

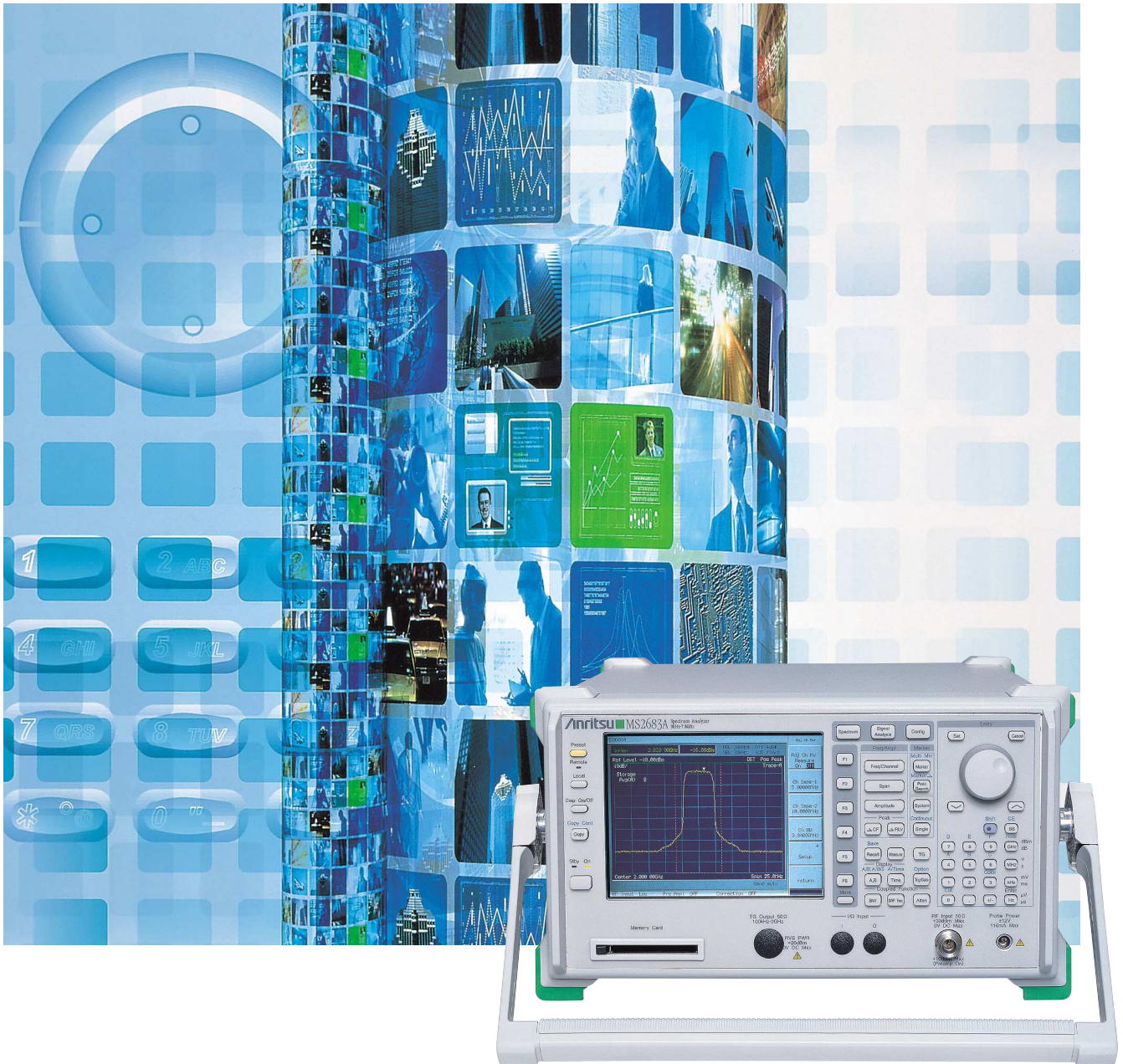
Discover What's Possible™

Anritsu

MS2681A/2683A

Spectrum Analyzer

9 kHz to 3/7.8 GHz



**For analyzing next-generation radio communication systems
and devices**

For analyzing next-generation radio communication systems and devices

The IMT-2000 (2 GHz band) service for third-generation mobile radio communication has started. Bluetooth, has been adopted for close-range radio communication between portable remote terminals and peripheral equipment, and R&D of MMAC, IEEE802.11a, and HiperLAN2 (High Performance European Radio Local Area Network Type2) for higher speed access have been conducted in various countries.

The MS2681A/2683A spectrum analyzer delivers optimum performance over a wide dynamic range (156 dB, typical value), wide resolution bandwidth (20 MHz), to high-speed sweep (refresh rate of 20 times/s), required for evaluating next-generation radio communication systems and devices. It can be used not only as a spectrum analyzer but also to perform various measurements easily and quickly by installing measurement software.





Features

- Wide resolution band width up to 20MHz.
- Data transmission speed approximately 10 times faster.
(GPIB transmission speed : 120 kbytes/s)
- Optional measurement software (sold separately) for high-speed modulation analysis.
(1.5 sec. with W-CDMA, 0.5 sec with IEEE802.11a)
- Optional narrow resolution bandwidth from 1Hz.



SYDNEY

FRANKFURT

Basic Specifications

■ For research and development of radio systems and devices

Frequency range: 9 kHz to 3 GHz (MS2681A)
9 kHz to 7.8 GHz (MS2683A)

Span accuracy: $\pm 1\%$

Resolution bandwidth:
300 Hz to 3 MHz, 5 MHz, 10 MHz, and to 20 MHz
1 Hz to 1 kHz (option 02, FFT)
10 Hz to 1 MHz (option 04)

Average noise level: ≤ -146 dBm/Hz (1 MHz to 2.5 GHz)

1 dB gain compression: +3 dBm (typical value, +10 dBm, 2 GHz)

Two-signal third-order distortion: ≤ -85 dBc (0.1 to 7.8 GHz)

Input attenuator: 0 to 62 dB (2 dB steps)

W-CDMA ACP measurement performance
-68 dBc (5 MHz offset at 3.84 MHz)
-75 dBc (10 MHz offset at 3.84 MHz)

■ For installation and maintenance of radio stations

Save/recall of set parameters:
up to 12 into/from internal memory

Output of measurement results:
BMP, CSV format or printer (ESC/P compatible model)

PC card interface: PC compatible ATA card
(ATA card equipped as standard for 20 Mbytes or over)

Display: 6.5 inch (17 cm) color TFT-LCD

Dimensions, weight:
320 (W) x 177 (H) x 411 (D) (mm), 16 kg

A carrybone and soft carrying case convenient for field use are also available.



■ For high-speed measurement on radio system/device manufacturing line

Sweep time: 10 ms to 1000 s (frequency span)

1 μ s to 1000 s (time span)

Sweep refresh rate: 20 trace/s

I/O interface:

GPIB, RS-232C, and Centronics equipped as standard

Ethernet (option 09) allows network control by 10base-T.

GP-IB transfer rate: 120 kbytes/s

Measure: One-touch measurement of occupied frequency bandwidth, channel power, and adjacent channel leakage power

■ Options

Option 01: Precision frequency reference (aging rate: $\pm 5 \times 10^{-10}$ /day)

Option 02: Narrow resolution bandwidth (FFT)

Option 03: Extension of preselector lower limit to 1.6 GHz*

Option 04: Digital resolution bandwidth (RMS detection)

Option 08: Pre-amplifier

Option 09: Ethernet interface

Option 17: I/Q balanced input

Option 18: I/Q unbalanced input

Option 34: 4 GHz LO output*

Option 46: Auto power recovery

Option 47: Rack mount (IEC) without handles

Option 48: Rack mount (JIS) without handles

* Available only for MS2683A.

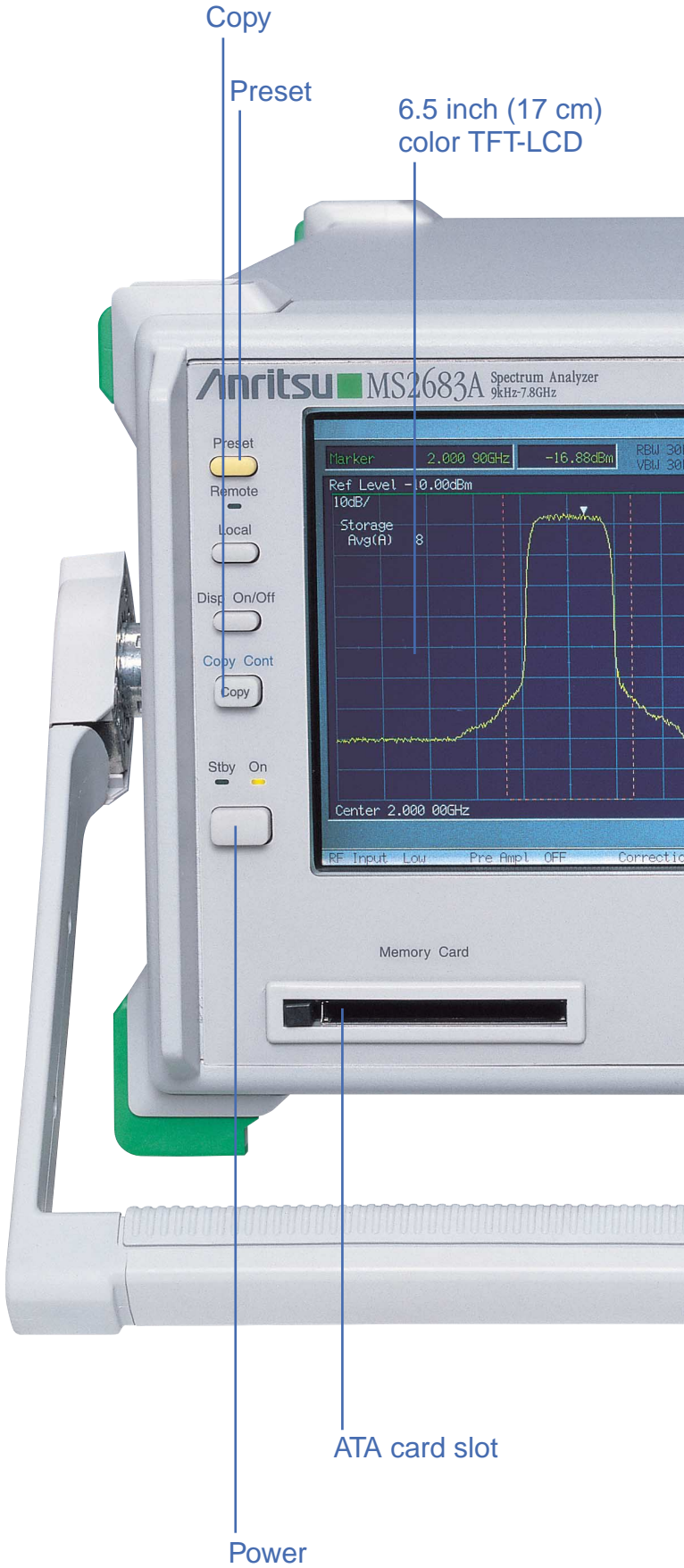
■ Warranty

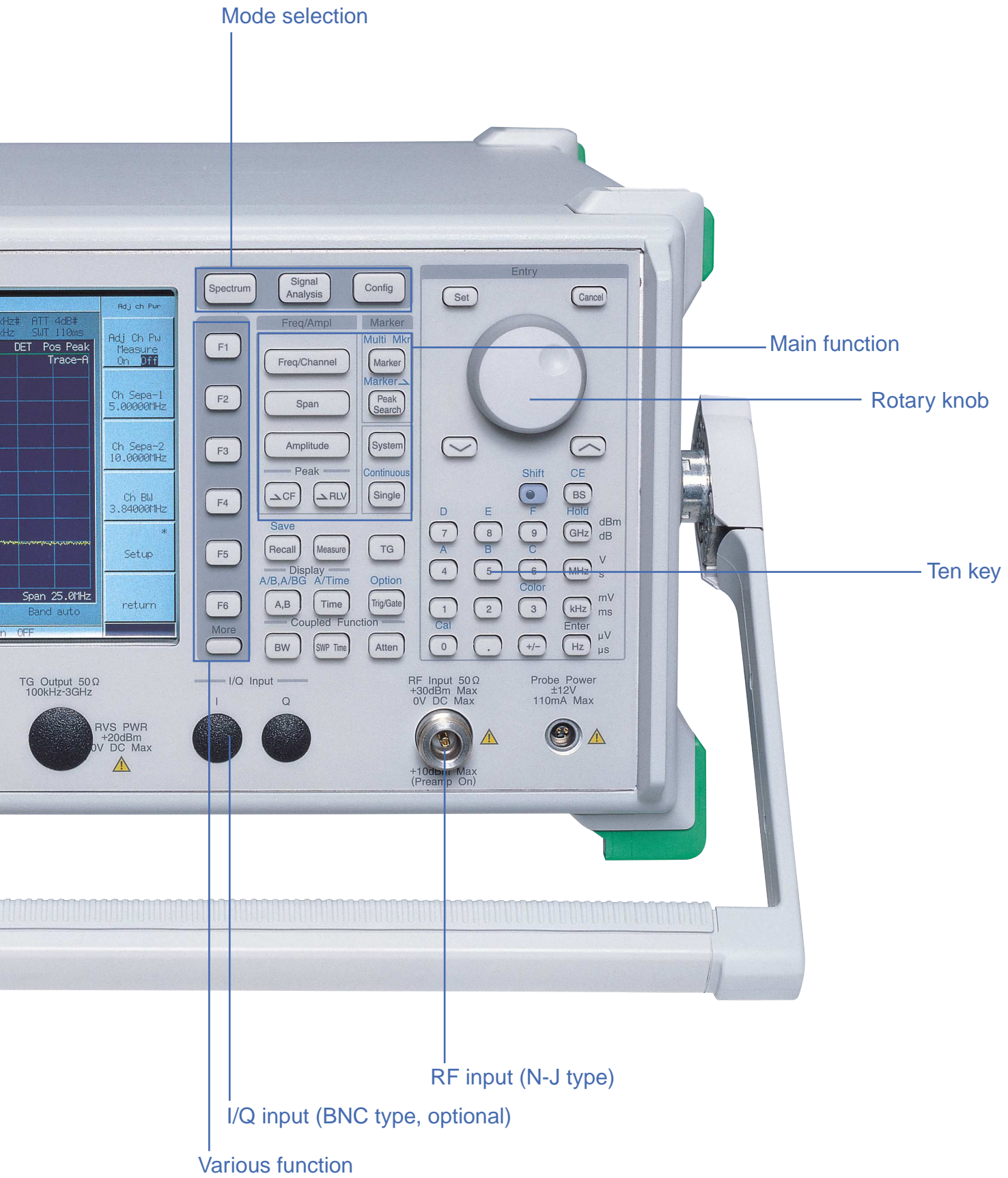
Option 90: Extended three years warranty service

Option 91: Extended five years warranty service

Easy-to-Use Panel Design

- 1 IF output (BNC type)
- 2 Reference input/output (BNC type)
- 3 Power
- 4 AC input
- 5 Ethernet interface (10base-T, optional)
- 6 RS-232C interface
- 7 VGA output
- 8 GPIB interface
- 9 Parallel interface (D-sub25)
- 10 Trigger input (BNC type)
- 11 Video signal output (BNC type)





Mode selection

Main function

Rotary knob

Ten key

Various function

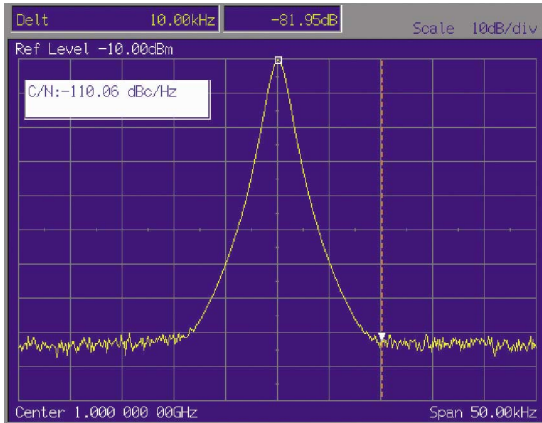
I/Q input (BNC type, optional)

RF input (N-J type)

Excellent Basic Performance

High C/N ratio to securely capture adjacent signals

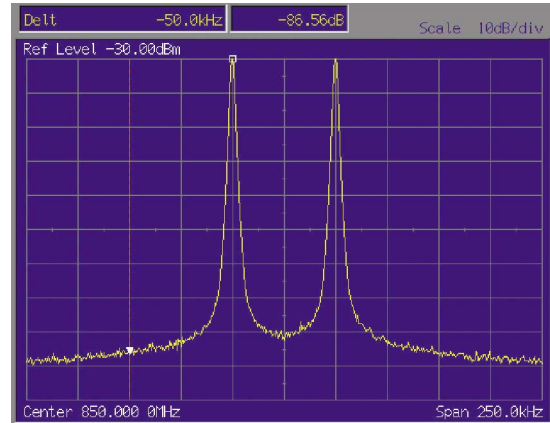
The MS2681A/2683A has excellent noise sideband characteristics of -108 dBc/Hz or lower (1 GHz, 10 kHz offset), which is ideal for analyzing weak signals adjacent to strong signals or a narrow bandwidth carrier.



Example of C/N characteristic waveform

Extremely low distortion rate suited for power amplification or harmonic measurement

The MS2681A/2683A has extremely low harmonic distortion levels, including second harmonic distortion of -90 dBc and two-signal third-order distortion of -85 dBc, making it suitable for evaluating the non-linearity of high-power amplifiers and for measuring harmonics.

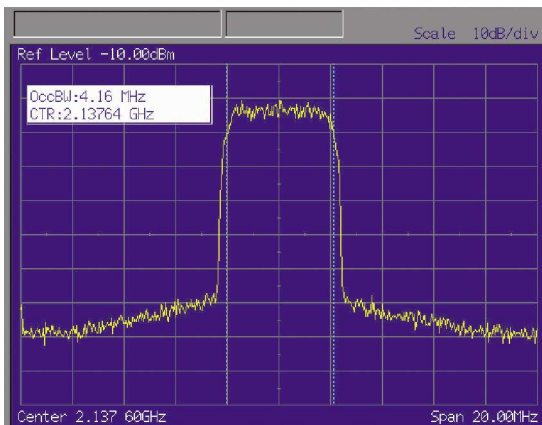


Example of two-signal third-order distortion waveform

Instantaneous evaluation of various radio devices Standard measure functions

The MS2681A/2683A has a wealth of measuring functions to perform various high-speed evaluations of radio devices such as channel power measurement, frequency measurement, adjacent channel leakage power (ACP) measurement, and occupied bandwidth (OBW) measurement.

Optional measurement software is also available for instantaneously analyzing various digital communication systems by just installing the software.



Example of occupied bandwidth

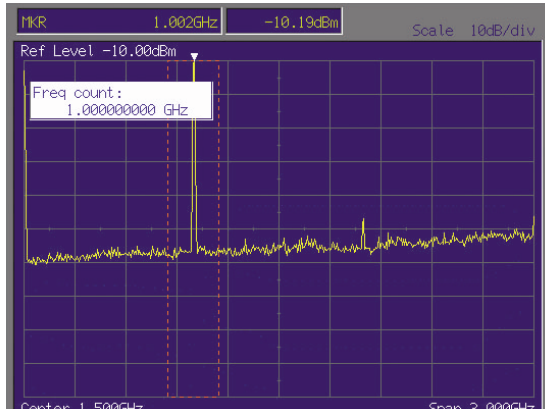
Optimum Level Measurement Standard 2 dB step attenuator

The MS2681A/2683A features a 2 dB step input attenuator for the first time in this class, which allows fine level setting, with minimal mixer distortion and noise inside the analyzer. The built-in pre-amplifier (option 08) which permits optimum level signal analysis improves the reliability of measurement results.

Convenient and Easy-to-Use Functions

1 Hz resolution Built-in frequency counter

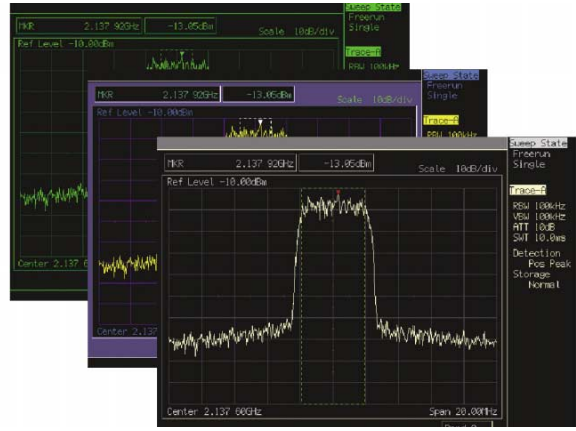
The built-in frequency counter is convenient for measuring frequency signals arbitrarily selected from multiple signals. High resolution of 1 Hz even at full span is assured.



Example of frequency counter

Bright and easy-to-see 6.5 inch (17 cm) color TFT display

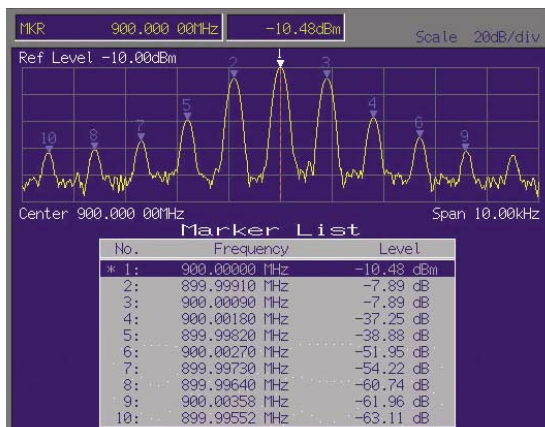
The MS2681A/2683A has a 6.5 inch (17 cm) color TFT-LCD. Intensity and color can be adjusted freely according to the operating conditions.



Example of coloring change

Multiple waveform display and multimarkers

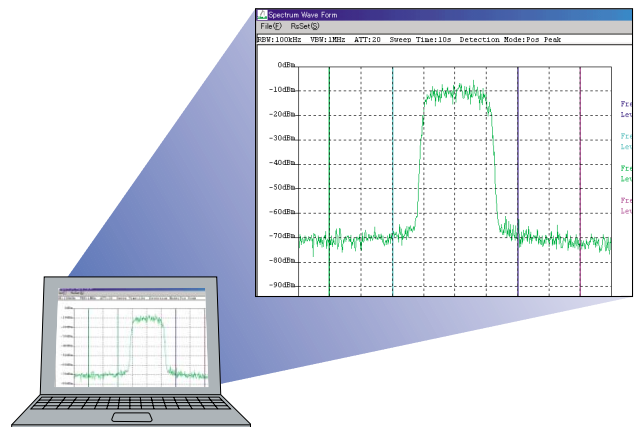
The MS2681A/2683A is equipped with multiple waveform display function that allows superimposition of two waveforms or simultaneous display of analysis of frequency domain and time domain. It also has substantial marker functions that allow up to 10-point multimarkers to be displayed for comparison of waveforms and measurement of harmonics.



Example of harmonics measurement

Easy measurement data control allowed by various interfaces

The results of measurement can be saved at the touch of a button (in BMP or CSV format; data can also be output to a printer). The large-capacity memory card instead of a floppy disk which is susceptible to mechanical failure allows accurate and high-speed storage of important data. Various interfaces such as RS-232C, Centronics, GPIB, and Ethernet (optional) permit easy connection to a PC for data collection.



Example of capture soft (standard)

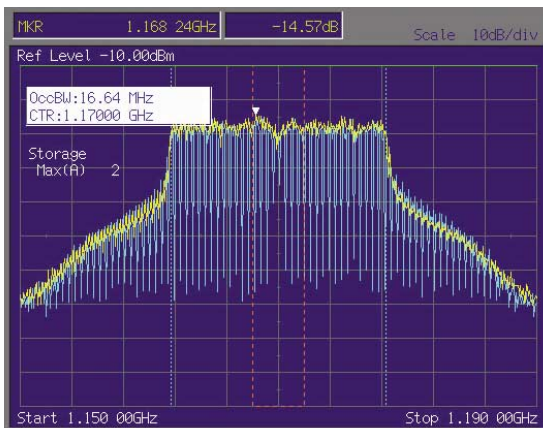


For Research and Development of Radio Communication Systems/Devices

Suitable for analysis of broadband signals Wide resolution bandwidth of up to 20 MHz

The MS2681A/2683A comes with a high-performance DSP as standard. Various modulation analysis functions can be added simply by installing measurement software. In signal analysis mode, analysis by I/Q input (option 17 or 18 required) can be performed.

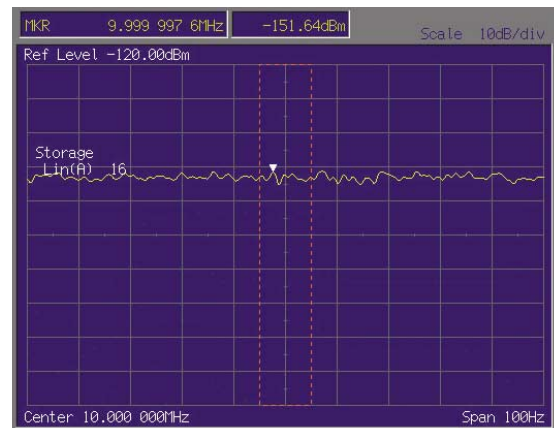
The resolution bandwidth is up to 20 MHz, which allows the analysis of wireless LAN.



Example of wide bandwidth signal measurement

High-speed measurement by FFT Narrow resolution bandwidth (optional)

Optional narrow resolution bandwidth with FFT (fast Fourier transform) is available (option 02, 1 Hz to 1 kHz). This option permits state-of-the-art high-speed measurement in a narrow band that used to be impossible with the conventional sweep method.



Example of narrow resolution bandwidth measurement

Wide dynamic range and low average noise level

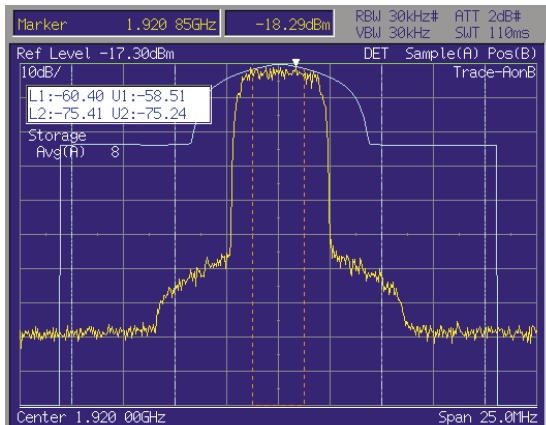
The MS2681A/2683A has a dynamic range of 156 dB (typical value), and its average noise level is -146 dBm/Hz (1 MHz to 2.5 GHz), which is suitable for research and development of radio communication systems, for high-performance evaluation at low cost.



For High-speed Measurement on Radio System/Device Manufacturing Line

High-speed measurement for construction of automatic manufacturing line

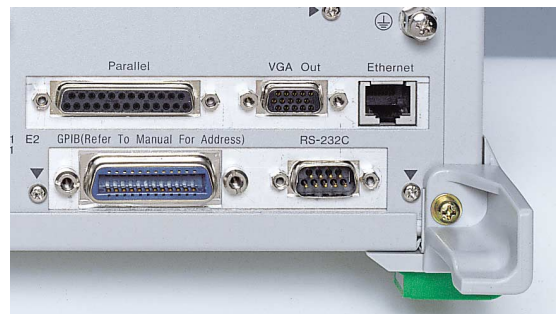
The MS2681A/2683A has a rapid sweep refresh rate of 20 times/s. A slight change can thus be accurately captured and measured at high speed, which helps speedup the manufacturing line of next-generation radio communication systems and devices.



Example of automatic measurement of adjacent channel leakage power

High-speed data transmission 10 times faster than the conventional model-ideal for automatic measurement systems

The MS2681A/2683A can transmit GPIB data at the high rate of 120 kbytes/s. High-speed data transmission 10 times faster than our conventional model helps speed up the construction of automatic measurement systems. The analyzer can be connected to a LAN via an Ethernet interface (option 09), and centralized management via a network and high-speed measurement makes the product ideal for building an efficient manufacturing line.



Versatile Options for Improving Performance and Functions

[option 01]

■ Precision frequency reference

Highly-stable reference crystal oscillator option with frequency of 10 MHz, and aging rate of $\pm 5 \times 10^{-10}$ /day.

[option 17]

■ I/Q balanced input

Mounts 4 connectors for I/Q sync input and operating input (BNC type) to the front panel. Measurement software corresponding to I/Q input is required for actual measurement.

[option 02]

■ Narrow resolution bandwidth

Realizes narrow RBW of 1 Hz to 1 KHz with FFT adopted.

[option 18]

■ I/Q unbalanced input

Mounts 2 connectors for I/Q synch inputs and operating inputs (BNC type) to the front panel. Measurement software corresponding to I/Q input is required for actual measurement.

[option 03]

■ Extension of pre-selector lower limit to 1.6 GHz

Extends the lower limit of frequency from 3.15 to 1.6 GHz. Available only for MS2683A.

[option 34]

■ 4 GHz LO output

Outputs internal 2nd local signal through rear connector. Available only for MS2683A.

[option 04]

■ Digital resolution bandwidth

Adds RMS director and expands resolution bandwidth (10 Hz to 1 MHz).

[option 46]

■ Auto power recovery

Disables the power switch on the front panel. Power is automatically reset after the line is restored.

[option 08]

■ Pre-amplifier

Installs a pre-amplifier with 20 dB gain typical value and frequency range from 100 kHz to 3 GHz.

[option 47]

■ Rack mount (IEC) without handles

Mounts an IEC standard rack mount. When mounted, the (standard) tilt handle is eliminated.

[option 09]

■ Ethernet interface

Allows external control via 10base-T.

[option 48]

■ Rack mount (JIS) without handles

Mounts a JIS standard rack mount. When mounted, the (standard) tilt handle is eliminated.

Application Software

Optional measurement software is available for instantaneously analyzing various digital communication systems by just installing the software.

For details, please see the data sheet of each software.

Communication system	Name	Model/order No.	
		For MS2681A	For MS2683A
W-CDMA	W-CDMA Measurement software	MX268101B	MX268301B
GSM	GSM Measurement software	MX268102A	MX268302A
cdmaOne, CDMA1X	cdma Measurement software	MX268103A	MX268303A
CDMA1xEV-DO	1xEV-DO Measurement software	MX268104A	MX268304A
PDC/PHS/NADC (IS-136), STD-39/T79, STD-T61	$\pi/4$ DQPSK Measurement software	MX268105A	MX268305A
IEEE802.11a/11b, HiSWANa, HiperLAN2	WIRELESS LAN Measurement software	MX268130A	MX268330A

MS2681A/MS2683A Specifications

Specified values are obtained after warming up the equipment for 30 minutes at a constant ambient temperature and then performing calibration. The typical values are given for reference, and are not guaranteed.

Name	MS2681A	MS2683A
Frequency range	9 kHz to 3.0 GHz	9 kHz to 7.8 GHz
Frequency band	—	Band 0: 9 kHz to 3.2 GHz, Band 1–L: 1.6 to 3.2 GHz (option 03), Band 1: 3.15 to 6.3 GHz, Band 1+: 6.2 to 7.8 GHz
Pre-selector range	—	3.15 to 7.8 GHz, 1.6 to 7.8 GHz (option 03)
Display frequency accuracy	\pm (Display frequency x reference frequency accuracy + span x span accuracy + resolution bandwidth x 0.15 + 10 Hz)	
Frequency counter resolution	1 Hz, 10 Hz, 100 Hz, 1k Hz (counts the received frequency at the peak point inside the zone)	
Frequency counter accuracy	\pm (Display frequency x reference frequency accuracy + 2 Hz + 1 LSD) (at S/N 20 dB or more and RBW 3 MHz or less)	
Frequency span	Setting range: 0 Hz, and 5 kHz to 3.0 GHz, Accuracy: $\pm 1.0\%$ (at data point of 1001)	Setting range: 0 Hz, and 5 kHz to 7.8 GHz, Accuracy: $\pm 1.0\%$ (at data point of 1001)
Resolution bandwidth (RBW) [3 dB bandwidth]	Setting range: 300 Hz to 3 MHz (1, 3 sequence), 5 MHz, 10 MHz, 20 MHz * Manually settable, or automatically settable according to frequency span Accuracy: $\pm 20\%$ (300 Hz to 10 MHz), $\pm 40\%$ (20 MHz) Selectivity (60 dB: 3 dB): $\leq 15 : 1$	
Video bandwidth (VBW)	1 Hz to 3 MHz (1, 3 sequence), off * Manually settable, or automatically settable according to RBW	
Signal purity	Noise sideband: ≤ -108 dBc/Hz (1 GHz, 10 kHz offset), ≤ -120 dBc/Hz (1 GHz, 100 kHz offset)	
Reference oscillator	Frequency: 10 MHz Start-up characteristics: $\leq \pm 5 \times 10^{-8}$ (after 10 minutes warm-up, with frequency after 24 hours warm-up referenced) Aging rate: $\leq \pm 2 \times 10^{-8}$ /day, $\leq \pm 1 \times 10^{-7}$ /year (with frequency after 24 hours of warm-up referenced) Temperature characteristics: $\leq \pm 5 \times 10^{-8}$ (0 to +50°C, with frequency at +25°C referenced)	
Level measurement	Measurement range: Average noise level to +30 dBm Maximum input level: CW average power: +30 dBm (RF ATT ≥ 10 dB) Peak pulse input: +47 dBm (pulse width ≤ 1 μ s, duty ratio $\leq 1\%$, RF ATT ≥ 30 dB) DC voltage: 0 VDC	
	Average noise level display RBW: 300 Hz, VBW: 1 Hz, RF ATT 0 dB, in Sample detection mode [Without option 08] ≤ -124 dBm + f[GHz] dB (1 MHz to 2.5 GHz) ≤ -120 dBm + f[GHz] dB (2.5 to 3.0 GHz) [With option 08] ≤ -122 dBm + 1.5f[GHz] dB (1 MHz to 2.5 GHz) ≤ -120 dBm + 1.5f[GHz] dB (2.5 to 3.0 GHz) Residual response: ≤ -100 dBm (1 MHz to 3.0 GHz)	Average noise level display RBW: 300 Hz, VBW: 1 Hz, RF ATT 0 dB, in Sample detection mode [Without option 08] ≤ -124 dBm + f[GHz] dB (1 MHz to 2.5 GHz, band 0) ≤ -120 dBm + f[GHz] dB (2.5 to 3.2 GHz, band 0) ≤ -122 dBm + 0.5f[GHz] dB (3.15 to 7.8 GHz, band 1) [With option 08] ≤ -122 dBm + 1.5f[GHz] dB (1 MHz to 2.5 GHz, band 0) ≤ -120 dBm + 1.5f[GHz] dB (2.5 to 3.2 GHz, band 0) ≤ -122 dBm + 0.5f[GHz] dB (3.15 to 7.8 GHz, band 1) Residual response: ≤ -100 dBm (1 MHz to 3.2 GHz, band 0) ≤ -90 dBm (3.15 to 7.8 GHz, band 1)
Reference level	Setting range Log scale: -100 to +40 dBm, or equivalent level, Linear scale: 2.24 μ V to 22.4 V Unit Log scale: dBm, dB μ V, dBmV, dB μ V (emf), W, V, dB μ V/m Linear scale: V Reference level accuracy: ± 0.5 dB (-49.9 to 0 dBm), ± 0.75 dB (+0.1 to +30 dBm, -69.9 to -50 dBm) ± 1.5 dB (-80 to -70 dBm) * After calibration, at 50 MHz, span: 1 MHz (when RF ATT, RBW, VBW, and sweep time set to AUTO) RBW switching uncertainty: ± 0.3 dB (300 Hz to 5 MHz), ± 0.5 dB (10, 20 MHz) * After calibration, with RBW 3 kHz referenced	
	Input attenuator (RF ATT): Setting range: 0 to 62 dB (2 dB step), manually settable, or automatically settable according to reference level Switching uncertainty: ± 0.3 dB (10 to 50 dB), ± 0.5 dB (52 to 62 dB) * After calibration, with 50 MHz, RF ATT 10 dB referenced Input attenuator switching mode: 2, 10 dB step mode	

Name	MS2681A	MS2683A
Frequency response	± 0.6 dB (9 kHz to 3.0 GHz) * With 50 MHz referenced (when RF ATT 10 dB, +18 to +28°C) ± 1.0 dB (9 kHz to 3.0 GHz) * With 50 MHz referenced (when RF ATT 10 to 62 dB)	± 0.6 dB (9 kHz to 3.2 GHz, band 0), ± 1.0 dB (3.15 to 7.8 GHz, band 1) ± 1.0 dB (option 03, 1.6 to 7.8 GHz, band 1) * With 50 MHz referenced (when RF ATT 10 dB, +18 to +28°C) ± 1.0 dB (9 kHz to 3.2 GHz, band 0), ± 2.0 dB (3.15 to 7.8 GHz, band 1) ± 2.0 dB (1.6 to 7.8 GHz, band 1) * With 50 MHz referenced (when RF ATT 10 to 62 dB), after pre-selector tuning for band 1.
Waveform display	Scale: 10 div (single scale) Log scale: 10, 5, 2, 1 dB/div, Linear scale: 10, 5, 2, 1%/div Linearity (after calibration) Log scale: ± 0.4 dB (0 to -20 dB, RBW ≤ 1 kHz), ± 1.0 dB (0 to -70 dB, ≤ 1 kHz), ± 1.2 dB (0 to -90 dB, ≤ 1 kHz) Linear scale: 4% of reference level Marker level resolution Log scale: 0.01 dB, linear scale: 0.02%	
Spurious response	2nd harmonic distortion ≤ -60 dBc (input frequency 10 to 200 MHz, Mixer input: -30 dBm) ≤ -75 dBc (0.2 to 0.85 GHz, Mixer input: -30 dBm) ≤ -70 dBc (0.85 to 1.5 GHz, Mixer input: -30 dBm) Two-signal third-order intermodulation distortion: ≤ -70 dBc (10 to 100 MHz), ≤ -85 dBc (0.1 to 3.0 GHz) * Frequency difference of two signals: ≥ 50 kHz, Mixer input: -30 dBm Image response: ≤ -70 dBc	2nd harmonic distortion ≤ -60 dBc (input frequency 10 to 200 MHz, Mixer input: -30 dBm) ≤ -75 dBc (0.2 to 0.85 GHz, band 0, Mixer input: -30 dBm) ≤ -70 dBc (0.85 to 1.6 GHz, band 0, Mixer input: -30 dBm) ≤ 90 dBc (1.6 to 3.9 GHz, band 1, Mixer input: -10 dBm) ≤ -90 dBc (option 03, 0.8 to 3.9 GHz, band 1, Mixer input: -10 dBm) Two-signal third-order intermodulation distortion: ≤ -70 dBc (10 to 100 MHz), ≤ -85 dBc (0.1 to 7.8 GHz) * Frequency difference of two signals: ≥ 50 kHz, Mixer input: -30 dBm Image response: ≤ -70 dBc
1 dB gain compression	≥ 0 dBm (≥ 100 MHz), $\geq +3$ dBm (≥ 500 MHz)	≥ 0 dBm (≥ 100 MHz), $\geq +3$ dBm (≥ 500 MHz, band 1) ≥ 0 dBm (≥ 3.15 GHz, band 1) ≥ 0 dBm (option 03: ≥ 1.6 GHz, band 1)
Maximum dynamic range	1 dB gain compression to average noise level [Without option 08] ≥ 124 dB - f[GHz] dB Reference value: 0.1 to 3.0 GHz [With option 08] ≥ 122 dB - 1.5f[GHz] dB Reference value: 0.1 to 3.0 GHz	1 dB gain compression to average noise level [Without option 08] ≥ 124 dB - f[GHz] dB Reference value: 0.1 to 3.2 GHz, Band 0 ≥ 122 dB - 0.5 f[GHz] dB Reference value: 3.15 to 7.8 GHz, Band 1 [With option 08] ≥ 122 dB - 1.5 f[GHz] dB Reference value: 0.1 to 3.2 GHz, Band 0 ≥ 122 dB - 0.5 f[GHz] dB Reference value: 3.15 to 7.8 GHz, Band 1
Sweep mode	Continuous, single	
Sweep time	Setting range: 10 ms to 1000 s * Manually settable, or automatically settable according to RBW and VBW Set resolution: 5 ms (5 ms to 1 s), Top three digits (≥ 1 s) Accuracy: $\pm 3\%$	
Trigger switch	Free run, triggered	
Trigger source	Wide IF video, external (TTL), external (± 10 V), line	
Gate sweep mode	Off, random sweep mode Setting range Gate delay range: 0 to 65.5 ms (Resolution: 1 μ s) Gate length range: 2 μ s to 65.5 ms (Resolution: 1 μ s) Gate end: Internal/external	
Zone sweep	Sweeps the indicated range in the zone only.	—
Tracking sweep	Sweeps following the peak point inside the zone marker (zone sweep also available).	—
Time sweep	Sweep mode	Continuous, single
	Sweep time	Setting range/resolution: 1 to 50 μ s (1, 2, 5 sequence), 100 μ s to 4.9 ms (100 μ s resolution), Sweep time: 5.0 ms to 1 s (5 ms resolution), 1 to 1000 s (setting of top three digits) Accuracy: $\pm 1\%$
	Trigger switch	Free run, triggered
	Trigger source	Wide IF video, video, external (TTL), external (± 10 V), line
Trigger delay	Pre-trigger (displays waveform before trigger occurrence point) Setting range: -time span to 0 s Trigger delay: Resolution: time span/500 or 100 ns, whichever is larger Post-trigger Setting range: 0 μ s to 65.5 ms Resolution: 100 ns (sweep time: ≤ 4.9 ms), 1 μ s (sweep time: ≥ 5 ms)	

MS2681A/MS2683A Specifications

Name	MS2681A	MS2683A
Functions	Number of data points	Selectable between 501 and 1001
	Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, AVERAGE
	Display functions	TRACE A, TRACE B, TRACE A/BG, TRACE A/TIME Trace calculation: A→B, B→A, A↔B, A + B→A, A - B→A, A - B + DL→A
	Storage functions	NORMAL, VIEW, MAX HOLD, MIN HOLD, AVERAGE, CUMULATIVE, OVER WRITE
	Marker	Signal search: AUTO TUNE, PEAK→CF, PEAK→REF, SCROLL Zone marker: NORMAL, DELTA Marker functions: MARKER→CF, MARKER→REF, MARKER→CF STEP SIZE ΔMARKER→SPAN, ZONE→SPAN Peak search: PEAK, NEXT PEAK, MIN DIP, NEXT DIP Multi marker: 10 max. (highest 10, harmonics, manually set)
	Measure	Noise power: dBm/Hz, dBm/CH, dBμV/√Hz C/N: dBc/Hz, dBc/CH Occupied bandwidth: power N% method, X-dB down method Adjacent channel leakage power REF: total power/reference level/in-band level method Display: channel designate display: 3 channels x 2, graphic display Average power within burst signal: average power in the designated range of time domain waveform Template comparison (at time sweep): upper limit x 2, lower limit x 2 MASK (at frequency sweep): upper limit x 2, lower limit x 2
Others	Correction	Frequency response can be corrected arbitrarily up to 150 points
	Display	Color TFT-LCD, VGA 17 cm (6.5 type)
	Color	Number of colors: 4096, RGB, each 16-scale settable
	Intensity	Settable in 5 steps (display off included)
	Contents	Scale, waveform data, setting condition, menu, title
	Save/recall	Saves and recalls setting conditions and waveform data to internal memory (max. 12) or memory card
	Hard copy	Displayed data can be hard-copied with the printer via parallel interface (PCL level 3 or lower, or ESC/P-J83, J84 compatible models only)
	GPIB	Meets IEEE488.2. Controllable with external controller (except for power switch) Interface function: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2
	Parallel interface	Centronics-compatible, outputs print data to printer, D-sub25 pin connector (jack) Data line exclusive for output: 8, Control line: 4 (BUSY, DTSB, ERROR, PE)
	PC card interface	Saves and recalls setting condition and waveform data, ATA flash card accessible (3.3 V/5 V), Connector: Type I or Type II of PC card
Input/output connector	RS232C	Controllable with external controller (except for power switch) Baud rate: 1200, 2400, 4800, 9600, 19.2 k, 38.4 k, 56 k, 115 kbps
		Input connector: N-J, 50 Ω nominal value Impedance: VSWR ≤1.5 Typical (RF ATT ≥10 dB) Video output: outputs analog RGB, D-sub 15-pin connector (jack) IF output: BNC connector, 50 Ω nominal value, 66/10.69 MHz, Level: -10 dBm Typical, (frequency 50 MHz, display scale upper edge, 50 Ω terminated) Broadband IF output: BNC connector, 50 Ω nominal value, 60.69/66 MHz Gain: 0 dB Typical (50 MHz, RF ATT: 0 dB, for RF input level) Video output (Y): BNC connector Level: 0 V to 0.5 V ± 0.1 V Typical (log scale), 0 V to 0.4 V ± 0.1 V Typical (linear scale), (50 MHz, from upper edge to lower edge at 10 dB/div or 10%/div, 75 Ω terminated) Buffered Output: BNC connector, Level: 2 to 5 V (p-p) (200 Ω terminated) Sweep Output (X): BNC connector, Level: 0 to 10 V ± 0.1 V (≥100 kΩ termination, from the left edge to the right edge of the display scale, single band sweep) Sweep Status Output (Z): BNC connector, Level: TTL (low level at sweep) Probe source: 4-pole connector, +12 V, -12 V, ±10% each, 110 mA max. each. Trig/Gate input: BNC connector, level: ±10 V (0.1 V resolution), or TTL level External reference input: BNC connector, Frequency: 10 MHz ±10 Hz, 13 MHz ±13 Hz, level: ≥0 dBm
Dimensions, weight	320 (W) x 177 (H) x 411 (D) mm (handle, leg, front cover, fan cover excluded), ≤16 kg (nominal value)	
Power	100 to 120/200 to 240 VAC (-15%/+10%, 250 V max., wide range input) 47.5 Hz to 63 Hz, ≤400 VA	
Ambient temperature and humidity	0 to +50°C, RH ≤85% (no condensation allowed)	
Storage temperature range	-20 to +60°C	
EMC	EN61326: 1997/A1: 1998 (Class A), EN61000-3-2: 1995/A2: 1998 (Class A) EN61326: 1997/A1: 1998 (Annex A)	
LVD	EN61010-1: 1993/A2: 1995 (Installation Category II, Pollution degree 2)	

Options

■ MS2681A/MS2683A

Option 01: Precision frequency reference oscillator

Frequency	10 MHz
Start-up characteristics	$\leq \pm 5 \times 10^{-8}$ (≤ 7 minutes, +25°C, Typical value)
Aging rate	$\leq \pm 5 \times 10^{-10}$ /day (With the frequency at 24 hours after the power is turned on referenced)
Temperature characteristics	$\leq \pm 5 \times 10^{-10}$ (With the frequency at 0 to +50°C and +25°C referenced)

■ MS2681A/MS2683A

Option 02: Narrow resolution bandwidths (FFT)

	MS2681A	MS2683A
Resolution bandwidth	Setting range: 1 Hz to 1 kHz (1, 3 sequence) Bandwidth accuracy: $\pm 10\%$ (RBW = 30, 300 Hz) $\pm 10\%$ Typical (RBW = 1, 3, 10, 100, 1 kHz) RBW selectivity (60 dB: 3 dB): $\leq 5:1$ RBW switching uncertainty: ± 0.5 dB	
Span setting	Minimum setting span: 100 Hz	
Average noise level display	When RBW is 1 Hz and RF ATT is 0 dB [Without option 08] ≤ -148.3 dBm + f[GHz] dB Typical (1 MHz to 2.5 GHz) ≤ -146.3 dBm + f[GHz] dB Typical (2.5 to 3.0 GHz) [With option 08] ≤ -146.3 dBm + 1.5f[GHz]dB Typical (1 MHz to 2.5 GHz) ≤ -144.3 dBm + 1.5f[GHz]dB Typical (2.5 to 3.0 GHz)	When RBW is 1 Hz and RF ATT is 0 dB [Without option 08] ≤ -146.5 dBm + f[GHz] dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -142.5 dBm + f[GHz] dB Typical (2.5 to 3.2 GHz, band 0) ≤ -144.5 dBm + 0.5f[GHz] dB Typical (3.15 to 7.8 GHz, band 1) [With option 08] ≤ -144.5 dBm + 1.5f[GHz]dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -140.5 dBm + 1.5f[GHz]dB Typical (2.5 to 3.2 GHz, band 1) ≤ -138.5 dBm + 0.5f[GHz]dB Typical (3.15 to 7.8 GHz, band 1)

■ MS2683A

Option 03: Extension of pre-selector lower limit to 1.6 GHz

Function	Extends the lowest frequency of pre-selector from 3.15 to 1.6 GHz
Frequency band	0 band: 9 kHz to 3.2 GHz, 1-L band: 1.6 to 3.2 GHz, 1- band: 3.15 to 6.3 GHz, 1+ band: 6.2 to 7.8 GHz
Pre-selector range	1.6 to 7.8 GHz (band: 1-L, 1-, 1+)
Average noise level	≤ -122 dBm + 0.5f[GHz] dB (1.6 to 7.8 GHz, band 1, RBW 300 Hz, VBW 1 Hz, RF ATT 0 dB)
Residual response	≤ -90 dBm (1.6 to 7.8 GHz, band 1, RF ATT 0 dB, input terminated at 50 Ω)
Frequency response	± 1.0 dB (with 1.6 to 7.8 GHz, band 1, and 50 MHz referenced, when RF ATT is 10 dB and temperature is +18 to +28°C) ± 2.0 dB (1.6 to 7.8 GHz, band 1, RF ATT 10 dB to 62 dB) * After pre-selector tuning for band 1
2nd harmonic distortion	≤ -90 dBc (0.8 to 3.9 GHz, band 1, mixer input -10 dBm)
1 dB gain compression	≥ 0 dBm (1.6 to 7.8 GHz, band 1)
Maximum dynamic range	≥ -122 dB + 0.5f[GHz] dB (1.6 to 7.8 GHz, band 1)

■ MS2681A/MS2683A

Option 04: Digital resolution bandwidth

	MS2681A	MS2683A
Resolution bandwidth	Setting range: 10 Hz to 1 MHz (1, 3 sequence) Bandwidth accuracy: $\pm 10\%$ (RBW = ≥ 100 Hz) $\pm 10\%$ Typical (RBW = ≤ 30 Hz) RBW selectivity (60 dB: 3 dB): $\leq 5:1$ (RBW = ≥ 100 Hz) $\leq 5:1$ NOMINAL (RBW ≤ 30 Hz) RBW switching uncertainty: ± 0.5 dB	
Span setting	Minimum setting span: 1 kHz	
Average noise level display	When RBW is 1 Hz and RF ATT is 0 dB [Without option 08] ≤ -136.5 dBm + f[GHz] dB NOMINAL (1 MHz to 2.5 GHz) ≤ -132.5 dBm + f[GHz] dB NOMINAL (2.5 to 3.0 GHz) [With option 08] ≤ -134.5 dBm + 1.5 x f[GHz]dB Typical (1 MHz to 2.5 GHz) ≤ -130.5 dBm + 1.5 x f[GHz]dB Typical (2.5 to 3.0 GHz)	When RBW is 1 Hz and RF ATT is 0 dB [Without option 08] ≤ -136.5 dBm + f[GHz]dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -132.5 dBm + f[GHz]dB Typical (2.5 to 3.2 GHz, band 0) ≤ -134.5 dBm + 0.5f[GHz]dB Typical (3.15 to 7.8 GHz, band 1) [With option 08] ≤ -134.5 dBm + 1.5 x f[GHz]dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -130.5 dBm + 1.5 x f[GHz]dB Typical (2.5 to 3.2 GHz, band 0) ≤ -134.5 dBm + 0.5 x f[GHz]dB Typical (3.15 to 7.8 GHz, band 1)

Options

■ MS2681A/MS2683A

Option 08: Pre-amplifier*1

	MS2681A	MS2683A
Frequency range	100 kHz to 3 GHz	
Gain	20 dB Typical	
Noise figure	6.5 dB Typical (input frequency \leq 2 GHz), 12 dB Typical (input frequency $>$ 2 GHz)	
Level measurement range	Average noise level display to +10 dBm	
Max. input level	CW average power: +10 dBm	
Reference level	Setting range: log scale: -120 to +10 dBm, or equivalent Linear scale: 2.24 μ V to 707 mV Reference level accuracy: \pm 0.9 dB (-69.9 to +10 dBm), \pm 1.5 dB (-90 to -70 dBm) * After calibration, with 50 MHz referenced, 1 MHz span (RF ATT, RBW, VBW, and sweep time set to AUTO) RBW switching uncertainty: \pm 0.5 dB (300 Hz to 5 MHz), \pm 0.75 dB (10 MHz, 20 MHz) RF ATT switching uncertainty: \pm 0.5 dB (10 to 50 dB), \pm 0.75 dB (52 to 62 dB) * With 50 MHz and RF ATT 10 dB referenced	
Average noise level display	-137 dBm + 2.0 x f[GHz]dB (1 MHz to 3.0 GHz) * When RBW is 300 Hz, VBW is 1 Hz, RF ATT is 0 dB, and detection mode is set to SAMPLE	-137 dBm + 2.0 x f[GHz]dB (1 MHz to 2.5 GHz, band 0)
Frequency response	\pm 2.0 dB (100 kHz to 3.0 GHz) * With 50 MHz referenced, when RF ATT is 10 dB to 50 dB, and temperature is +18 to +28°C	
Linearity of waveform display	Log scale (after calibration): \pm 0.5 dB (0 to -20 dB, RBW \leq 1 kHz), \pm 1.0 dB (0 to -60 dB, RBW \leq 1 kHz), \pm 1.5 dB (0 to -75 dB, RBW \leq 1 kHz) Linear scale (after calibration): \pm 5% (relative to reference level)	
Spurious response	\leq -70 dBc (10 MHz to 3 GHz) Frequency difference of two signals \geq 50 kHz, At pre-amplifier input level of -55 dBm*2	
1 dB gain compression	\geq -35 dBm (input frequency \geq 100 MHz) * At pre-amplifier input level	

*1 : Overall specification with pre-amplifier ON (Noise figure and gain are single performance of pre-amplifier.)

*2 : Pre-amplifier input level is shown by the following equation: Pre-amplifier input level = RF input level - RF ATT setting level

■ MS2681A/MS2683A

Option 09: Ethernet interface

Function	Control with external controller (except for power switch)
Connector	10base-T

■ MS2681A/MS2683A

Option 17: I/Q balanced input

Connector	BNC
Impedance	Selectable between 1 M Ω (parallel capacity $<$ 100 pF) and 50 Ω
Input level range	Differential voltage range: 0.1 Vp-p to 1 Vp-p (at input terminal) In-phase voltage range: \pm 2.5 V (at input terminal)

■ MS2681A/MS2683A

Option 18: I/Q unbalanced input

Connector	BNC
Impedance	Selectable between 1 M Ω (parallel capacity $<$ 100 pF) and 50 Ω
Input level range	Differential voltage range: 0.1 Vp-p to 1 Vp-p (at input terminal) Changeable between DC connection and AC connection

■ MS2683A

Option 34: 4 GHz LO output

Frequency	Frequency: 4 GHz Frequency accuracy: $\pm(4 \text{ GHz} \times \text{reference frequency accuracy}) \pm 1 \text{ Hz}$
Output level	-10 dBm Typical
Spurious	$\leq -40 \text{ dBc}$ Typical

■ MS2681A

Option 46: Auto power recovery

Function	Disables the power switch on the front panel and automatically restores power after power failure. ON/OFF operation can be performed using the standby switch on the rear panel. * Power switch on the front panel of this unit does not have a latching function. Therefore, if power is interrupted in the ON status, the standby status is kept even after power is restored.
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■ MS2681A

Option 47: Rack mount (IEC)

Function	Mounts the rack mount for IEC standard-compatible rack. When mounted, the tilt handle (standard) is eliminated.
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■ MS2681A

Option 48: Rack mount (JIS)

Function	Mounts the rack mount for JIS standard-compatible rack. When mounted, the tilt handle (standard) is eliminated.
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Ordering Information

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

Model/order No.	Name	Model/order No.	Name
MS2681A	– Main frame – Spectrum analyzer	MS2683A-01	Precision frequency reference (Aging rate: $\pm 5 \times 10^{-10}/\text{day}$)
MS2683A	Spectrum analyzer	MS2683A-02	Narrow resolution bandwidths (FFT)
	– Standard accessories –	MS2683A-03	Extension of pre-selector lower limit to 1.6 GHz
J0996B	Power cord, 2.6m: 1 pc.	MS2683A-04	Digital resolution bandwidth
JT32MA3-NT1	RS-232C cable: 1 pc.	MS2683A-08	Pre-amplifier
F0014	PC-ATA card (32 MB): 1 pc.	MS2683A-09	Ethernet interface
MX268001A	Fuse, 6.3 A: 1 pc.	MS2683A-17	I/Q balanced input
W1754AE	File transfer utility: 1 pc.	MS2683A-18	I/Q unbalanced input
	MS2681A/2683A/2687B operation manual :1 copy	MS2683A-34	4 GHz LO output
		MS2683A-46	Auto power recovery
		MS2683A-47	Rack mount (IEC) without handles
		MS2683A-48	Rack mount (JIS) without handles
	– Options –		– Measurement software –
MS2681A-01	Precision frequency reference (Aging rate: $\pm 5 \times 10^{-10}/\text{day}$)	MX268101B	W-CDMA measurement software (for MS2681A)
MS2681A-02	Narrow resolution bandwidths (FFT)	MX268301B	W-CDMA measurement software (for MS2683A)
MS2681A-04	Digital resolution bandwidth	W1746AE	W-CDMA Measurement Software operation manual (MS2681A/2683A/2687B Common)
MS2681A-08	Pre-amplifier	MX268102A	GSM measurement software (for MS2681A)
MS2681A-09	Ethernet interface	MX268302A	GSM measurement software (for MS2683A)
MS2681A-17	I/Q balanced input	W1854AE	GSM Measurement Software operation manual (MS2681A/2683A/2687B Common)
MS2681A-18	I/Q unbalanced input		
MS2681A-46	Auto power recovery		
MS2681A-47	Rack mount (IEC) without handles		
MS2681A-48	Rack mount (JIS) without handles		

Model/order No.	Name
MX268103A MX268303A W1865AE	cdma Measurement Software (for MS2681A) cdma Measurement Software (for MS2683A) cdma Measurement Software operation manual (MS2681A/2683A/2687B Common)
MX268104A MX268304A W2090AE	1xEV-DO Measurement Software (for MS2681A) 1xEV-DO Measurement Software (for MS2683A) 1xEV-DO Measurement Software operation manual (MS2681A/2683A/2687B Common)
MX268105A MX268305A W1866AE	π /4DQPSK Measurement Software (for MS2681A) π /4DQPSK Measurement Software (for MS2683A) π /4DQPSK Measurement Software operation manual (MS2681A/2683A/2687B Common)
MX268130A MX268330A W2080AE	WIRELESS LAN Measurement Software (for MS2681A) WIRELESS LAN Measurement Software (for MS2683A) WIRELESS LAN Measurement Software operation manual (MS2681A/2683A/2687B Common)
– Application parts –	
J0576D	Coaxial cord (N-P, 5D-2W, N-P), 2 m
J0561	Coaxial cord (N-P, 5D-2W, N-P), 1 m
J0104A	Coaxial cord (BNC-P, RG-55/U, BNC-P), 1 m
J0127C	Coaxial cord (BNC-P, RG-58A/U, BNC-P), 0.5 m
J0127A	Coaxial cord (BNC-P, RG-58A/U, BNC-P), 1 m
J0007	GPIO cable, 1 m
J0008	GPIO cable, 2 m
J1047	Ethernet cross cable
MA1612A MA1621A	Four-port Junction Pad (5 MHz to 3000 MHz) 50 Ω →75 Ω Impedance Transformer (75 Ω , 9 kHz to 3 GHz, \pm 100 V, NC-type)
MP614B	50 \leftrightarrow 70 Ω Impedance Converter (50 to 1200 MHz, 1.5 dB or lower)
J0395	Fixed attenuator for high-power (30 dB, 30 W, DC to 9 GHz)
B0472	Fixed attenuator for high-power (30 dB, 100 W, DC to 18 GHz)
J0078	High power attenuator (N type, 20 dB, 10 W, DC to 18 GHz)

Model/order No.	Name
MA2507A J0805	DC Block Adaptor (50 Ω , 9 kHz to 3 GHz, \pm 50 V) DC block, N type (10 kHz to 18 GHz, made by Wineshell)
B0452A B0452B B0488 W1888AE	Hard carrying case (with casters) Hard carrying case (without casters) Rear panel protective pad Assembling guide drawing for rear protective pad (supplied with B0488 as standard)
B0481B B0479	Carrybone Soft carrying case (rucksack type)
– Warranty –	
MS2681A-90	Extended three year warranty service
MS2681A-91	Extended five year warranty service
MS2683A-90	Extended three year warranty service
MS2683A-91	Extended five year warranty service

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Specifications are subject to change without notice.

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