

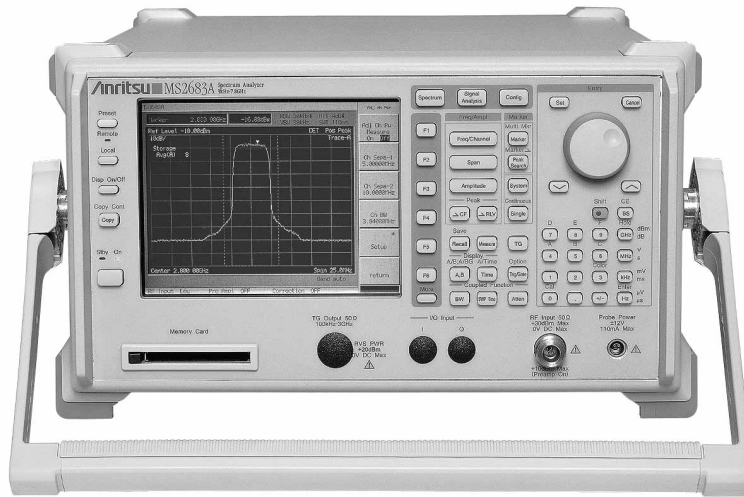
SPECTRUM ANALYZER MS2681A/2683A/2687B

9 kHz to 3/7.8/30 GHz



For Evaluation of IMT-2000, Bluetooth™, MMAC and Advanced Radio Communication Devices

NEW



The IMT-2000 (2 GHz band) service for third-generation mobile radio communication has started. Bluetooth, or Wireless LAN, has been adopted for close-range radio communication between portable remote terminals and peripheral equipment, and R&D of MMAC, IEEE802.11a, and HyperLAN2 for higher speed access have been conducted in various countries.

The MS2681A/2683A/2687B 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.

Application software

Support system	Name
W-CDMA	W-CDMA measurement software
GSM	GSM measurement software
cdmaOne, CDMA 1X	cdma measurement software
CDMA 1xEV-DO	CDMA 1xEV-DO measurement software
PDC/PHS/NADC (IS-136), STD-39/T79, STD-T61	$\pi/4$ DQPSK measurement software
IEEE802.11a/11b, HiSWANa, HiperLAN2	Wireless LAN measurement software

Features

- Wide resolution band width up to 20 MHz.
- 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 1 Hz.
- Optional rubidium reference oscillator for warm-up time of just 7 minutes.
- Optional power meter that measures up to 32 GHz.

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	MS2687B
Frequency range	9 kHz to 3 GHz	9 kHz to 7.8 GHz	9 kHz to 30 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	Band 0: 9 kHz to 3.2 GHz Mixer harmonics order 1 Band 1-: 3.15 to 6.3 GHz Mixer harmonics order 1 Band 1+: 6.2 to 7.9 GHz Mixer harmonics order 1 Band 2+: 7.8 to 15.3 GHz Mixer harmonics order 2 Band 4+: 15.2 to 30 GHz Mixer harmonics order 4
Pre-selector range	—	3.15 to 7.8 GHz, 1.6 to 7.8 GHz (option 03)	3.15 to 30 GHz (band 1-, 1+, 2+, 4+)

Continued on next page

Name	MS2681A	MS2683A	MS2687B
Display frequency accuracy	\pm (Display frequency x reference frequency accuracy + span x span accuracy + resolution bandwidth x 0.15 + 10 Hz)		\pm (Display frequency x reference frequency accuracy + span x span accuracy + resolution bandwidth x 0.15 + 10 Hz x N Hz) Normal marker: same as frequency display accuracy, Delta marker: same as span accuracy *N: Mixer harmonics order
Frequency counter resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz (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)		\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)	Setting range: 0 Hz, and 5 kHz to 30 GHz, Accuracy: \pm 1.0% (band 0,1), \pm 2.5% (band 2, 4) At single band sweep, data point 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: \leq -108 dBc/Hz (1 GHz, 10 kHz offset), \leq -120 dBc/Hz (1 GHz, 100 kHz offset)		Noise sideband: \leq -108 dBc/Hz (1 GHz, 10 kHz offset), \leq -120 dBc/Hz (1 GHz, 10 kHz offset) Spurious resulting from local cause: \leq -65 dBc (at harmonic mixing order 1)
Reference oscillator	Frequency: 10 MHz Start-up characteristics: \leq 5 x 10 ⁻⁸ (after 10 minutes warm-up, with frequency after 24 hours warm-up referenced) Aging rate: \leq 2 x 10 ⁻⁸ /day, \leq 1 x 10 ⁻⁷ /year (with frequency after 24 hours of warm-up referenced) Temperature characteristics: \pm 5 x 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: Continuous average power: +30 dBm (RF ATT: \geq 10 dB) Peak pulse input: +47 dBm (pulse width \leq 1 μ s, duty ratio \leq 1%, RF ATT: \geq 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] \leq -124 dBm + f [GHz] dB (1 MHz to 2.5 GHz) \leq -120 dBm + f [GHz] dB (2.5 to 3.0 GHz) [With option 08] \leq -122 dBm + 1.5f [GHz] dB (1 MHz to 2.5 GHz) \leq -120 dBm + 1.5f [GHz] dB (2.5 to 3.0 GHz) Residual response: \leq -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] \leq -124 dBm + f [GHz] dB (1 MHz to 2.5 GHz, band 0) \leq -120 dBm + f [GHz] dB (2.5 to 3.2 GHz, band 0) \leq -122 dBm + 0.5f [GHz] dB (3.15 to 7.8 GHz, band 1) [With option 08] \leq -122 dBm + 1.5f [GHz] dB (1 MHz to 2.5 GHz, band 0) \leq -120 dBm + 1.5f [GHz] dB (2.5 to 3.2 GHz, band 0) \leq -122 dBm + 0.5f [GHz] dB (3.15 to 7.8 GHz, band 1) Residual response: \leq -100 dBm (1 MHz to 3.2 GHz, band 0), \leq -90 dBm (3.15 to 7.8 GHz, band 1)	Average noise level display RBW: 300 Hz, VBW: 1 Hz, RF ATT 0 dB, in SAMPLE detection mode \leq -124 dBm + f [GHz] dB (1 MHz to 2.5 GHz, band 0) \leq -120 dBm + f [GHz] dB (2.5 to 3.2 GHz, band 0) \leq -115 dBm (3.15 to 7.9 GHz, band 1) \leq -113 dBm (7.8 to 15.3 GHz, band 2) \leq -103 dBm (15.2 to 30.0 GHz, band 4) Residual response: RF ATT 0 dB, input terminated at 50 Ω \leq -100 dBm (1 MHz to 3.2 GHz, band 0), \leq -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: \pm 0.5 dB (-49.9 to 0 dBm), \pm 0.75 dB (+0.1 to +30 dBm, -69.9 to -50 dBm), \pm 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: \pm 0.3 dB (300 Hz to 5 MHz), \pm 0.5 dB (10, 20 MHz) *After calibration, with RBW 3 kHz referenced		
	Input attenuator (RF ATT) Setting range: 0 dB to 62 dB (2 dB step), manually settable, or automatically settable according to reference level Switching uncertainty: \pm 0.3 dB (10 to 50 dB), \pm 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	Input attenuator (RF ATT) Setting range: 0 to 70 dB (10 dB step), manually settable, or automatically settable according to reference level Switching uncertainty: \pm 0.3 dB (10 to 50 dB), \pm 0.5 dB (50 to 70 dB) *With 50 MHz, RF ATT 10 dB referenced	

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Name	MS2681A	MS2683A	MS2687B
Frequency response	<p>±0.6 dB (9 kHz to 3.0 GHz) 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)</p>	<p>±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.</p>	<p>Relative flatness: at RF ATT 10 dB with the center point of frequency response in the band referenced ±1.0 dB (9 kHz to 3.2 GHz, band 0), ±1.5 dB (3.15 to 7.9 GHz, band 1), ±3.0 dB (7.8 to 15.3 GHz, band 2), ±4.0 dB (15.2 to 30 GHz, band 4) *After pre-selector tuning for band 1, 2, and 4 Absolute flatness: at RF ATT 10 dB with 50 MHz referenced ±5.0 dB (9 kHz to 30 GHz), *After pre-selector tuning for band 1, 2, and 4</p>
Waveform display	<p>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%</p>		
Spurious response	<p>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</p>	<p>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</p>	<p>2nd harmonic distortion: ≤-60 dBc (input frequency 10 to 200 MHz, Mixer input: -30 dBm) ≤-70 dBc (0.2 to 1.6 GHz, band 0, Mixer input: -30 dBm) ≤-90 dBc or lower than average noise level (1.6 to 15 GHz, band 1, 2, and 4, Mixer input: -10 dBm) Two-signal third-order intermodulation distortion (Frequency difference of two signals: ≥50 kHz, Mixer input: -30 dBm): ≤-70 dBc (10 to 100 MHz), ≤-85 dBc (0.1 to 3.2 GHz, band 0) ≤-80 dBc (3.15 to 7.9 GHz, band 1) ≤-75 dBc or lower than average noise level (7.8 to 22.5 GHz, band 2, 4) ≤-75 dBc or lower than average noise level (22.5 to 30 GHz, band 4, Typical) Image response: ≤-65 dBc (≤18 GHz), ≤-60 dBc (≤22 GHz), ≤-55 dBc (≤30 GHz) Multiple response/spurious outside the band: ≤-60 dBc (≤22 GHz), ≤-55 dBc (≤30 GHz)</p>
1 dB gain compression	<p>≥0 dBm (≥100 MHz), ≥+3 dBm (≥500 MHz)</p>	<p>≥0 dBm (≥100 MHz), ≥+3 dBm (≥500 MHz, band 1), ≥0 dBm (≥3.15 GHz, band 1) ≥0 dBm (option 03: ≥1.6 GHz, band 1)</p>	<p>≥0 dBm (≥100 MHz), ≥+3 dBm (≥500 MHz, band 0), ≥-5 dBm (≥3150 MHz, band 1, 2, and 4)</p>
Maximum dynamic range	<p>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)</p>	<p>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 - 0.5f [GHz] dB, Reference value (3.15 to 7.8 GHz, band 1) [With option 08] ≥122 dB - 1.5f [GHz] dB, Reference value (0.1 to 3.2 GHz, band 0) ≥122 dB - 0.5f [GHz] dB, Reference value (3.15 to 7.8 GHz, band 1)</p>	<p>—</p>
Sweep mode	<p>Continuous, single</p>		
Sweep time	<p>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: ±3%</p>		
Trigger switch	<p>Free run, triggered</p>		
Trigger source	<p>Wide IF video, external (TTL), external (±10 V), line</p>		
Gate sweep mode	<p>Off, random sweep mode Setting range Gate delay range: 0 to 65.5 ms (Resolution: 1 μs) Gate length range: 2 μs to 65.5 ms (Resolution: 1 μs), Gate end: Internal/external</p>		
Zone sweep	<p>Sweeps the indicated range in the zone only.</p>	<p>—</p>	<p>Sweeps the indicated range in the zone only.</p>
Tracking sweep	<p>Sweeps following the peak point inside the zone marker (zone sweep also available).</p>	<p>—</p>	<p>Sweeps following the peak point inside the zone marker (zone sweep also available).</p>

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Name	MS2681A	MS2683A	MS2687B
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)	
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 \rightarrow B, B \rightarrow A, A \leftrightarrow B, A + B \rightarrow A, A - B \rightarrow A, A - B + DL \rightarrow A	
	Storage functions	NORMAL, VIEW, MAX HOLD, MIN HOLD, AVERAGE, CUMULATIVE, OVER WRITE	
	Marker	Signal search: AUTO TUNE, PEAK \rightarrow CF, PEAK \rightarrow REF, SCROLL Zone marker: NORMAL, DELTA Marker functions: MARKER \rightarrow CF, MARKER \rightarrow REF, MARKER \rightarrow CF STEP SIZE Δ MARKER \rightarrow SPAN, ZONE \rightarrow SPAN Peak search: PEAK, NEXT PEAK, MIN DIP, NEXT DIP Multi marker: 10 max. (highest 10, harmonics, manually)	
	Measure	Noise power: dBm/Hz, dBm/CH, dB μ V/ \sqrt 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	
	Correction	Frequency response can be corrected arbitrarily up to 150 points	
Others	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-sub 25 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	
RS-232C	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/output connector	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 Input/output connector Level: 0 to 0.5 V \pm 0.1 V Typical (log scale), 0 to 0.4 V \pm 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 \pm 0.1 V (100 k Ω 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, $\pm 10\%$ 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 and mass	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 $\leq 85\%$ (no condensation allowed)		
Storage temperature range	-20° to +60°C		

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Name	MS2681A	MS2683A	MS2687B
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)		

MS2687B Mainframe specifications when external mixer is used.

External Mixer	Frequency	<p>Frequency range: 18 to 110 GHz Frequency band:</p> <table border="1"> <thead> <tr> <th>Band</th> <th>Frequency range</th> <th>Mixer harmonics order [N]</th> </tr> </thead> <tbody> <tr> <td>K</td> <td>18 to 26.5 GHz</td> <td>4</td> </tr> <tr> <td>Ka</td> <td>26.5 to 40 GHz</td> <td>6</td> </tr> <tr> <td>Q</td> <td>33 to 55 GHz</td> <td>8</td> </tr> <tr> <td>U</td> <td>40 to 60 GHz</td> <td>9 or 10</td> </tr> <tr> <td>V</td> <td>50 to 75 GHz</td> <td>11 or 12</td> </tr> <tr> <td>E</td> <td>60 to 90 GHz</td> <td>13 or 14</td> </tr> <tr> <td>W</td> <td>75 to 110 GHz</td> <td>16</td> </tr> </tbody> </table>	Band	Frequency range	Mixer harmonics order [N]	K	18 to 26.5 GHz	4	Ka	26.5 to 40 GHz	6	Q	33 to 55 GHz	8	U	40 to 60 GHz	9 or 10	V	50 to 75 GHz	11 or 12	E	60 to 90 GHz	13 or 14	W	75 to 110 GHz	16
	Band	Frequency range	Mixer harmonics order [N]																							
K	18 to 26.5 GHz	4																								
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U	40 to 60 GHz	9 or 10																								
V	50 to 75 GHz	11 or 12																								
E	60 to 90 GHz	13 or 14																								
W	75 to 110 GHz	16																								
	Span setting range	0 Hz, (100 x N) Hz to each bandwidth																								
Amplitude	Mixer transform loss setting range	15 to 85 dB																								
	Maximum input level	Depend of external mixer																								
	Average noise level	Depend of external mixer																								
	Frequency response	Depend of external mixer																								
Input/Output	Adaptive mixer	Only 2 port mixer																								
	Local frequency	4 to 7 GHz																								
	IF frequency	460.69 or 466 MHz																								
	Display gain	0 ±2 dB (External mixer input level -10 dBm, Mixer transform loss 15 dB)																								

• MS2681A Options

Option 01: Precision frequency reference oscillator

Frequency	10 MHz
Start-up characteristics	$\leq 5 \times 10^{-8}$ (≤ 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)

Option 02: Narrow resolution bandwidths (FFT)

Resolution bandwidth	<p>Setting range: 1 Hz to 1 kHz (1, 3 sequence) Bandwidth accuracy: ±10% (RBW: ≥100 Hz), ±10% NOMINAL (RBW: ≤30 Hz) RBW selectivity (60 dB: 3 dB): ≤5:1 RBW switching uncertainty: ±0.5 dB</p>
Span setting	Minimum setting span: 100 Hz
Average noise level display	<p>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)</p>

Option 04: Digital resolution bandwidth

Resolution bandwidth	<p>Setting range: 10 Hz to 1 MHz (1, 3 sequence) Bandwidth accuracy: ±10% (RBW: ≥100 Hz), ±10% NOMINAL (RBW: ≤30 Hz) Bandwidth selectivity (60 dB: 3 dB): ≤5:1 (RBW ≥100 Hz), ≤5:1 NOMINAL (RBW: ≤30 Hz) RBW switching uncertainty: 0.5 dB</p>
Span setting	Minimum span setting: 1 kHz
Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, RMS RMS: displays root-mean-square value of average power between sample points
Average noise level	<p>When RBW is 10 Hz and RF ATT is 0dB [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)</p>

Option 08: Pre-amplifier*1

Frequency range	100 kHz to 3 GHz
Gain	20 dB Typical
Noise figure	6.5 dB Typical (input frequency ≤ 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: ± 0.9 dB (-69.9 to +10 dBm), ± 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: ± 0.5 dB (300 Hz to 5 MHz), ± 0.75 dB (10 MHz, 20 MHz) RF ATT switching uncertainty: ± 0.5 dB (10 to 50 dB), ± 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
Frequency response	± 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): ± 0.5 dB (0 to -20 dB, RBW ≤ 1 kHz), ± 1.0 dB (0 to -60 dB, RBW ≤ 1 kHz), ± 1.5 dB (0 to -75 dB, RBW ≤ 1 kHz) Linear scale (after calibration): $\pm 5\%$ (relative to reference level)
Spurious response	≤ -70 dBc (10 MHz to 3 GHz) *Frequency difference of two signals ≥ 50 kHz, At pre-amplifier input level of -55 dBm*2
1 dB gain compression	≥ -35 dBm (input frequency ≥ 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

Option 09: Ethernet interface

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

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: ± 2.5 V (at input terminal)

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 Options

Option 01: Precision frequency reference oscillator

Frequency	10 MHz
Start-up characteristics	$\leq 5 \times 10^{-8}$ (≤ 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	$\leq \pm 5 \times 10^{-10}$ /day (With the frequency at 0° to 50°C and 25°C referenced)

Option 02: Narrow resolution bandwidths (FFT)

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] ≤ -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)

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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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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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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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	$\leq -122 \text{ dBm} + 0.5f \text{ [GHz] dB}$ (1.6 to 7.8 GHz, band 1, RBW: 300 Hz, VBW: 1 Hz, RF ATT: 0 dB)
Residual response	$\leq -90 \text{ dBm}$ (1.6 to 7.8 GHz, band 1, RF ATT: 0 dB, input terminated at 50 Ω)
Frequency response	$\pm 1.0 \text{ dB}$ (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) $\pm 2.0 \text{ dB}$ (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	$\leq -90 \text{ dBc}$ (0.8 to 3.9 GHz, band 1, mixer input: -10 dBm)
1 dB gain compression	$\geq 0 \text{ dBm}$ (1.6 to 7.8 GHz, band 1)
Maximum dynamic range	$\geq -122 \text{ dB} + 0.5f \text{ [GHz] dB}$ (1.6 to 7.8 GHz, band 1)

Option 04: Digital resolution bandwidth

Resolution bandwidth	Setting range: 10 Hz to 1 MHz (1, 3 sequence) Bandwidth accuracy: $\pm 10\%$ (RBW: $\geq 100 \text{ Hz}$), $\pm 10\%$ NOMINAL (RBW: $\geq 30 \text{ Hz}$) Bandwidth selectivity (60 dB: 3 dB): $\leq 5:1$ (RBW: $\geq 100 \text{ Hz}$), $\leq 5:1$ NOMINAL (RBW: $\leq 30 \text{ Hz}$) RBW switching uncertainty: 0.5 dB
Span setting	Minimum span setting: 1 kHz
Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, RMS RMS: displays root-mean-square value of average power between sample points
Average noise level	When RBW is 10 Hz and RF ATT is 0 dB [Without Option 08] $\leq -136.5 \text{ dBm} + f \text{ [GHz] dB}$ Typical (1 MHz to 2.5 GHz, band 0) $\leq -132.5 \text{ dBm} + f \text{ [GHz] dB}$ Typical (2.5 to 3.2 GHz, band 0) $\leq -134.5 \text{ dBm} + 0.5f \text{ [GHz] dB}$ Typical (3.15 to 7.8 GHz, band 1) [With Option 08] $\leq -134.5 \text{ dBm} + 1.5 \times f \text{ [GHz] dB}$ Typical (1 MHz to 2.5 GHz, band 0) $\leq -130.5 \text{ dBm} + 1.5 \times f \text{ [GHz] dB}$ Typical (2.5 to 3.2 GHz, band 0) $\leq -134.5 \text{ dBm} + 0.5 \times f \text{ [GHz] dB}$ Typical (3.15 to 7.8 GHz, band 1)

Option 08: Pre-amplifier*1

Frequency range	100 kHz to 3 GHz
Gain	20 dB Typical
Noise figure	6.5 dB Typical (input frequency $\leq 2 \text{ GHz}$), 12 dB Typical (input frequency $> 2 \text{ GHz}$)
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 μV to 707 mV Reference level accuracy: $\pm 0.9 \text{ dB}$ (-69.9 to +10 dBm), $\pm 1.5 \text{ dB}$ (-90 to -70 dBm) *After calibration, with 50 MHz referenced, 1 MHz span (RF, RBW, VBW, and sweep time set to AUTO) RBW switching uncertainty: $\pm 0.5 \text{ dB}$ (300 Hz to 5 MHz), $\pm 0.75 \text{ dB}$ (10 MHz, 20 MHz) RF ATT switching uncertainty: $\pm 0.5 \text{ dB}$ (10 to 50 dB), $\pm 0.75 \text{ dB}$ (52 to 62 dB) *With 50 MHz referenced, when RF ATT is 10 dB
Average noise level display	$-137 \text{ dBm} + 2.0 \times f \text{ [GHz] dB}$ (1 MHz to 2.5 GHz, band 0) *When RBW is 300 Hz, VBW is 1 Hz, RF ATT is 0 dB, and detection mode set to SAMPLE
Frequency response	$\pm 2.0 \text{ dB}$ (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): $\pm 0.5 \text{ dB}$ (0 to -20 dB, RBW: $\leq 1 \text{ kHz}$), $\pm 1.0 \text{ dB}$ (0 to -60 dB, RBW: $\leq 1 \text{ kHz}$), $\pm 1.5 \text{ dB}$ (0 to -75 dB, RBW: $\leq 1 \text{ kHz}$) Linear scale (after calibration): $\pm 5\%$ (relative to reference level)
Spurious response	$\leq -70 \text{ dBc}$ (10 MHz to 3 GHz) *Frequency difference of two signals $\geq 50 \text{ kHz}$, At pre-amplifier input level of -55 dBm*2
1 dB gain compression	$\geq -35 \text{ dBm}$ (input frequency $\geq 100 \text{ MHz}$) *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

Option 09: Ethernet interface

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

Option 17: I/Q balanced input

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

Option 18: I/Q unbalanced input

Connector	BNC
Impedance	Selectable between 1 M Ω (parallel capacity $< 100 \text{ pF}$) 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

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

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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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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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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• MS2687B Options

Option 01: Precision frequency reference oscillator

Frequency	10 MHz
Start-up characteristics	$\leq 5 \times 10^{-8}$ (≤ 7 min. 25°C, Typical)
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° and +25°C referenced)

Option 02: Narrow resolution bandwidths (FFT)

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, RF ATT is 0 dB ≤ -146.5 dBm + 1.5f [GHz] dB Typical (1 MHz to 2.5 GHz, band 0) ≤ -142.5 dBm + 1.5f [GHz] dB Typical (2.5 to 3.2 GHz, band 0) ≤ -137.5 dBm Typical (3.15 to 7.9 GHz, band 1) ≤ -129.5 dBm Typical (7.8 to 15.2 GHz, band 2) ≤ -125.5 dBm Typical (15.1 to 22.5 GHz, band 3) ≤ -118.5 dBm Typical (22.4 to 30 GHz, band 4)

Option 04: Digital resolution bandwidth

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) Bandwidth selectivity (60 dB: 3 dB): $\leq 5:1$ (RBW ≥ 100 Hz) $\leq 5:1$ Typical (RBW ≤ 30 Hz) RBW switching uncertainty: ± 0.5 dB
Detection mode	NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, RMS RMS: displays root-mean-square value of average power between sample points
Average noise level	When RBW is 10 Hz, RF ATT is 0 dB ≤ -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) ≤ -127.5 dBm Typical (3.15 to 7.9 GHz, band 1) ≤ -119.5 dBm Typical (7.8 to 15.2 GHz, band 2) ≤ -115.5 dBm Typical (15.1 to 22.5 GHz, band 3) ≤ -108.5 dBm Typical (22.4 to 30 GHz, band 4)

Option 05: Rubidium reference oscillator*

Frequency	10 MHz
Start-up characteristics	$\pm 1 \times 10^{-9}$ /7 min. (with frequency one hour after the power is turned on referenced)
Aging rate	$\pm 1 \times 10^{-10}$ /month (with frequency one hour after the power is turned on referenced)
Temperature characteristics	$\pm 1 \times 10^{-9}$ /day (with frequency at 0° to +45°C and +25°C referenced)
Accessories	J1066 coaxial code 0.15 m (BNC211-LP4)

* Can not be installed with option 22

Option 09: Ethernet interface

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

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 to 1 Vp-p (at input terminal) Changeable between DC connection and AC connection

Option 21: Power meter function

Frequency range	100 kHz to 32 GHz
Level range	-10 to +20 dBm
Applicable power sensor	MA4601A, MA4701A, MA4703A, MA4705A
Display	Selectable from W, dBm, and dB (RELATIVE), Digital 4 digit display, 20% over range, Power range: 4 range/10 dB step (Measurement level range is listed on the power sensor specifications.)
Range switching	Auto, manual (settable to arbitrary range irrespective of range hold or input level)
Accuracy	±0.7% (W mode), ±0.03 dB [dBm mode, dB (RELATIVE) mode] * Pressing ZERO ADJ key allows automatic adjustment to zero point.
Zero setting	±0.5% of full scale Typical value (100 μW range of maximum sensitivity)
Zero move between ranges	±0.2% (after zero setting at 100 μW range of maximum sensitivity)
Calibration oscillator frequency	50 MHz
Calibration oscillator level	1 mW ± 1.2% (for one year)
Averaging	Sample rate time settable in 4 steps

Option 34: 4 GHz LO output

Frequency	Frequency: 4 GHz Frequency accuracy: ± (4 GHz x reference frequency accuracy) ±1 Hz
Output level	-10 dBm Typical
Spurious	≤-40 dBc Typical

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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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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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
MS2681A	Main frame Spectrum Analyzer
MS2683A	Spectrum Analyzer
MS2687B	Spectrum Analyzer
	Standard accessories
	Power cord, 2.6 m: 1 pc
J0996B	RS-232C cable: 1 pc
JT32MA3-NT1	PC-ATA card (32 MB): 1 pc
F0014	Fuse, 6.3 A: 1 pc
MX268001A	File Transfer Utility: 1 pc
W1754AE	MS2681A/2683A/2687B operation manual: 1 copy
	Options
MS2681A-01	Precision frequency reference (aging rate: 5 x 10 ⁻¹⁰ /day)
MS2681A-02	Narrow resolution bandwidths (FFT)
MS2681A-04	Digital resolution bandwidth
MS2681A-08	Pre-amplifier
MS2681A-09	Ethernet interface
MS2681A-17	I/Q balanced input
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
MS2683A-01	Precision frequency reference (aging rate: 5 x 10 ⁻¹⁰ /day)
MS2683A-02	Narrow resolution bandwidths (FFT)
MS2683A-03	Extension of pre-selector lower limit to 1.6 GHz
MS2683A-04	Digital resolution bandwidth
MS2683A-08	Pre-amplifier
MS2683A-09	Ethernet interface
MS2683A-17	I/Q balanced input
MS2683A-18	I/Q unbalanced input
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
MS2687B-01	Precision frequency reference (aging rate: 5 x 10 ⁻¹⁰ /day)
MS2687B-02	Narrow resolution bandwidths (FFT)
MS2687B-04	Digital resolution bandwidth
MS2687B-05	Rubidium reference oscillator
MS2687B-09	Ethernet interface
MS2687B-18	I/Q unbalanced input
MS2687B-21	Power meter function
MS2687B-34	4 GHz LO output
MS2687B-46	Auto power recovery
MS2687B-47	Rack mount (IEC) without handles
MS2687B-48	Rack mount (JIS) without handles
	Measurement software
MX268101B	W-CDMA Measurement Software (for MS2681A)
MX268301B	W-CDMA Measurement Software (for MS2683A)
MX268701B	W-CDMA Measurement Software (for MS2687B)
W1746AE	W-CDMA Measurement Software operation manual (MS2681A/2683A/2687B Common)
MX268102A	GSM Measurement Software (for MS2681A)
MX268302A	GSM Measurement Software (for MS2683A)
MX268702A	GSM Measurement Software (for MS2687B)
W1854AE	GSM Measurement Software operation manual (MS2681A/2683A/2687B Common)

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Model/Order No.	Name
MX268103A MX268303A MX268703A W1865AE	cdma Measurement Software (for MS2681A) cdma Measurement Software (for MS2683A) cdma Measurement Software (for MS2687B) cdma Measurement Software operation manual (MS2681A/2683A/2687B Common)
MX268104A MX268304A MX268704A W2090AE	1xEV-DO Measurement Software (for MS2681A) 1xEV-DO Measurement Software (for MS2683A) 1xEV-DO Measurement Software (for MS2687B) 1xEV-DO Measurement Software operation manual (MS2681A/2683A/2687B Common)
MX268105A MX268305A MX268705A W1866AE	π /4DQPSK Measurement Software (for MS2681A) π /4DQPSK Measurement Software (for MS2683A) π /4DQPSK Measurement Software (for MS2687B) π /4DQPSK Measurement Software operation manual (MS2681A/2683A/2687B Common)
MX268130A MX268330A MX268730A W2080AE	WIRELESS LAN Measurement Software (for MS2681A) WIRELESS LAN Measurement Software (for MS2683A) WIRELESS LAN Measurement Software (for MS2687B) 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	GPIB cable, 1 m
J0008	GPIB cable, 2 m
J1047	Ethernet cross cable
MA1612A	Four-port Junction Pad (5 MHz to 3000 MHz)
MA1621A	50 Ω \rightarrow 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)
34AKNF50	Ruggedized K-to-Type N Adapter
MA2507A	DC Block Adaptor (50 Ω , 9 kHz to 3 GHz, \pm 50 V)
J0805	DC block, N type (10 kHz to 18 GHz, made by Wineshell)
B0452A	Hard carrying case (with casters)
B0452B	Hard carrying case (without casters)
B0488	Rear panel protective pad
W1888AE	Assembling guide drawing for rear protective pad (supplied with B0488 as standard)
B0481B	Carrybone
B0479	Soft carrying case (rucksack type)
MA4601A	Power Sensor (100 kHz to 5.5 GHz, $-$ 30 to +20 dBm, N connector)
MA4701A	Power Sensor (10 MHz to 18 GHz, $-$ 30 to +20 dBm, N connector)
MA4703A	Power Sensor (50 MHz to 26.5 GHz, $-$ 30 to +20 dBm, APC3.5(P) connector)
MA4705A	Power Sensor (50 MHz to 32 GHz, $-$ 30 to +20 dBm, APC3.5(P) connector)
J0370A	Sensor connecting cord, 1.5 m (for power meter option)
J0370C	Sensor cord, 2.5 m (for power meter option)
J0370E	Sensor cord, 5 m (for power meter option)
J0370G	Sensor cord, 10 m (for power meter option)
MA2741A	External Mixer (26.5 to 40 GHz)
MA2742A	External Mixer (33 to 50 GHz)
MA2743A	External Mixer (40 to 60 GHz)
MA2744A	External Mixer (50 to 75 GHz)
MA2745A	External Mixer (60 to 90 GHz)
MA2746A	External Mixer (75 to 110 GHz)
J0364	APC-3.5 to N conversion connector (for MA4703A and MA4605A)
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
MS2687B-90	Extended three year warranty service
MS2687B-91	Extended five year warranty service