within ± 500 Hz, during remote operation)			
Output	Range	-143 to $+13 \text{ dBm}$			
	Units	dBm, dBμ, μV, mV, V (Terminated and open voltages are selectable for dBμ, μV, mV, V)			
	Resolution	0.1 dB			
	Frequency response	$\pm 0.5 \text{ dB}$ relative to 0 dBm ($\leq 1040 \text{ MHz}$) $\pm 1 \text{ dB}$ relative to 0 dBm ($> 1040 \text{ MHz}$)			
	Accuracy	Output level	$\leq 1040 \text{ MHz}$	$> 1040 \text{ MHz}, \leq 1700 \text{ MHz}$ (for MG3632A only)	$> 1700 \text{ MHz}$ (for MG3632A only)
		-33 to $+13 \text{ dBm}$	$\pm 1 \text{ dB}$	$\pm 1.5 \text{ dB}$	$\pm 1.5 \text{ dB}$
		-108 to -33.1 dBm	$\pm 1.5 \text{ dB}$	$\pm 2.5 \text{ dB}$	$\pm 3 \text{ dB}$
		-123 to -108.1 dBm	$\pm 3 \text{ dB}$	$\pm 4 \text{ dB}$	$\pm 4 \text{ dB}$
		-143 to -133.1 dBm	—	—	—
	Impedance	50 Ω , N-type connector VSWR: ≤ 1.5 ($\leq 1040 \text{ MHz}$, $\leq -3 \text{ dBm}$) ≤ 1.8 ($> 1040 \text{ MHz}$, $\leq -3 \text{ dBm}$, for MG3632A only)			
	Switching time	≤ 150 ms (Time from last command until level has stabilized within $\pm 0.5 \text{ dB}$ during remote operation)			
	Interference radiation	$\leq 0.3 \mu\text{V}$ (Value is voltage terminated with 50 Ω load, measured 25 mm from front panel with two-turn 25 mm diameter loop antenna. Except 10 MHz reference signal component when options 01 to 03 are used)			
Signal purity	Harmonics	$\leq -30 \text{ dBc}$ (for 2nd and 3rd harmonics, in CW mode)			
	Sub-harmonics	None ($\leq 1040 \text{ MHz}$, CW mode) $\leq -30 \text{ dBc}$ ($> 1040 \text{ MHz}$, CW mode, $f/2$, $3f/2$, $5f/2$, for MG3632A only)			
	Non-harmonics	In CW mode, $\geq 5 \text{ kHz}$ offset $\leq -60 \text{ dBc}$ ($< 130 \text{ MHz}$) $\leq -66 \text{ dBc}$ ($\geq 130 \text{ MHz}$, $< 520 \text{ MHz}$) $\leq -60 \text{ dBc}$ ($\geq 520 \text{ MHz}$, $\leq 1040 \text{ MHz}$) $\leq -54 \text{ dBc}$ ($> 1040 \text{ MHz}$, for MG3632A only)			

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Signal purity	SSB phase noise	<p>In CW mode, 10 kHz offset</p> <ul style="list-style-type: none"> ≤ -124 dBc/Hz (≥ 10 MHz, < 130 MHz) ≤ -133 dBc/Hz (≥ 130 MHz, < 260 MHz) ≤ -130 dBc/Hz (≥ 260 MHz, < 520 MHz) ≤ -124 dBc/Hz (≥ 520 MHz, ≤ 1040 MHz) ≤ -118 dBc/Hz (> 1040 MHz, for MG3632A only) <p>In CW mode, 20 kHz offset</p> <ul style="list-style-type: none"> ≤ -125 dBc/Hz (≥ 10 MHz, < 130 MHz) ≤ -134 dBc/Hz (≥ 130 MHz, < 260 MHz) ≤ -131 dBc/Hz (≥ 260 MHz, < 520 MHz) ≤ -125 dBc/Hz (≥ 520 MHz, ≤ 1040 MHz) ≤ -119 dBc/Hz (> 1040 MHz, for MG3632A only)
	Residual AM	≤ 0.03% rms (≥ 0.5 MHz, demodulation band from 50 Hz to 15 kHz)
	Residual FM	<p>On demodulation band 0.3 to 3 kHz</p> <ul style="list-style-type: none"> ≤ 4 Hz rms (≥ 10 MHz, < 130 MHz) ≤ 1 Hz rms (≥ 130 MHz, < 260 MHz) ≤ 2 Hz rms (≥ 260 MHz, < 520 MHz) ≤ 4 Hz rms (≥ 520 MHz, ≤ 1040 MHz) ≤ 8 Hz rms (> 1040 MHz, for MG3632A only) <p>On demodulation band 50 Hz to 15 kHz</p> <ul style="list-style-type: none"> ≤ 10 Hz rms (≥ 10 MHz, < 130 MHz) ≤ 3 Hz rms (≥ 130 MHz, < 260 MHz) ≤ 5 Hz rms (≥ 260 MHz, < 520 MHz) ≤ 10 Hz rms (≥ 520 MHz, ≤ 1040 MHz) ≤ 20 Hz rms (> 1040 MHz, for MG3632A only)
Amplitude modulation	Range	0 to 100%
	Resolution	1%
	Accuracy	± (5% of indicated value + 2%) [At ≥ 0.4 MHz, ≤ +7 dBm, AM ≤ 90%, fm = 1 kHz, demodulation band from 0.3 to 3 kHz]
	Frequency response	<p>At ≤ +7 dBm, ± 1 dB bandwidth</p> <p>Lower limit: 20 Hz (EXT AC mode), DC (EXT DC mode)</p> <p>Upper limit: 10 kHz (≥ 0.4 MHz, < 2 MHz, AM 30%)</p> <p>5 kHz (≥ 0.4 MHz, < 2 MHz, AM 80%)</p> <p>20 kHz (≥ 2 MHz, AM 30%)</p> <p>15 kHz (≥ 2 MHz, AM 80%)</p>
	External modulation	Optimum input level: approx. 2 Vp-p/600 Ω, Input impedance: 600 Ω (nominal)
	Distortion factor	<p>At ≥ 0.4 MHz, ≤ +7 dBm, fm = 1 kHz</p> <ul style="list-style-type: none"> ≤ -40 dB (AM 30%) ≤ -30 dB (AM 80%)
	Incidental FM	≤ 200 Hz peak (At ≥ 0.4 MHz, ≤ +7 dBm, AM 30%, fm = 1 kHz demodulation band from 0.3 to 3 kHz)
Frequency modulation	Range	<p>0 to 200 kHz (≥ 0.5 MHz, < 130 MHz)</p> <p>0 to 100 kHz (≥ 130 MHz, < 260 MHz)</p> <p>0 to 200 kHz (≥ 260 MHz)</p>
	Resolution	10 Hz (0 to 9.99 kHz deviation), 100 Hz (10 to 99.9 kHz deviation), 1 kHz (100 to 200 kHz deviation)
	Accuracy	± (5% of indicated value + 20 Hz) [At ≥ 0.5 MHz, fm = 1 kHz, demodulation band from 0.3 to 3 kHz]
	Frequency response	<p>At ≥ 0.5 MHz, ± 1 dB bandwidth</p> <p>Lower limit: 20 Hz (EXT AC mode), DC (EXT DC mode)</p> <p>Upper limit: 100 kHz</p>
	External modulation	Optimum input level: Approx. 2 Vp-p/600 Ω, Input impedance: 600 Ω (nominal)
	Distortion	<p>At ≥ 0.5 MHz, fm = 1 kHz</p> <ul style="list-style-type: none"> ≤ -45 dB (deviation 3.5 kHz) ≤ -45 dB (deviation 22.5 kHz)
	Carrier frequency stability in DC-FM mode	± 100 Hz/3-minutes (calibrated after two hour warmup, at 1000 MHz, 10 kHz frequency modulation)
	Incidental AM	≤ 0.4% peak (≥ 0.5 MHz, FM 22.5 kHz, AM 30%, fm = 1 kHz, demodulation band from 0.3 to 3 kHz)
Internal modulation signal	Frequency	400 Hz, 1 kHz [20 Hz to 100 kHz available when using option 04 (AF Oscillator)]
	Accuracy	± 100 ppm
Functions	Simultaneous modulation	<p>When used in the following combination, simultaneous modulation is possible and modulation factor/deviation can be set independently. (AF oscillator is available only when option 04 is installed.)</p> <p>AM: 1 kHz/EXT, 400 Hz/EXT, AF/EXT, 1 kHz/AF, 400 Hz/AF</p> <p>FM: 1 kHz/EXT, 400 Hz/EXT, AF/EXT, 1 kHz/AF, 400 Hz/AF</p>
	Modulation signal output	Outputs MAIN modulation signal when modulating Output level: (2 Vp-p ± 20%)/600 Ω, Output impedance: 600 Ω (nominal)
	Modulation polarity switching	Can be switched only for external modulation signal
	Relative value display	<ul style="list-style-type: none"> Carrier frequency Output level

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Functions	Continuous variation mode of output level	Output level can be attenuated continuously over 26 dB at each 5 dB attenuation step. Linearity: ± 1 dB (Output level of ALC attenuator at > -7 dBm, $\leq \pm 13$ dBm) ± 3 dB (Output level of ALC attenuator at > -13 dBm, ≤ -7 dBm) *However, output level of ALC attenuator is shown relative to $+7$ dBm.
	Memory	100 sets of panel settings can be saved and recalled.
	Memory backup	Last settings except the following items, are stored when power is turned off. These items are not backed up. • Data currently being saved • Data and setting in remote operation mode • Data being transferred by GP-IB • Active state of reverse power protector
	GP-IB	All functions except power switch and local operation key can be controlled. Interface function: SH0, AH1, T0, L4, TE0, SR0, RL1, PP0, DC1, DT0, C0, E2
	REMOTE	External remote controller can control almost all of the front panel key functions except the power switch and rotary knob. Control functions are sent by the remote controller.
	Reverse power protection	≤ 50 W (≤ 1040 MHz), ≤ 25 W (≤ 2080 MHz, for MG3632A only) DC ± 50 V
General specifications	Operating temperature range	0° to 50°C
	Power	AC $\pm V_{-15}^{+10}$ %, 47.5 to 63 Hz, ≤ 125 VA
	Dimensions and mass	132.5H × 426W × 451D mm, <22 kg
Options	Option 01 (Reference Oscillator)	Frequency: 10 MHz Aging rate: 2×10^{-8} /day (after 24 hours of operation) Start-up characteristics: 1×10^{-7} /day (after 30 minutes of operation) 5×10^{-8} /day (after 60 minutes of operation) Temperature characteristics: $\pm 5 \times 10^{-8}$ (0° to 50°C)
	Option 02 (Reference Oscillator)	Frequency: 10 MHz Aging rate: 5×10^{-9} /day (after 24 hours of operation) Start-up characteristics: 7×10^{-8} /day (after 30 minutes of operation) 3×10^{-8} /day (after 60 minutes of operation) Temperature characteristics: $\pm 5 \times 10^{-8}$ (0° to 50°C)
	Option 03 (Reference Oscillator)	Frequency: 10 MHz Aging rate: 2×10^{-9} /day (after 24 hours of operation) Start-up characteristics: 2×10^{-8} /day (after 60 minutes of operation) Temperature characteristics: $\pm 1.5 \times 10^{-8}$ (0° to 50°C)
	Option 04 (AF Oscillator)	Frequency range: 20 Hz to 100 kHz Resolution: 0.1 Hz Accuracy: ± 100 ppm

* Please specify one nominal line voltage between 100 and 240 V when ordering. The maximum operating voltage is 250 V.

Ordering information

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

Model/Order No.	Name	Remarks
MG3631A MG3632A	Main frame Synthesized Signal Generator Synthesized Signal Generator	0.1 to 1040 MHz 0.1 to 2080 MHz
J0576B J0127A J0017 B0325 F0012 F0010 W0643AE	Standard accessories Coaxial Cord, 1 m: 1 pc Coaxial Cord, 1 m: 1 pc Power Cord, 2.5 m: 1 pc GP-IB Shield Cap: 1 pc Fuse, 3.15 A: 2 pcs Fuse, 1.6 A: 2 pcs MG3631A/MG3632A Operation Manual: 1 copy	N-P•5D-2W•N-P BNC-P•RG-58A/U•BNC-P T3.15A250V (for AC 100 V mains) T1.6A250V (for AC 200 V mains)
MG363□A-01 MG363□A-02 MG363□A-03 MG363□A-04	Options Reference Oscillator Reference Oscillator Reference Oscillator AF Oscillator	Aging rate: 2×10^{-8} /day Aging rate: 5×10^{-9} /day Aging rate: 2×10^{-9} /day 20 Hz to 100 kHz
MS2702A MS616B MN3650A/B/C MA1610A MA8010A	Peripheral equipment Spectrum Analyzer Modulation Analyzer Digital Modulator Pulse Modulator Remote Controller	100 Hz to 24.5 GHz 150 kHz to 3 GHz 800 MHz to 2.7 GHz, GMSK, $\pi/4$ DPSK 10 kHz to 2.7 GHz
MP51A MP52A MP614A Z-164A Z-164B MP659A MA1612A MP721□ B0047 B0326 B0345B	Optional accessories Pad Pad 50 Ω ↔ 75 Ω Impedance Transformer T-Pad T-Pad Four-Port Junction Pad Four-Port Junction Pad Fixed Attenuator Rack Flange Kit Carrying Case Carrying Case	DC to 200 MHz, 75 Ω → 50 Ω DC to 200 MHz, 50 Ω → 75 Ω 10 to 1200 MHz 0 to 1000 MHz, 50 Ω 0 to 1000 MHz, 75 Ω 40 to 1000 MHz, 50 Ω 5 to 3000 MHz, 50 Ω DC to 12.4 GHz, 50 Ω With casters