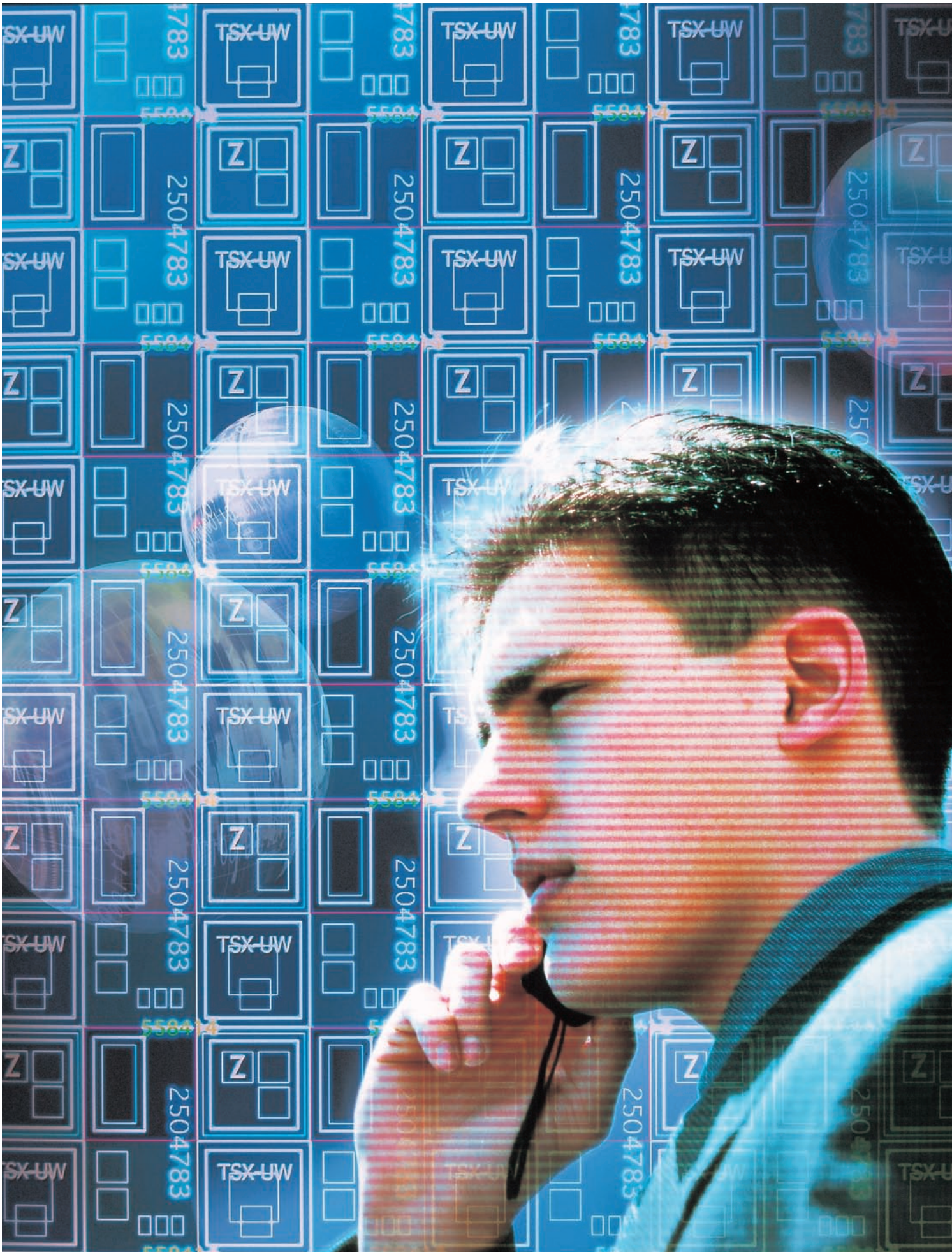
Product Brochure

Anritsu

MS2687B

Spectrum Analyzer

9 kHz to 30 GHz (18 GHz to 110 GHz)


TSX-UW
2504783

High-performance Microwave Spectrum Analyzer Covering 30 GHz

High-speed Internet services using Wireless LANs are spreading rapidly. High-speed hot-spot wireless services are appearing in hotels, offices, restaurants. 5 GHz Wireless LAN equipment and devices are being actively developed and there is urgent need for OFDM signal analysis.
The MS2687B Microwave Spectrum Analyzer covers a frequency range up to 30 GHz and can measure up to 5th-order harmonics on 5 GHz Wireless LANs. Moreover, the MS2687B has a maximum RBW of 20 MHz and is ideal for measuring the burst power of wideband signals used by Wireless LANs. When the MX268730A Measurement Software is installed, the modulation accuracy, of each sub-carrier of the OFDM signal can be measured at high speed and high accuracy.

Features

- Optional measurement software (sold separately) for high-speed modulation analysis
  (0.5 sec. with IEEE802.11a)
- Optional wide resolution bandwidth up to 20 MHz and narrow resolution bandwidth from 1 Hz
- Optional power meter that measures up to 32 GHz
- Data transmission speed approximately 10 times faster*
  (GPIB transmission speed: 120 kB/s) * Comparison with our conventional models
- Optional rubidium reference oscillator for warm-up time of just 7 minutes

Basic Specifications

For R&D and Manufacturing of Wireless LAN Equipment and Devices

- Frequency range: 9 kHz to 30 GHz
- Reference oscillator start-up characteristics:
  5×10^{-8} or lower (standard)
  1×10^{-9}/7 min. or lower (option 05)
- Span accuracy: ±1%
- Resolution bandwidth:
  300 Hz to 3 MHz, 5 MHz, 10 MHz, 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)
- Input attenuator: 0 to 70 dB (10 dB step)

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 Memory card
  (Memory card equipped as standard for 32 MB or over)
- Display: 6.5 inch (17 cm) color TFT-LCD
- Dimensions, weight: 320 (W) × 177 (H) × 411 (D) mm, 16 kg

For Maintenance of Microwave Entrance Lines

- Frequency range: 9 kHz to 30 GHz
  (When using external mixer: to 110 GHz)
- Measure: One-touch measurement of occupied bandwidth, channel power, and adjacent channel leakage power
- Power meter function: 100 kHz to 32 GHz
  (Power sensor optionally available)

A backpack and soft carrying case convenient for field use is also available.

For Development and Production Line of Various Radio Frequency Parts

- Reference oscillator stability:
  ±2 × 10^{-8}/day (standard)
  ±5 × 10^{-9}/day (option 01)
- Sweep time: 10 ms to 1000 s (frequency span)
  1 µs 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.
- GPIB transfer rate: 120 kB/s

Options

- Option 01: Precision frequency reference
  (aging rate: 5 × 10^{-10}/day)
- Option 02: Narrow resolution bandwidth (FFT)
- Option 04: Digital resolution bandwidth (RMS detection)
- Option 05: Rubidium reference oscillator
- Option 09: Ethernet interface
- Option 18: I/Q unbalanced input
- Option 21: Power meter function
- Option 23: Range expansion power meter function
- Option 34: 4 GHz LO output
- Option 41: Power meter function retrofit
- Option 43: Range expansion power meter function retrofit
- Option 44: Range expansion power meter function upgrade
- Option 46: Auto power recovery
- Option 47: Rack mount (IEC) without handles
- Option 48: Rack mount (JIS) without handles

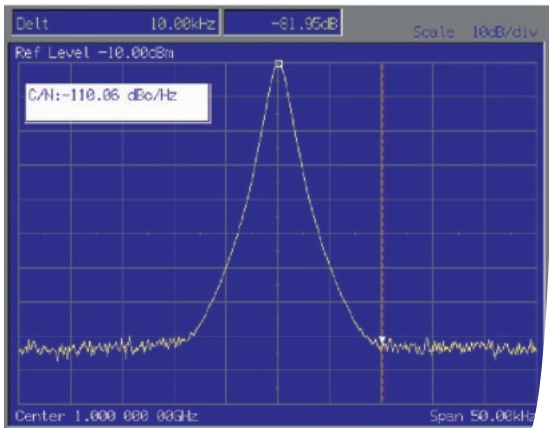
Warranty

- Option 90: Extended three year warranty service
- Option 91: Extended five year warranty service

Excellent Basic Performance

High C/N Ratio to Securely Capture Adjacent Signals

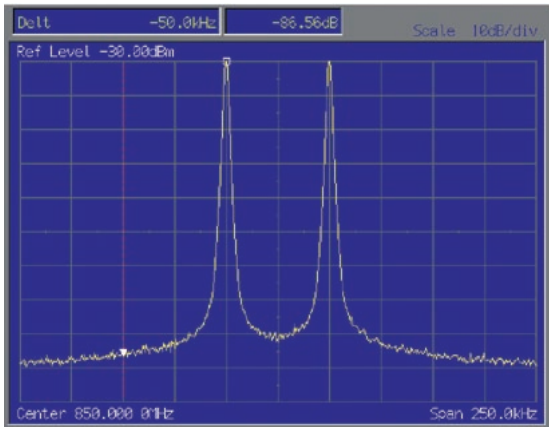
The MS2687B has excellent noise sideband characteristics of –108 dBc/Hz or lower (1 GHz, 10 kHz offset), which is ideal for analyzing weak signals adjacent to strong signals or a narrow bandwidth carrier.



Example of C/N characteristics waveform

Extremely Low Distortion Rate Suitable for Power Amplification or Harmonic Measurement

The MS2687B 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.



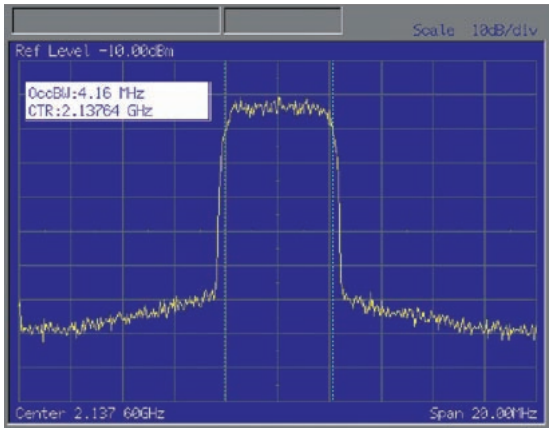
Example of two-signal third-order distortion waveform

Broad Dynamic Range that Accurately Captures Weak Signals

With the development of digital radio technology, analyzed signals are becoming weaker and broader than ever. With the MS2687B, a dynamic range display of up to 156 dB (typical value) has been achieved, thus allowing accurate analysis of even weak signals.
The resolution bandwidth of up to 20 MHz permits the analysis of broadband signals and can handle the broader bandwidths of the future.

Instantaneous Evaluation of Various Radio Devices Standard Measure Functions

The MS2687B has a wealth of measuring functions to perform various high-speed evaluations of radio devices such as power measurement, frequency measurement, adjacent channel leakage power measurement, and mask measurement.
Optional measurement software is also available for instantaneously analyzing various digital communication systems by just installing the software.

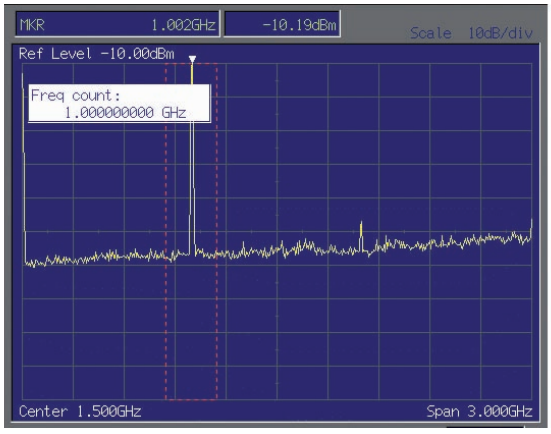


Example of occupied bandwidth

Convenient and Easy-to-Use Functions

1 Hz Resolution Built-in Frequency Counter

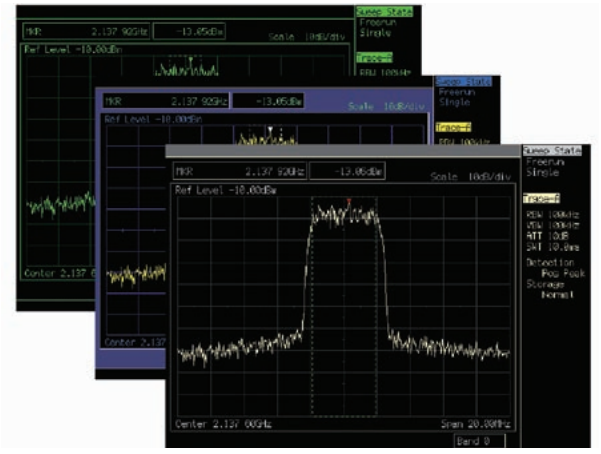
The built-in frequency counter is convenient for measuring the frequency of a signals arbitrarily selected from multiple signals. High resolution of 1 Hz even at full span is assured.



Example of frequency counter

Bright and Easy-to-see 6.5 inch (17 cm) Color TFT Display

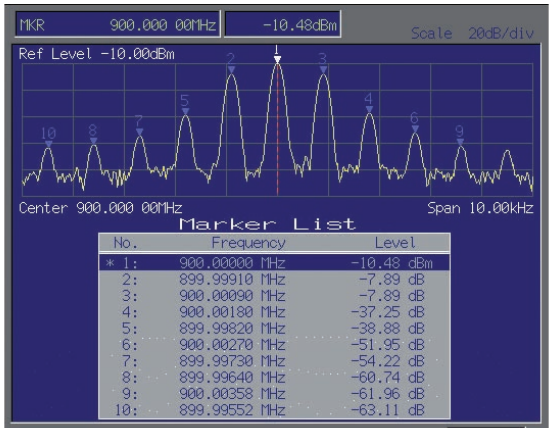
The MS2687B has a 6.5 inch (17 cm) color TFT-LCD. Intensity and color can be adjusted freely according to the operating conditions.



Example of coloring change

Multiple Waveform Display and Multimarkers

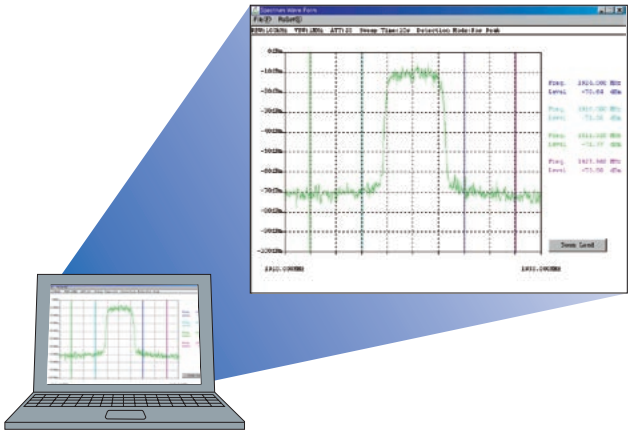
The MS2687B is equipped with multiple waveform display function that allows superimposition of two waveforms or simultaneous display of analysis of frequency domain and time domain.
It also has substantial marker functions that allow up to 10-point multimarkers to be displayed for comparison of waveforms and measurement of harmonics.



Example of harmonics measurement

Easy Measurement Data Control Allowed by Various Interfaces

The results of measurement with the MS2687B 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.



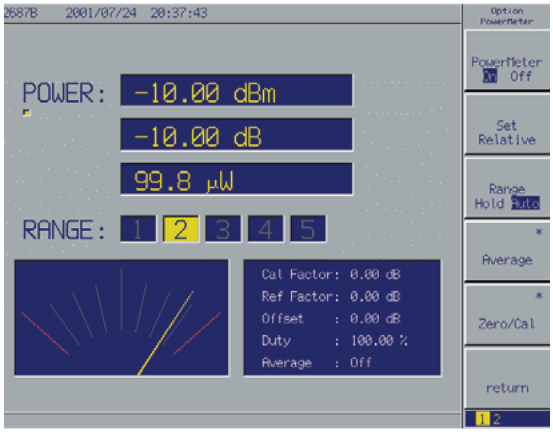
Example of capture soft

Ideal for Installation and Maintenance of Radio Stations
Short Warm-up Time of Just 7 Minutes

The MS2687B is a portable spectrum analyzer ideal for installing and maintaining various radio stations. A frequency range of 9 kHz to 30 GHz has been achieved, and by using an external mixer, this can be extended up to 110 GHz. This range covers the frequencies of various mobile communication systems and applications such as microwave entrance lines. The warm-up time of the optional rubidium reference oscillator (option 05) is just 7 minutes, making it ideal if you have to move from one site to another.

Optional Power Meter Function for Highly Accurate Power Measurement

The MS2687B has an optional power meter function that permits measurement of up to 32 GHz. Just by mounting a power sensor to the full-face connector, highly accurate power measurement can be performed.
Use of the MS2687B eliminates the need to carry a power meter to the site, and enables more efficient measurement at the site.



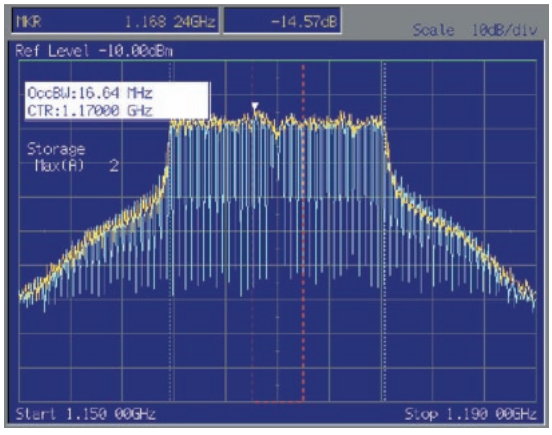
Example of power measurement

Various Accessories Ideal for Field Use

A backpack and soft carrying case are available for installation and maintenance of radio stations in the field. Various accessories such as a rubber protective pad for the back of the analyzer are useful precautions for field use.

Suitable for Analysis of Broadband Signals Wide Resolution Bandwidth of Up to 20 MHz

The MS2687B 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 18 is required) can be performed.
The resolution bandwidth is up to 20 MHz, which allows the analysis of Wireless LAN signal.



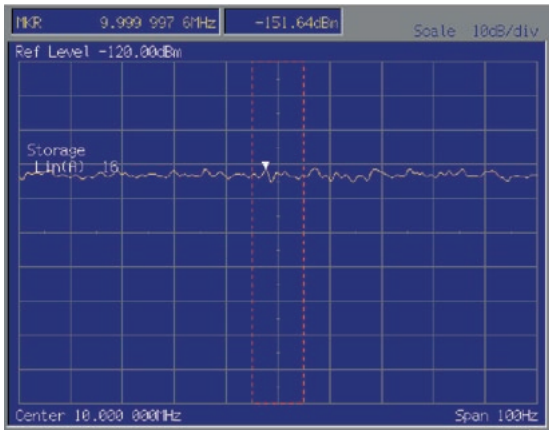
Example of wide bandwidth signal measurement

High-speed Measurement for Construction of Automatic Manufacturing Lines

The MS2687B has a high sweep rate of more than 20 times/s. A slight change of the signal can thus be accurately captured and measured at high speed. The GPIB transfer speed of the measured data is as fast as 120 kB/s, making it approximately 10 times faster than our conventional model. Use of the optional Ethernet interface allows connection to a LAN for centralized management and high-speed measurement, and thus efficient construction of production lines.

High-speed Sweep by FFT Narrow Resolution Bandwidth (option)

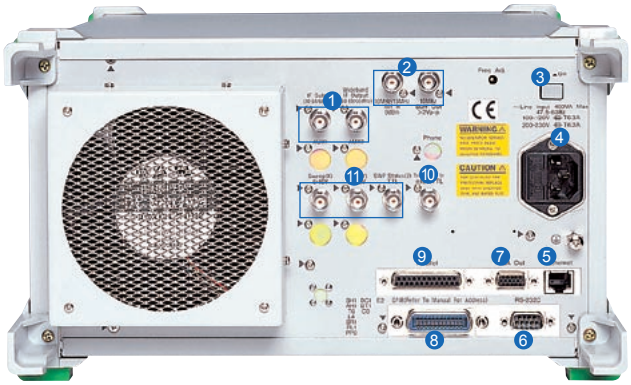
Optional narrow resolution bandwidth with FFT (fast Fourier transform) is available (option 02, 1 Hz to 1 kHz). This option permits state-of-the-art high-speed measurement in a narrow band that used to be impossible with the conventional sweep method.

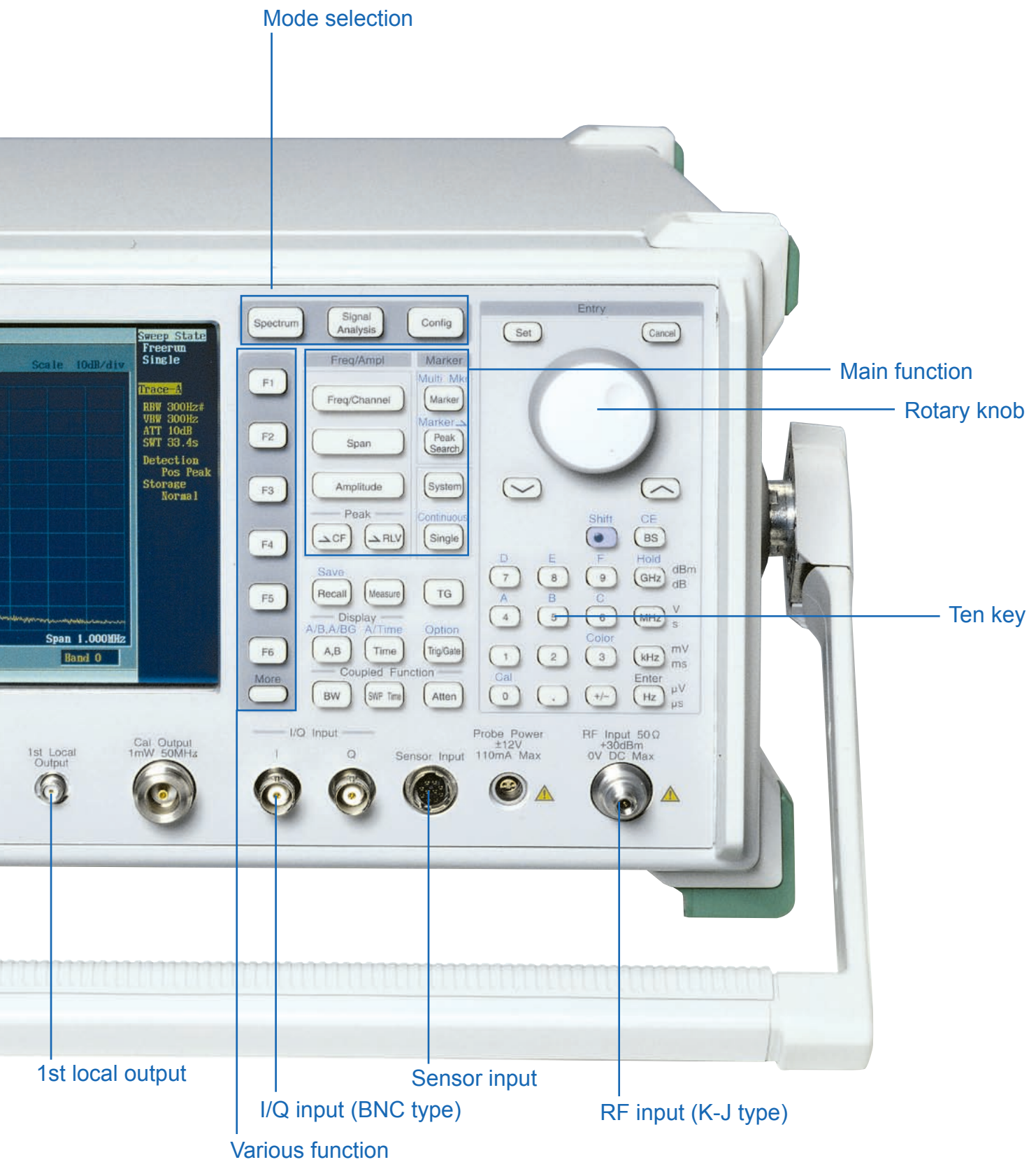


Example of narrow resolution bandwidth measurement

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
1st local output
Various function
I/Q input (BNC type)
Sensor input
RF input (K-J type)
Spectrum
Signal Analysis
Config
Entry
Set
Cancel
Freq/Ampl
Marker
Freq/Channel
Span
Amplitude
Peak
CF
RLV
Multi Mkr
Peak Search
System
Continuous
Single
Save
Recall
Measure
TG
Display
A/B,A/BG
A/Time
Option
A,B
Time
Trig/Gate
Coupled Function
BW
SWP Time
Atten
More
F1
F2
F3
F4
F5
F6
Shift
CE
BS
Hold
dBm
dB
V
s
mV
ms
µV
µs
Color
Cal
Enter
Hz
kHz
MHz
GHz
I/Q Input
1st Local Output
Cal Output 1mW 50MHz
Probe Power ±12V 110mA Max
RF Input 50Ω +30dBm 0V DC Max
Sweep State
Freerun
Single
Trace-A
RBW 300Hz#
VBW 300Hz
ATT 10dB
SWT 33.4s
Detection
Pos Peak
Storage
Normal
Span 1.000MHz
Band 0

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 5×10^{-10}/day.

[option 02]

Narrow Resolution Bandwidth

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

[option 04]

Digital Resolution Bandwidth

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

[option 05]

Rubidium Reference Oscillator

Offers excellent start-up characteristics of 10 MHz oscillation frequency and start-up characteristics of 1×10^{-9}/7 min.

[option 09]

Ethernet Interface

Allows external control via 10BASE-T.

[option 18]

I/Q Unbalanced Input

Mounts 2 connectors for I/Q sync inputs and operating inputs (BNC type) to the front panel.

* Measurement software corresponding to I/Q input is required for actual measurement.

[option 21, 41]

Power Meter Function

The main unit can be used as a power meter with the upper limit of 32 GHz by mounting an external power sensor (see ordering information for details) to the connector on the front panel.
Power measurement range expands from –20 to +20 dBm.

[option 23, 43, 44]

Range Expansion Power Meter Function

The main unit can be used as a power meter with the upper limit of 32 GHz by mounting an external power sensor (see ordering information for details) to the connector on the front panel.
Power measurement range expands from –30 to +20 dBm.

[option 34]

4 GHz LO Output

Outputs internal 2nd local signal through rear connector.

[option 46]

Auto Power Recovery

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

[option 47]

Rack Mount (IEC) without Handles

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

[option 48]

Rack Mount (JIS) without Handles

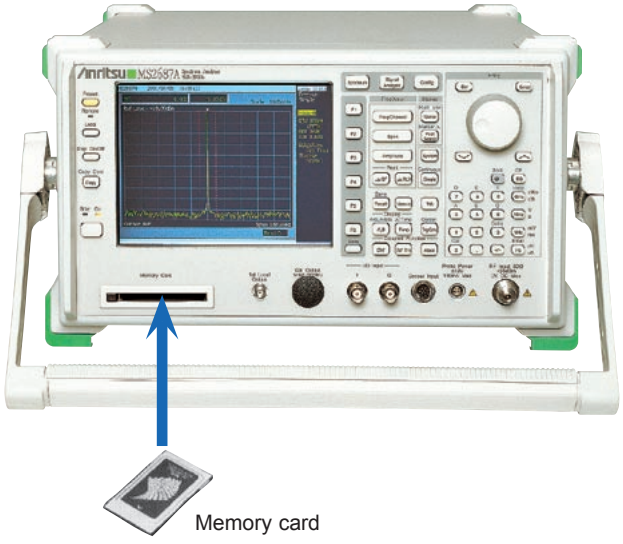
Mounts a JIS standard rack mount. When mounted, the tilt handle (standard) is eliminated.

Application Software

The MS2687B Spectrum Analyzer has been designed to provide the optimum performance required for evaluation of the advanced radio communication devices. They have a wide dynamic range, wide resolution bandwidth (20 MHz), and high-speed sweep (refresh rate: 20 times/s).
When measurement software is stalled in the mainframe, the analysis function of spectrum analyzer to each communication system will be extended. In this case, more advanced analysis can be performed.

Communication system	Applicable software
W-CDMA	W-CDMA Measurement Software
GSM	GSM Measurement Software
cdmaOne, CDMA2000 1X	CDMA Measurement Software
CDMA2000 1xEV-DO	CDMA2000 1xEV-DO Measurement Software
PDC/PHS/NADC (IS-136), STD-39/T79, STD-T61	π/4DQPSK Measurement Software
IEEE802.11a/11b/11g, HiSWANa, HiperLAN2	Wireless LAN Measurement Software
TD-SCDMA	TD-SCDMA Measurement Software

∗: For details, please see the catalog of MX268x Series Measurement Software.



- Measurement software is installed in main frame using a memory card.
- The signal of various kinds is analyzable with the function of the measurement software installed in main frame. The notebook PC for analyzing a signal is unnecessary.
- Measurement software is installable in one set of a Spectrum Analyzer to three.

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.

<table>
<tr><td rowspan="10">Frequency</td><td>Frequency range</td><td>9 kHz to 30 GHz, 18 GHz to 110 GHz (with external mixer)</td></tr>
<tr><td>Frequency band</td><td>
<table>
<tr><th>Band</th><th>Frequency range</th><th>Local harmonics order [N]</th></tr>
<tr><td>0</td><td>9 kHz to 3.2 GHz</td><td>1</td></tr>
<tr><td>1–</td><td>3.15 GHz to 6.3 GHz</td><td>1</td></tr>
<tr><td>1+</td><td>6.2 GHz to 7.9 GHz</td><td>1</td></tr>
<tr><td>2+</td><td>7.8 GHz to 15.3 GHz</td><td>2</td></tr>
<tr><td>4+</td><td>15.2 GHz to 30 GHz</td><td>4</td></tr>
</table>
</td></tr>
<tr><td>Pre-selector range</td><td>3.15 GHz to 30 GHz (band 1–, 1+, 2+, 4+)</td></tr>
<tr><td>Display frequency accuracy</td><td>± (Display frequency × reference frequency accuracy + span × span accuracy + resolution bandwidth × 0.15 + 10 Hz × N Hz)
Normal marker: same as frequency display accuracy
Delta marker: same as span accuracy
∗N: Local harmonics order</td></tr>
<tr><td>Frequency counter resolution</td><td>1, 10, 100 Hz, 1 kHz (counts the received frequency at the peak point inside the zone, RBW 3 MHz or less)</td></tr>
<tr><td>Frequency counter accuracy</td><td>± (Display frequency × reference frequency accuracy +2 × N Hz + 1 LSD)
(at S/N 20 dB or more and RBW 3 MHz or less)
∗N: Local harmonics order</td></tr>
<tr><td>Frequency span</td><td>Setting range: 0 Hz, and 5 kHz to 30 GHz
Accuracy: ±1.0% (band 0,1), ±2.5% (band 2, 4)
∗at single band sweep, data point 1001)</td></tr>
<tr><td>Resolution bandwidth (RBW) [3 dB bandwidth]</td><td>Setting range: 300 Hz to 3 MHz (1-3 sequence), 5, 10, 20 MHz (band 0)
∗Manually settable, or automatically settable according to frequency span
Accuracy: ±20% (300 Hz to 10 MHz), ±40% (20 MHz)
Selectivity (60 dB: 3 dB): ≤15 : 1</td></tr>
<tr><td>Video bandwidth (VBW)</td><td>1 Hz to 3 MHz (1-3 sequence), Off
∗Manually settable, or automatically settable according to RBW</td></tr>
<tr><td>Signal purity</td><td>Sideband noise: ≤–108 dBc/Hz (1 GHz, 10 kHz offset)
≤–120 dBc/Hz (1 GHz, 100 kHz offset)
Spurious resulting from local cause: ≤–65 dBc (at local harmonics order 1)</td></tr>
<tr><td>Reference oscillator</td><td>Frequency: 10 MHz
Start-up characteristics: ≤5 × 10^{-8} (after 10 minutes warm-up, with frequency after 24 hours warm-up referenced)
Aging rate: ≤2 × 10^{-8}/day, ≤1 × 10^{-7}/year (with frequency after 24 hours of warm-up referenced)
Temperature characteristics: ±5 × 10^{-8} (0˚ to 50˚C, with frequency at 25˚C referenced)</td></tr>
<tr><td rowspan="2">Amplitude</td><td>Level measurement</td><td>Measurement range: Average noise level to +30 dBm
Maximum input level: +30 dBm (Continuous average power, RF ATT: ≥10 dB)
Peak pulse input: +47 dBm (pulse width: ≤1 µs, duty ratio: ≤1%, RF ATT: ≥30 dB)
DC voltage: 0 V
Average noise level display
RBW: 300 Hz, VBW: 1 Hz, RF ATT 0 dB, in SAMPLE detection mode
≤–124 dBm + f [GHz] dB (1 MHz to 2.5 GHz, band 0)
≤–120 dBm + f [GHz] dB (2.5 GHz to 3.2 GHz, band 0)
≤–115 dBm (3.15 GHz to 7.9 GHz, band 1)
≤–113 dBm (7.8 GHz to 15.3 GHz, band 2)
≤–103 dBm (15.2 GHz to 30 GHz, band 4)
Residual response: RF ATT 0 dB, input terminated at 50 Ω
≤–100 dBm (1 MHz to 3.2 GHz, band 0)
≤–90 dBm (3.15 GHz to 7.8 GHz, band 1)</td></tr>
<tr><td>Reference level</td><td>Setting range
Log scale: –100 to +40 dBm, or equivalent level
Linear scale: 2.24 µV to 22.4 V
Unit
Log scale: dBm, dBµV, dBmV, dBµV (emf), W, V, dBµV/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 70 dB (10 dB step), manually settable, or automatically settable according to reference level
Switching uncertainty: ±0.3 dB (10 to 50 dB), ±0.5 dB (50 to 70 dB)
∗With 50 MHz, RF ATT: 10 dB referenced</td></tr>
</table>

Amplitude	Frequency response	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 GHz to 7.9 GHz, band 1) ±3.0 dB (7.8 GHz to 15.3 GHz, band 2) ±4.0 dB (15.2 GHz to 30 GHz, band 4) ∗ After pre-selector tuning for band 1, 2, and4 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, and4
	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 (–20 to 0 dB, RBW ≤1 kHz), ±1.0 dB (–70 to 0 dB, ≤1 kHz), ±1.2 dB (–90 to 0 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 (10 MHz to 200 MHz) ≤–70 dBc (200 MHz to 1.6 GHz, band 0) ∗Mixer input: –30 dBm ≤–90 dBc or lower than average noise level (1.6 GHz 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 MHz to 100 MHz) ≤–85 dBc (100 MHz to 3.2 GHz, band 0) ≤–80 dBc (3.15 GHz to 7.9 GHz, band 1) ≤–75 dBc or lower than average noise level (7.8 GHz to 22.5 GHz, band 2, 4) ≤–75 dBc or lower than average noise level (22.4 GHz to 30 GHz, band 4, typ.) 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)
	1 dB gain compression	≥0 dBm (≥100 MHz) ≥+3 dBm (≥500 MHz, band 0) ≥–5 dBm (≥3150 MHz, band 1, 2, and 4)
Frequency sweep	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: ±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 µs) Gate length range: 2 µs to 65.5 ms (Resolution: 1 µs) 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 µs to 50 µs (1-2-5 sequence), 100 µs to 4.9 ms (100 µs resolution), 5.0 ms to 1 s (5 ms resolution), 1 to 1000 s (setting of top three digits) Accuracy: ±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 ns or 100 ns, whichever is larger Post-trigger Setting range: 0 to 65.5 ms Resolution: 100 ns (sweep time: ≤4.9 ms), 1 µs (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 → 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)
	Measure	Noise power: dBm/Hz, dBm/CH, dBμV/$\sqrt{\text{Hz}}$ 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 × 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 × 2, Lower limit × 2 MASK (at frequency sweep): Upper limit × 2, Lower limit × 2
	Correction	Frequency response can be corrected arbitrarily up to 150 points
Others	Display	Color TFT-LCD, VGA 6.5-inch
	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, $\overline{\text{DTSB}}$, $\overline{\text{ERROR}}$, 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 bps, 19.2, 38.4, 56, 115 kbps
Input/Output connector		Input connector: K-J Impedance: 50 Ω (nominal), VSWR: ≤2.3 (typ., RF ATT ≥10 dB) Video output: outputs analog RGB, D-Sub 15 pin connector (jack) IF output: BNC connector, 50 Ω (nominal, 66/10.69 MHz) Level: –10 dBm (typ., frequency 50 MHz, display scale upper edge, 50 Ω terminated) Broadband IF output: BNC connector, 50 Ω (nominal, 60.69/66 MHz) Gain: 0 dB (typ., 50 MHz, RF ATT: 0 dB, for RF input level) Video output (Y): BNC connector Level: 0 to 0.5 V ± 0.1 V (typ., log scale), 0 to 0.4 V ± 0.1 V (typ., 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 and mass		320 (W) x 177 (H) x 411 (D) mm (handle, leg, front cover, fan cover excluded), ≤16 kg (nominal value)
Power supply		100 to 120 VAC/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		–20° to +60°C
EMC		EN61326-1, EN61000-3-2
LVD		EN61010-1

Options

Option 01: Precision Frequency Reference

Frequency	10 MHz
Start-up characteristics	≤±5 × 10^{-8} (≤7 minutes, 25˚C, typ.)
Aging rate	≤±5 × 10^{-10}/day (With the frequency at 24 hours after the power is turned on referenced)
Temperature characteristics	≤±5 × 10^{-10} (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: ±10% (RBW = 30, 300 Hz) ±10% (typ., RBW = 1, 3, 10, 100 Hz, 1 kHz) RBW selectivity (60 dB: 3 dB): ≤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 + f [GHz] dB (typ., 1 MHz to 2.5 GHz, band 0) ≤–142.5 dBm + f [GHz] dB (typ., 2.5 GHz to 3.2 GHz, band 0) ≤–137.5 dBm (typ., 3.15 GHz to 7.9 GHz, band 1) ≤–135.5 dBm (typ., 7.8 GHz to 15.3 GHz, band 2) ≤–125.5 dBm (typ., 15.2 GHz to 30 GHz, band 4)

Option 04: Digital Resolution Bandwidth

Resolution bandwidth	Setting range: 10 Hz to 1 MHz (1-3 sequence) Bandwidth accuracy: ±10% (RBW: ≥100 Hz) ±10% (typ., RBW: ≤30 Hz) Bandwidth selectivity (60 dB: 3 dB): ≤5:1 (RBW: ≥100 Hz) ≤5:1 (typ., 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 (typ., 1 MHz to 2.5 GHz, band 0) ≤–132.5 dBm + f [GHz] dB (typ., 2.5 GHz to 3.2 GHz, band 0) ≤–127.5 dBm (typ., 3.15 GHz to 7.9 GHz, band 1) ≤–119.5 dBm (typ., 7.8 GHz to 15.2 GHz, band 2) ≤–115.5 dBm (typ., 15.1 GHz to 30 GHz, band 4)

Option 05: Rubidium Reference Oscillator*

Frequency	10 MHz
Start-up characteristics	±1 × 10^{-9}/7 min. (with frequency one hour after the power is turned on referenced)
Aging rate	±1 × 10^{-10}/month (with frequency one hour after the power is turned on referenced)
Temperature characteristics	±1 × 10^{-9} (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 MΩ (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, 41: Power Meter Function

Frequency range	100 kHz to 32 GHz, Depends on the power sensor used.
Applicable power sensor	MA4601A (100 kHz to 5.5 GHz), MA4701A (10 MHz to 18 GHz), MA4703A (50 MHz to 26.5 GHz), MA4705A (50 MHz to 32 GHz)
Power measurement range	–20 to +20 dBm
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 (typ., 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	An average count can be set from 2 to 10.

Option 23, 43, 44: Range Expansion Power Meter Function

Frequency range	100 kHz to 32 GHz (Depends on the power sensor used)
Applicable power sensor	MA4601A (100 kHz to 5.5 GHz), MA4701A (10 MHz to 18 GHz), MA4703A (50 MHz to 26.5 GHz), MA4705A (50 MHz to 32 GHz)
Power measurement range	–30 to +20 dBm
Display	Selectable from W, dBm, and dB (RELATIVE), Digital 4 digit display, 20% over range
Power range	5 range/10 dB step (Measurement level range is listed on the power sensor specifications.) full scale value: –20, –10, 0, +10, +20 (10 µW to 100 mW)
Range switching	Auto, manual (settable to arbitrary range irrespective of range hold or input level)
Accuracy	±0.6% (W mode), ±0.026 dB (dBm mode, dB (RELATIVE) mode) When including the zero drift in range1 (10 µW range) is as follows. ±1.2% (W mode), ±0.052 dB (dBm mode, dB (RELATIVE) mode) Pressing ZERO ADJ key allows automatic adjustment to zero point.
Zero setting	±0.6% of full scale (typ., 10 µW range of maximum sensitivity)
Zero move between ranges	±0.2% of full scale (after zero setting at 10 µW range of maximum sensitivity)
Calibration oscillator frequency	50 MHz
Calibration oscillator level	1 mW ±1.2% (for one year)
Averaging	An average count can be set from 2 to 10.

Option 34: 4 GHz LO Output

Frequency	Frequency: 4 GHz Frequency accuracy: ± (4 GHz × reference frequency accuracy) ±1 Hz
Output level	–10 dBm (typ.)
Spurious	≤–40 dBc (typ.)

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.

Option 47: Rack Mount (IEC)

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

Option 48: Rack Mount (JIS)

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

Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
	Main frame
MS2687B	Spectrum Analyzer
	Standard accessories
	Power Cord, 2.6 m: 1 pc
J0996B	RS-232C Cable: 1 pc
Z0808	Memory Card: 1 pc
F0014	Fuse, 6.3 A: 1 pc
MX268001A	File Transfer Utility: 1 pc
W1754AE	2687B Operation Manual: 1 copy
	Options
MS2687B-01	Precision Frequency Reference (aging rate: ±5 × 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-23	Range Expansion Power Meter Function
MS2687B-34	4 GHz LO Output
MS2687B-41	Power Meter Function Retrofit
MS2687B-43	Range Expansion Power Meter Function Retrofit
MS2687B-44	Range Expansion Power Meter Function Upgrade
MS2687B-46	Auto Power Recovery
MS2687B-47	Rack Mount (IEC) without Handles
MS2687B-48	Rack Mount (JIS) without Handles
	Measurement software
MX268701B	W-CDMA Measurement Software
MX268702A	GSM Measurement Software
MX268703A	cdma Measurement Software
MX268704A	1xEV-DO Measurement Software
MX268705A	π/4DQPSK Measurement Software
MX268730A	WIRELESS LAN Measurement Software
MX268751A	W-CDMA Release5 Uplink Measurement Software
MX268760A	TD-SCDMA Measurement Software
	Warranty
MS2687B-90	Extended Three Year Warranty Service
MS2687B-91	Extended Five Year Warranty Service

Model/Order No.	Name
	Application parts
W1746AE	W-CDMA Measurement Software Operation Manual
W1854AE	GSM Measurement Software Operation Manual
W1865AE	cdma Measurement Software Operation Manual
W2090AE	1xEV-DO Measurement Software Operation Manual
W1866AE	π/4DQPSK Measurement Software Operation Manual
W2080AE	WIRELESS LAN Measurement Software Operation Manual
W2617AE	W-CDMA Release5 Uplink Measurement Software Operation Manual
W2593AE	TD-SCDMA Measurement Software Operation Manual
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, N-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
DGM010-02000EE	Coaxial Cord (general use, N-P · N-P, DC to 18 GHz), 2 m
DGM024-02000EE	Coaxial Cord (low-loss type, N-P · N-P, DC to 18 GHz), 2 m
J0911	Coaxial Cord (K-P · K-P, DC to 40 GHz), 1 m
J0912	Coaxial Cord (K-P · K-P, DC to 40 GHz), 0.5 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 → 75 Ω Impedance Transformer (75 Ω, 9 kHz to 3 GHz, ±100 V, NC-type)
MP614B	50 → 70 Ω Impedance Converter (50 MHz 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, ±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)
MA2740A	External Mixer (18 GHz to 26.5 GHz)
MA2741A	External Mixer (26.5 GHz to 40 GHz)
MA2742A	External Mixer (33 GHz to 50 GHz)
MA2743A	External Mixer (40 GHz to 60 GHz)
MA2744A	External Mixer (50 GHz to 75 GHz)
MA2745A	External Mixer (60 GHz to 90 GHz)
MA2746A	External Mixer (75 GHz to 110 GHz)
J0364	APC-3.5 to N Conversion Connector (for MA4703A and MA4605A)

MS2687B Spectrum Analyzer specifications when external mixer is used.

External Mixer	Frequency	Frequency range: 18 GHz to 110 GHz Frequency band:
	Span setting range	0 Hz, (100 × 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 GHz to 7 GHz
	IF frequency	460.69 MHz or 466 MHz
	Display gain	0 ±2 dB (External mixer input level –10 dBm, Mixer transform loss 15 dB)

Band	Frequency range	Local harmonics order [N]
K	18 GHz to 26.5 GHz	4
Ka	26.5 GHz to 40 GHz	6
Q	33 GHz to 50 GHz	8
U	40 GHz to 60 GHz	9 or 10
V	50 GHz to 75 GHz	11 or 12
E	60 GHz to 90 GHz	13 or 14
W	75 GHz to 110 GHz	16

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Specifications are subject to change without notice.

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