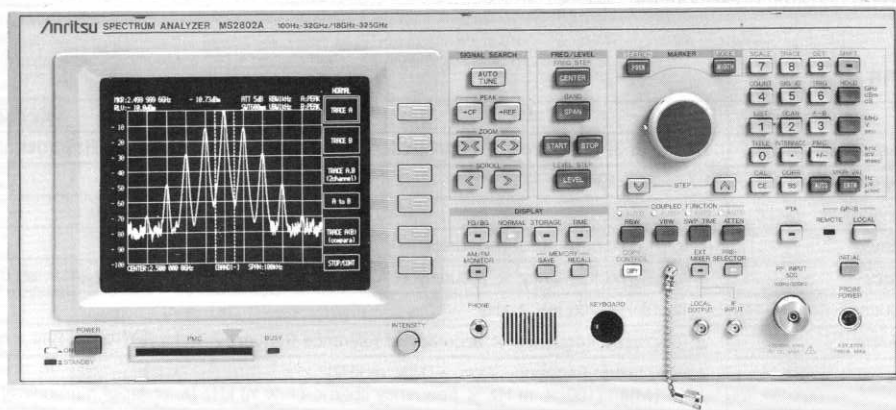


SPECTRUM ANALYZER MS2702A, MS2802A

100 Hz to 24.5 GHz 100 Hz to 32 GHz (18 to 325 GHz)



«GP-IB»

The MS2702A/MS2802A is a high-performance wide-band spectrum analyzer which covers the 100 Hz to 24.5 GHz or 32 GHz range. The MS2702A/MS2802A uses a fully-synthesized local oscillator and amplitude calibrations to give accurate, stable frequency and level measurements. In addition, the analyzer also has four display modes and a burst waveform spectrum analysis function. For external, automated and memory control two GP-IB interfaces, a PTA (Personal Test Automation) function, and a PMC (Plug-in Memory Card) have been included as standard features. Consequently, a variety of software applications and measuring system networks can be easily constructed with this system. The MS2702A/MS2802A has a broad range of applications such as satellite/microwave communications, microwave components testing, semiconductor testing, satellite broadcasting, radar evaluation, quasi-microwave mobile communications, video system testing, and the development of new devices for communications system.

Features

• 10 Hz resolution bandwidth

The MS2702A/MS2802A attains wide measurement bandwidths of up to 24.5 or 32 GHz by inputting the RF signal coaxially through an internal mixer. A fully-synthesized local oscillator allows stable measurement of up to 24.5 or 32 GHz with a 10 Hz resolution bandwidth. A frequency-counting function (with a minimum resolution of 1 Hz) automatically tunes and counts frequencies so that even wide-band microwave frequencies can be easily counted and measured.

• Fully synthesized high-purity local oscillator

The MS2702A/MS2802A local oscillator produces a fully-synthesized signal, whose frequency can be set to within 1 Hz. Noise sidebands is to -103 dB/Hz or less (at frequencies of 4 GHz or less and an offset of 10 kHz).

• Highly accurate amplitude measurements

Since a high-accuracy calibration signal and a calibration attenuator have been built-in, the LOG-scale linearity, and reference level are calibrated precisely and resolution bandwidth and LOG/LIN scale switching errors are minimized. The frequency response is calibrated according to the built-in calibration data, so that levels are measured accurately over a wide range of frequencies.

• Display mode

The MS2702A/MS2802A has four display modes.

Foreground and background display

When a desired signal is selected from the entire bandwidth (background with the zone marker), it is magnified and displayed in the foreground above the background on the CRT display screen.

Storage display

Overwrite, cumulative, min/max envelope, and repetitive display functions are provided so that more analog-like traces are displayed even though data is stored in a digital format.

Time and frequency domain (TIME/FREQ) display

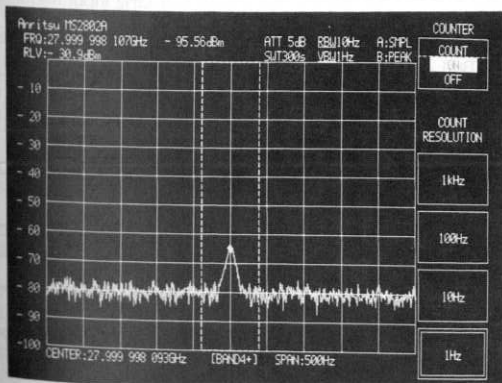
The frequency spectrum and time domain waveform of the modulated signal at the center frequency can be displayed simultaneously.

Normal display

Traces of two spectra can be displayed either alternately or comparatively. For example, a real-time sweep waveform can be observed while a MAX HOLD waveform is being displayed.

• Zone marker

The MS2702A/MS2802A has unique zone marker feature which automatically move the marker to the signal peak (or dip) within a specified zone. Simply set the zone, within which the desired signal lies, with the data knob. The frequency and level of the peak signal within the selected zone will be measured as the zone marker is being set.



Frequency counting up to 32 GHz

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● Burst signal spectrum analysis

The spectrum data writing function can be enabled/disabled by an external control signal so that spectral data for a specific period, in which — for example — a burst signal occurs, can be received and displayed.

● PTA and PMC as standard

Spectral data, setting parameters and PTA programs can be saved to or recalled from a PMC which is inserted into the mainframe. The PTA computer function allows measured values to be automatically converted and displayed. The PTA function also allows an automated measuring system to be constructed without the need for an external controller.

● Two GP-IB ports

One of the two GP-IB ports can be used for host-computer control while the other is used for PTA control. Consequently, an automated system can be easily configured.

● Up to 325 GHz with external waveguide mixer

The measurement range of the MS2802A can be expanded up to 325 GHz by connecting either a 2- or 3-port external waveguide mixer. The mixer bias as well as the reference level correction value for conversion loss can also be input and the measurement level can be read-out.

Major specifications

Model		MS2802A	MS2702A
Frequency range	Internal mixer	100 Hz to 32 GHz (order of harmonics: 1 to 4)	100 Hz to 24.5 GHz (order of harmonics: 1 to 3)
	Pre-selector	1.7 to 24.5 GHz	
	External mixer	18 to 325 GHz	—
Resolution of frequency setting		(1 × n) Hz n: order of harmonics	
Accuracy of center frequency		± (displayed frequency × accuracy of reference frequency + frequency span × accuracy of frequency span)	
Frequency count	Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz	
	Accuracy	± (displayed frequency × accuracy of reference frequency + 1 LSD), when S/N is ≥ 20 dB	
Frequency span	Accuracy	± 2.5% [when frequency span ≥ (1 × n) kHz] ± 5% [when (100 × n) Hz ≤ frequency span < (1 × n) kHz (n: order of harmonics)]	
	Setting range	0 Hz, 100 Hz to 24.5 GHz	
	Resolution bandwidth (RBW)	10 Hz to 3 MHz (3 dB), 1-3 sequence	
Video bandwidth		1 Hz to 3 MHz, 1-3 sequence	
Noise sidebands		≤ -103 dBc/Hz (at 1 MHz to 4 GHz, 10 kHz offset)	
Reference oscillator stability		2 × 10 ⁻⁸ /day, 2 × 10 ⁻⁷ /year (5 × 10 ⁻⁹ /day: option)	
Level measurement range		Average noise level to + 30 dBm	
Average noise level		At 10 Hz RBW ≧ -135 dBm (1 MHz to 1 GHz) ≧ -132 dBm (1 to 2 GHz) ≧ -125 dBm (1.7 to 8.5 GHz) ≧ -119 dBm (6.5 to 16.5 GHz) ≧ -110 dBm (14.5 to 32 GHz) ≧ -130 dBm (1.7 to 8.5 GHz, preselector: OFF) ≧ -124 dBm (6.5 to 16.5 GHz, preselector: OFF) ≧ -115 dBm (14.5 to 24.5 GHz, preselector: OFF)	At 10 Hz RBW ≧ -135 dBm (1 MHz to 1 GHz) ≧ -132 dBm (1 to 2 GHz) ≧ -125 dBm (1.7 to 8.5 GHz) ≧ -119 dBm (6.5 to 16.5 GHz) ≧ -110 dBm (14.5 to 24.5 GHz)
Residual response		≧ -100 dBm (1 MHz to 8.5 GHz, band 0, 1-, 1+)	
Reference level accuracy		± 0.3 dB (-50 to 0 dBm), ± 0.75 dB (-70 to -50 dBm, 0 to +30 dBm), ± 1.5 dB (-90 to -70 dBm) [After calibration, when the frequency is set to 100 MHz, and frequency span is ≤ 2 MHz. Input attenuator, RBW, video bandwidth and sweep time are set to AUTO.]	
Resolution bandwidth switching error		After calibration, ± 0.3 dB (10 Hz to 300 MHz), ± 1 dB (10 Hz to 3 MHz)	
Frequency response		When the input attenuator is set to 10 dB and the temperature is 20° to 30°C. ± 0.5 dB (100 Hz to 2 GHz) ± 1 dB (1.7 to 8.5 GHz) ± 1.5 dB (6.5 to 16.5 GHz) ± 2 dB (14.5 to 32 GHz)	± 0.5 dB (100 Hz to 2 GHz) ± 1 dB (1.7 to 8.5 GHz) ± 1.5 dB (6.5 to 16.5 GHz) ± 2 dB (14.5 to 24.5 GHz)
Linearity	LOG	After calibration, ± 0.3 dB (-20 to 0 dB, RBW: ≤ 1 MHz), ± 1 dB (-70 to 0 dB, RBW: ≤ 100 kHz)	
	LIN	± 3% (compared to reference level)	
Second harmonics		≧ -80 dBc (at 5 MHz to 1 GHz input frequency, mixer input level: -40 dBm) ≧ -100 dBc (at 850 MHz to 11.5 GHz input frequency, preselector: ON, mixer input level: -10 dBm)	≧ -80 dBc (at 5 MHz to 1 GHz input frequency, mixer input level: -40 dBm) ≧ -100 dBc (at 850 MHz to 11.5 GHz input frequency, mixer input level: -10 dBm)
Two signal third order intermodulation distortion		≧ -70 dBc (mixer input level at -30 dBm, frequency at 10 MHz to 2 GHz, Δf ≥ 1 kHz) ≧ -80 dBc (mixer input level at -35 dBm, frequency at 10 MHz to 2 GHz, Δf ≥ 30 kHz) ≧ -100 dBc (mixer input level at -10 dBm, frequency at 1.7 to 12.5 GHz, Δf ≥ 70 MHz) ≧ -100 dBc (mixer input level at -10 dBm, frequency at 12.5 to 24.5 GHz, Δf ≥ 100 MHz)	
Sweep	Sweep time	50 ms to 2000 s (frequency sweep mode including zero span) 50 μs to 2000 s (at TIME/FREQ mode)	
	Zone sweep	Sweeps only in the range indicated by zone markers	
	Tracking sweep	Sweeps while tracing peak points within a zone marker (Zone sweep also possible)	
Input connector		50 Ω, K-connector *1	50 Ω, K-connector *1, *2

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Functions	Noise measurement	Noise level (dBm/Hz, dBm/ch), C/N (dBc/Hz, dBc/ch)
	Correction	External frequency response can be calibrated by stored correction data (max. 5 sets)
	Save/Recall	Setting conditions and measured waveform data can be stored and recalled in an internal memory (4 sets) and external memory (PMC)
	Direct plotting	Screen information can be output directly to an external printer or plotter via GP-IB.
	External control	GP-IB (IEEE-488), 2 ports
Operating temperature range		0° to 50°C
Power		AC ± 3 V ± 10 % ₋₁₅ , 50/60 Hz, ≤ 330 VA
Dimensions and weight		177H x 426W x 451D mm, <26 kg

*1 K-connector is a trademark of Wiltron Company.

*2 A K-connector is replaceable with an N-type connector (option 04). When an N-type connector is used, the specifications are guaranteed up to 18 GHz.

*3 Please specify a nominal line voltage between 100 and 240 V when ordering. Maximum operation voltage is 250 V.

Ordering information

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

Model/Order No.	Name	Remarks
MS2802A	Main frame Spectrum Analyzer	100 Hz to 32 GHz/18 to 325 GHz
MS2702A	Spectrum Analyzer	100 Hz to 24.5 GHz
	Standard accessories	
J0524	Coaxial Cord, 1m:	1 pc HRM-202•3D-2W•HRM-202
J0525	Coaxial Adaptor:	1 pc K-J•K-J (option 04: N-P•SMA-J)
P0005	Plug-in Memory Card:	1 pc 32 Kbytes, BS32F1-C-172
F0014	Fuse, 6.3 A:	2 pcs T6.3A250V (for AC 100 V)
F0012	Fuse, 3.15 A:	2 pcs T3.15A250V (for AC 200 V)
J0017	Power Cord, 2.5 m:	1 pc
W0592AE	MS2802A/MS2702A Operation Manual:	1 copy
W0592BE	MS2802A/MS2702A Service Manual:	1 copy
	Options	
MS2802A-01	Crystal Oscillator	Stability: $\leq 5 \times 10^{-9}$ /day
MS2802A-02	RS-232C Interface	GP-IB and RS-232C
MS2802A-03	I/O Port Interface	GP-IB and I/O port
MS2702A-01	Reference Crystal Oscillator	Stability: $\leq 5 \times 10^{-7}$ /day
MS2702A-02	RS-232C Interface	GP-IB and RS-232C
MS2302A-03	I/O Port Interface	GP-IB and I/O port
MS2702A-04	N(J)-Type Input Connector	Operates from 100 Hz to 24.5 GHz. Specifications are guaranteed up to 18 GHz.
	Optional accessories	
J0526	Coaxial Adaptor	N-J•SMA-J
J0527	Coaxial Cord, 2 ft	K-type connector, DC to 40 GHz
J0309	Coaxial Cord, 1 m	HRM-202B•RG58A/U•HRM-202B
J0007	GP-IB Cable, 1 m	408JE-101
J0008	GP-IB Cable, 2 m	408JE-102
P0006	Plug-in Memory Card	64 Kbytes, BS64F1-C-173
P0007	Plug-in Memory Card	128 Kbytes, BS128F1-C-174
P0008	Plug-in Memory Card	256 Kbytes, BS256F1-C-175
P0009	Plug-in Memory Card	512 Kbytes, BS512F1-C-176
MP612A	50 Ω — 75 Ω Impedance Transformer	N-type connector, 10 to 1200 MHz
MB-009	50 Ω — 75 Ω Impedance Transformer	Insertion loss: 6.2 dB, N-type connector, DC to 2 GHz
J0078	High Power Attenuator	20 dB (10 W), N-type connector, DC to 18 GHz
J0064A	Coaxial to 7 GHz Band Waveguide Adaptor	5.8 to 8.6 GHz, N-J•BRJ-7
J0064C	Coaxial to 10 GHz Band Waveguide Adaptor	8.2 to 12.4 GHz, N-J•BRJ-10
MP59B	Coaxial Switch	N-type connector, DC to 3 GHz
K220	Coaxial Adaptor	K-P•K-P (Wiltron product)
K222	Coaxial Adaptor	K-J•K-J (Wiltron product)
K224	Coaxial Adaptor	K-J•K-P (Wiltron product)
43KC-3	Fixed Attenuator	3 dB, K-type connector (Wiltron product)
43KC-6	Fixed Attenuator	6 dB, K-type connector (Wiltron product)
43KC-10	Fixed Attenuator	10 dB, K-type connector (Wiltron product)
43KC-20	Fixed Attenuator	20 dB, K-type connector (Wiltron product)
K240C	Power Divider	K-type connector (Wiltron product)
B0063	Carrying Case	
B0020	Front Cover	
B0029	Stacking Foot	
B0043	Rack Mount Kit	
	Peripheral equipment	
G0044	PTA Keyboard	Tektronix product
UA455A	Video Plotter	Graphtec product, AC 100 V
Z0047	Paper for UA455A	Graphtec product, AC 200 V
MC8104A	Data Storage Unit	
MB23A	Portable Test Rack	
P6201	FET Probe	
GD9411-1-11	Plotter	
GD9411-2-11	Plotter	
CTM-800	Printer	