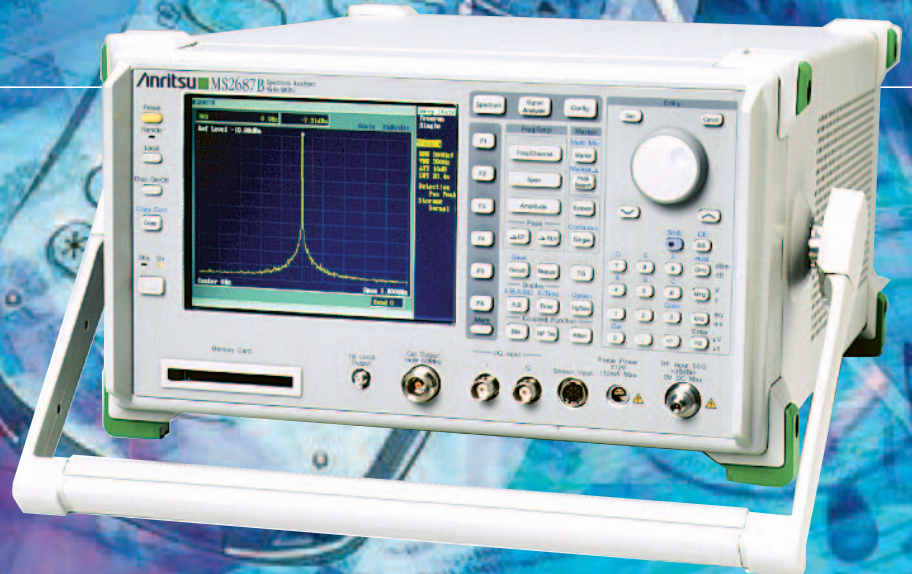
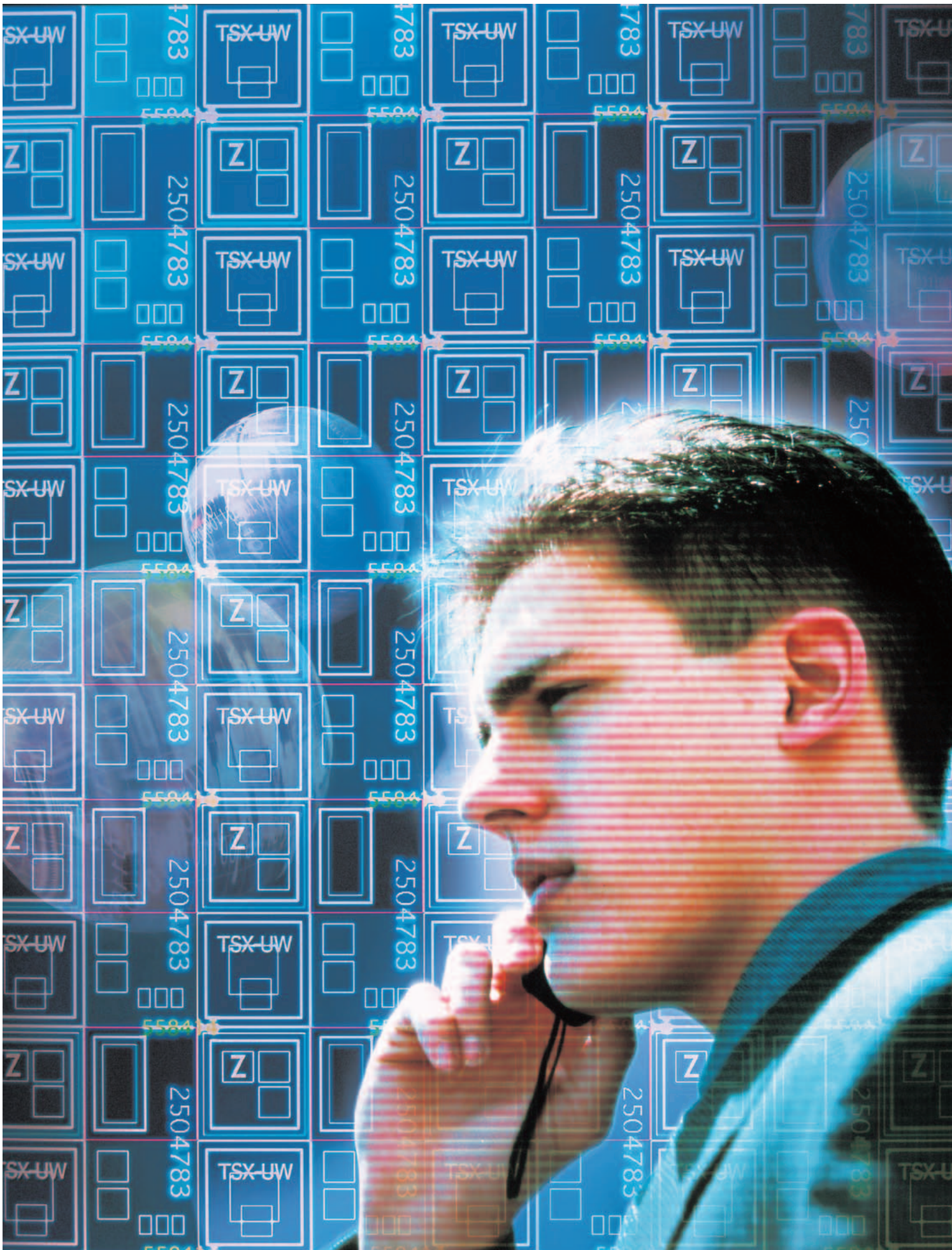


# MS2687B

Spectrum Analyzer

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





# 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



## 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:  
 $5 \times 10^{-8}$  or lower (standard)
- Span accuracy:  $\pm 1\%$
- 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:  $\leq -146$  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)  $\times$  177 (H)  $\times$  411 (D) mm,  $\leq 16$  kg (nominal value)

### ■ 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:  
 $\pm 2 \times 10^{-8}$ /day (standard)  
 $\pm 5 \times 10^{-10}$ /day (option 01)
- Sweep time: 10 ms to 1000 s (frequency span)  
1  $\mu$ 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.
- GPIB transfer rate: 120 kB/s

## ■ Options

- Option 01: Precision frequency reference (aging rate:  $5 \times 10^{-10}$ /day)
- Option 02: Narrow resolution bandwidth (FFT)
- Option 04: Digital resolution bandwidth (RMS detection)
- 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

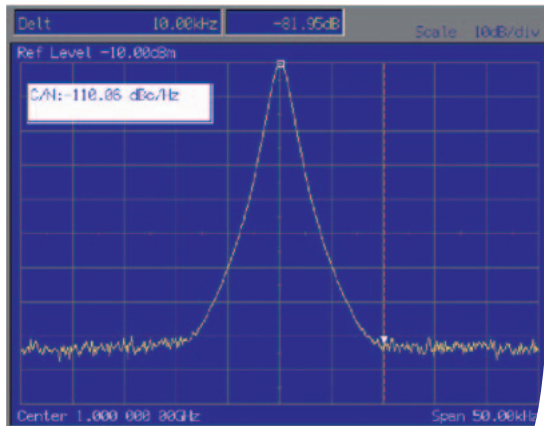
## ■ Warranty

- 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

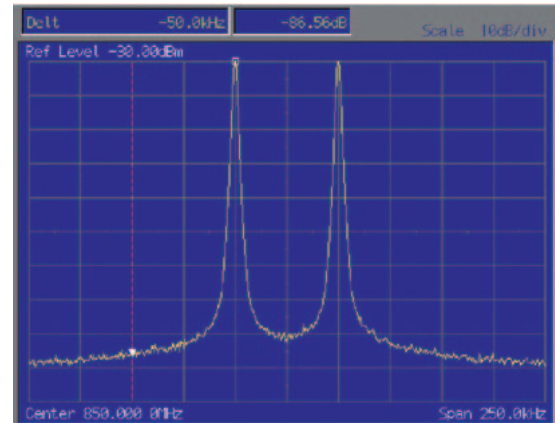
The MS2687B has excellent noise sideband characteristics of  $-108$  dBc/Hz or lower (1 GHz, 10 kHz offset), which is ideal for analyzing weak signals adjacent to strong signals or a narrow bandwidth carrier.



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

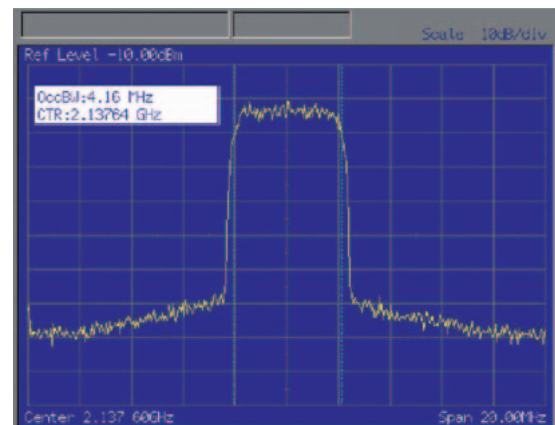
With the development of digital radio technology, analyzed signals are becoming weaker and broader than ever. With the MS2687B, a dynamic range display of up to 156 dB (typical value) has been achieved, thus allowing accurate analysis of even weak signals.

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.

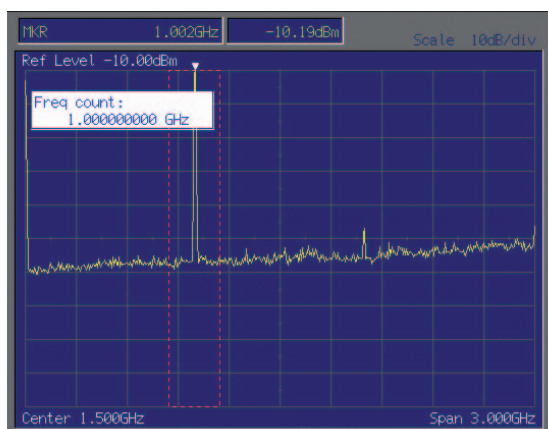


Example of occupied bandwidth

# Convenient and Easy-to-Use Functions

## 1 Hz Resolution Built-in Frequency Counter

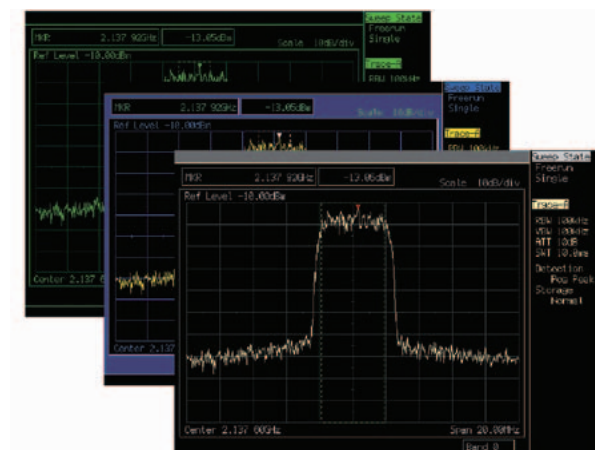
The built-in frequency counter is convenient for measuring the frequency of a signals arbitrarily selected from multiple signals. High resolution of 1 Hz even at full span is assured.



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.

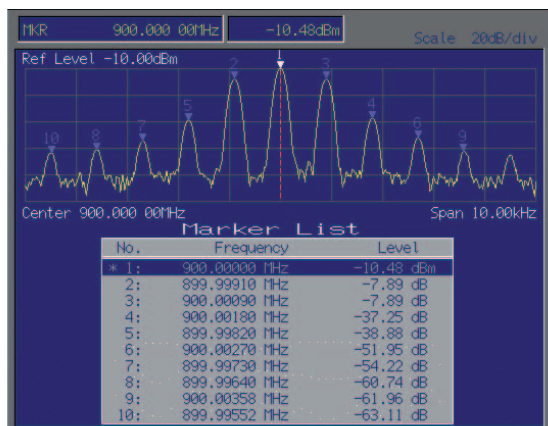


Example of coloring change

## 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.

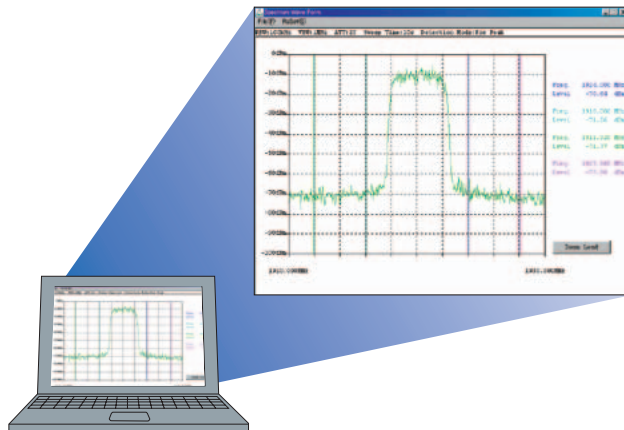
It also has substantial marker functions that allow up to 10-point multimarkers to be displayed for comparison of waveforms and measurement of harmonics.



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

## For installation and maintenance of various radio stations

### Ideal for Installation and Maintenance of Radio Stations

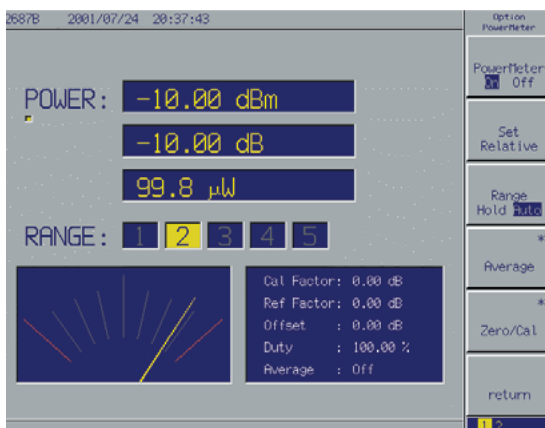
The MS2687B is a portable spectrum analyzer ideal for installing and maintaining various radio stations. A frequency range of 9 kHz to 30 GHz has been achieved, and by using an external mixer, this can be extended up to 110 GHz. This range covers the frequencies of various mobile communication systems and applications such as microwave entrance lines.

### 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.

### 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.

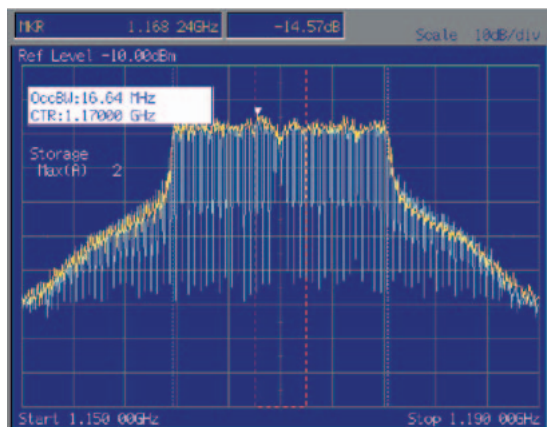


Example of power measurement

## For development and production lines of various high-frequency parts

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

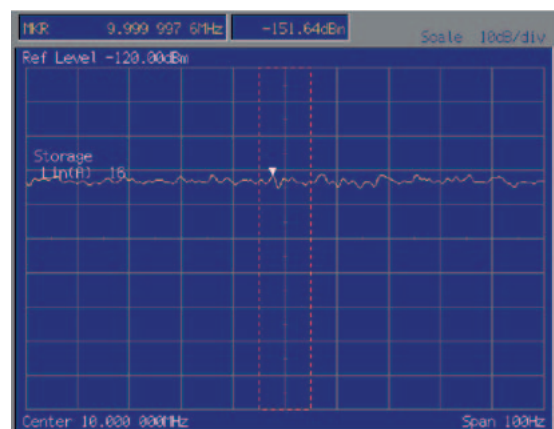
The MS2687B comes with a high-performance DSP as standard. Various modulation analysis functions can be added simply by installing measurement software. In signal analysis mode, analysis by I/Q input (option 18 is required) can be performed. The resolution bandwidth is up to 20 MHz, which allows the analysis of Wireless LAN signal.



Example of wide bandwidth signal measurement

### High-speed 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.



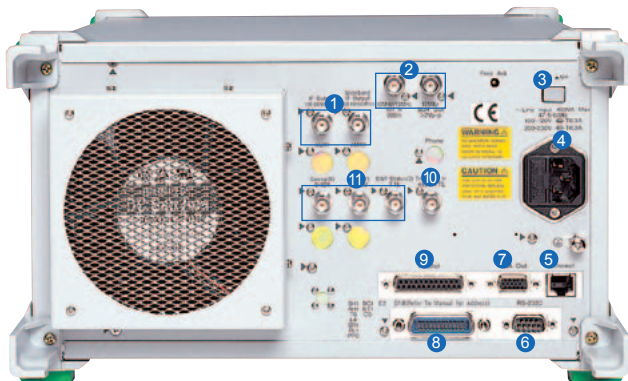
Example of narrow resolution bandwidth measurement

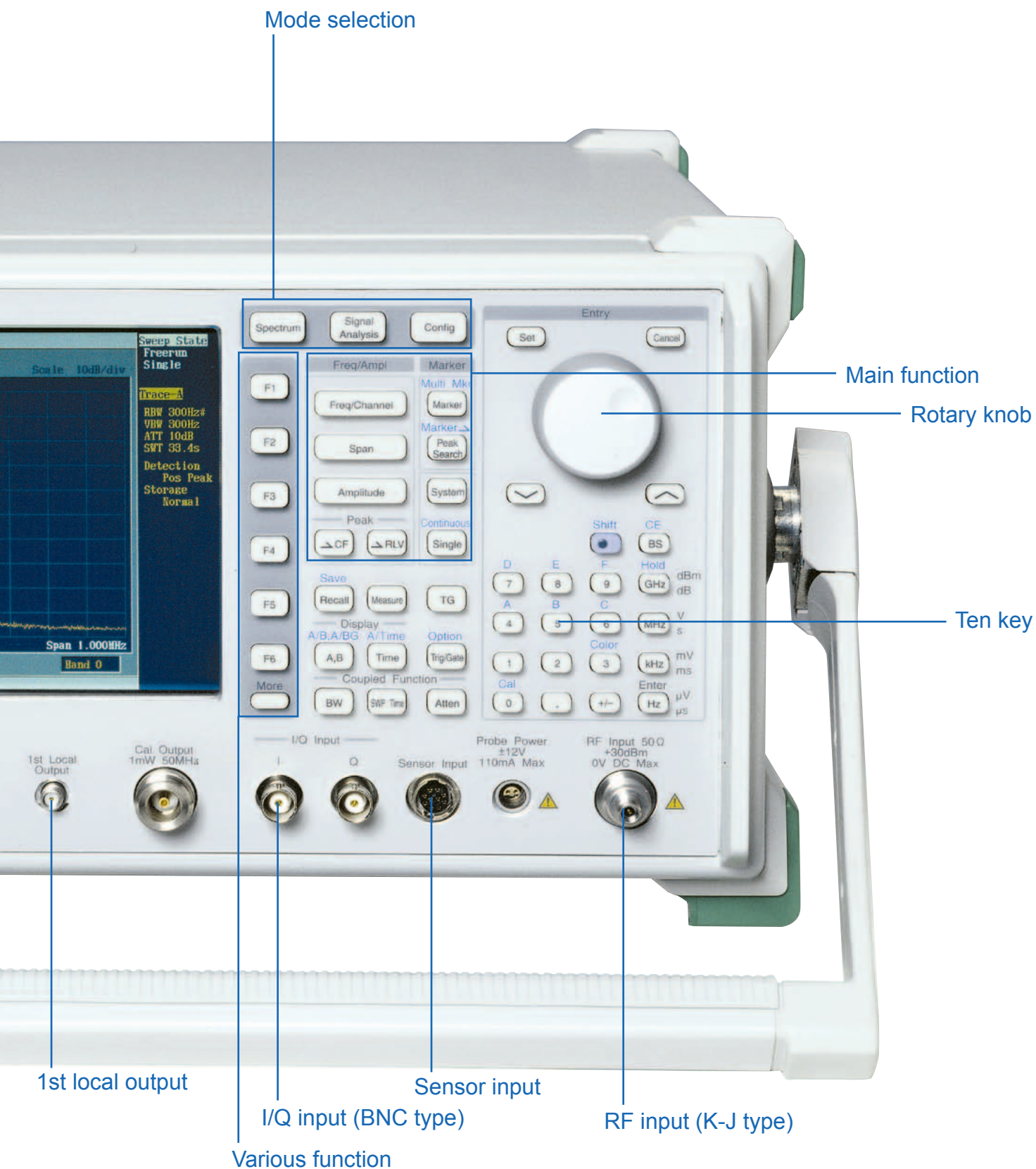
### High-speed Measurement for Construction of Automatic Manufacturing Lines

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.

# 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)





# 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  $5 \times 10^{-10}$ /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 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.

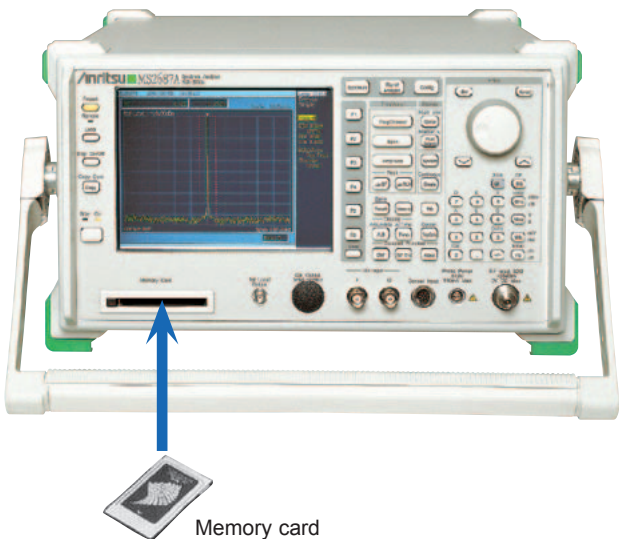
# Application Software

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 | $\pi$ /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.

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

|                 |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Amplitude       | Frequency response    | Relative flatness: at RF ATT: 10 dB with the center point of frequency response in the band referenced<br>±1.0 dB (9 kHz to 3.2 GHz, band 0)<br>±1.5 dB (3.15 GHz to 7.9 GHz, band 1)<br>±3.0 dB (7.8 GHz to 15.3 GHz, band 2)<br>±4.0 dB (15.2 GHz to 30 GHz, band 4)<br>*After pre-selector tuning for band 1, 2, and 4<br>Absolute flatness: at RF ATT: 10 dB with 50 MHz referenced<br>±5.0 dB (9 kHz to 30 GHz)<br>*After pre-selector tuning for band 1, 2, and 4                                                                                                                                                                                                                                                                                                                                                                |
|                 | Waveform display      | Scale: 10 div (single scale)<br>Log scale: 10, 5, 2, 1 dB/div<br>Linear scale: 10, 5, 2, 1%/div<br>Linearity (after calibration)<br>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)<br>Linear scale: 4% of reference level<br>Marker level resolution<br>Log scale: 0.01 dB<br>Linear scale: 0.02%                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                 | Spurious response     | 2nd harmonic distortion:<br>≤–60 dBc (10 MHz to 200 MHz)<br>≤–70 dBc (200 MHz to 1.6 GHz, band 0)<br>*Mixer input: –30 dBm<br>≤–90 dBc or lower than average noise level (1.6 GHz to 15 GHz, band 1, 2, and 4)<br>*Mixer input: –10 dBm<br>Two-signal third-order intermodulation distortion (Frequency difference of two signals: ≥50 kHz, Mixer input: –30 dBm):<br>≤–70 dBc (10 MHz to 100 MHz)<br>≤–85 dBc (100 MHz to 3.2 GHz, band 0)<br>≤–80 dBc (3.15 GHz to 7.9 GHz, band 1)<br>≤–75 dBc or lower than average noise level (7.8 GHz to 22.5 GHz, band 2, 4)<br>≤–75 dBc or lower than average noise level (22.4 GHz to 30 GHz, band 4, typ.)<br>Image response:<br>≤–65 dBc (≤18 GHz)<br>≤–60 dBc (≤22 GHz)<br>≤–55 dBc (≤30 GHz)<br>Multiple response/spurious outside the band:<br>≤–60 dBc (≤22 GHz)<br>≤–55 dBc (≤30 GHz) |
|                 | 1 dB gain compression | ≥0 dBm (≥100 MHz)<br>≥+3 dBm (≥500 MHz, band 0)<br>≥–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<br>Set resolution: 5 ms (5 ms to 1 s), Top three digits (≥1 s)<br>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<br>Setting range<br>Gate delay range: 0 to 65.5 ms (Resolution: 1 μs)<br>Gate length range: 2 μs to 65.5 ms (Resolution: 1 μs)<br>Gate end: Internal/External                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                 | Zone sweep            | Sweeps the indicated range in the zone only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Time sweep      | Tracking sweep        | Sweeps following the peak point inside the zone marker<br>(zone sweep also available)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                 | 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),<br>5.0 ms to 1 s (5 ms resolution), 1 to 1000 s (setting of top three digits)<br>Accuracy: ±1%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                 | Trigger switch        | Free run, Triggered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                 | Trigger source        | Wide IF video, Video, External (TTL), External (±10 V), Line                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Time sweep      | Trigger delay         | Pre-trigger (displays waveform before trigger occurrence point)<br>Setting range: – time span to 0 s<br>Trigger delay: Resolution: time span/500 ns or 100 ns, whichever is larger<br>Post-trigger<br>Setting range: 0 to 65.5 ms<br>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<br>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<br>Zone marker: NORMAL, DELTA<br>Marker functions: MARKER → CF, MARKER → REF, MARKER → CF STEP SIZE, ΔMARKER → SPAN, ZONE → SPAN<br>Peak search: PEAK, NEXT PEAK, MIN DIP, NEXT DIP<br>Multi marker: 10 max. (highest 10, harmonics, manually)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                  | Measure                | Noise power: dBm/Hz, dBm/CH, dBμV/√Hz<br>C/N: dBc/Hz, dBc/CH<br>Occupied bandwidth: Power N% method, X-dB down method<br>Adjacent channel leakage power<br>REF: Total power/Reference level/In-band level method<br>Display: Channel designate display: 3 channels × 2, Graphic display<br>Average power within burst signal: Average power in the designated range of time domain waveform<br>Template comparison (at time sweep): Upper limit × 2, Lower limit × 2<br>MASK (at frequency sweep): Upper limit × 2, Lower limit × 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                  | Correction             | Frequency response can be corrected arbitrarily up to 150 points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                  | 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)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Others                           | 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)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                  | GPIOB                  | Meets IEEE488.2. Controllable with external controller (except for power switch)<br>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)<br>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),<br>Connector: Type I or Type II of PC card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                  | RS-232C                | Controllable with external controller (except for power switch)<br>Baud rate: 1200, 2400, 4800, 9600 bps, 19.2, 38.4, 56, 115 kbps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                  | Input/Output connector | Input connector: K-J<br>Impedance: 50Ω (nominal), VSWR: ≤2.3 (typ., RF ATT ≥10 dB)<br>Video output: outputs analog RGB, D-Sub 15 pin connector (jack)<br>IF output: BNC connector, 50Ω (nominal, 66 MHz/10.69 MHz)<br>Level: –10 dBm (typ., frequency 50 MHz, display scale upper edge, 50Ω terminated)<br>Broadband IF output: BNC connector, 50Ω (nominal, 60.69 MHz/66 MHz)<br>Gain: 0 dB (typ., 50 MHz, RF ATT: 0 dB, for RF input level)<br>Video output (Y): BNC connector<br>Level: 0 to 0.5 V ± 0.1 V (typ., log scale), 0 to 0.4 V ± 0.1 V (typ., linear scale),<br>(50 MHz, from upper edge to lower edge at 10 dB/div or 10%/div, 75Ω terminated)<br>Buffered Output: BNC connector<br>Level: 2 to 5 V (p-p) (200Ω terminated)<br>Sweep Output (X): BNC connector,<br>Level: 0 to 10 V ± 0.1 V (100kΩ termination, from the left edge to the right edge of the display scale, single band sweep)<br>Sweep Status Output (Z): BNC connector<br>Level: TTL (low level at sweep)<br>Probe source: 4 pole connector, +12 V, –12 V, ±10% each, 110 mA max. each.<br>Trig/Gate input: BNC connector, level: ±10 V (0.1 V resolution), or TTL level<br>External reference input: BNC connector,<br>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 V(ac) to 120 V(ac)/200 V(ac) to 240 V(ac) (–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    | $\leq \pm 5 \times 10^{-8}$ ( $\leq 7$ minutes, 25°C, typ.)                                                |
| 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        | Setting range: 1 Hz to 1 kHz (1-3 sequence)<br>Bandwidth accuracy: $\pm 10\%$ (RBW = 30 Hz, 300 Hz)<br>$\pm 10\%$ (typ., RBW = 1, 3, 10, 100 Hz, 1 kHz)<br>RBW selectivity (60 dB: 3 dB): $\leq 5:1$<br>RBW switching uncertainty: $\pm 0.5$ dB                                                                                                    |
| Span setting                | Minimum setting span: 100 Hz                                                                                                                                                                                                                                                                                                                       |
| Average noise level display | When RBW is 1 Hz, RF ATT is 0 dB<br>$\leq -146.5$ dBm + f [GHz] dB (typ., 1 MHz to 2.5 GHz, band 0)<br>$\leq -142.5$ dBm + f [GHz] dB (typ., 2.5 GHz to 3.2 GHz, band 0)<br>$\leq -137.5$ dBm (typ., 3.15 GHz to 7.9 GHz, band 1)<br>$\leq -135.5$ dBm (typ., 7.8 GHz to 15.3 GHz, band 2)<br>$\leq -125.5$ 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)<br>Bandwidth accuracy: $\pm 10\%$ (RBW: $\geq 100$ Hz)<br>$\pm 10\%$ (typ., RBW: $\leq 30$ Hz)<br>Bandwidth selectivity (60 dB: 3 dB): $\leq 5:1$ (RBW: $\geq 100$ Hz)<br>$\leq 5:1$ (typ., RBW: $\leq 30$ Hz)<br>RBW switching uncertainty: $\pm 0.5$ dB                                              |
| Detection mode       | NORMAL, POSITIVE PEAK, NEGATIVE PEAK, SAMPLE, RMS<br>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<br>$\leq -136.5$ dBm + f [GHz] dB (typ., 1 MHz to 2.5 GHz, band 0)<br>$\leq -132.5$ dBm + f [GHz] dB (typ., 2.5 GHz to 3.2 GHz, band 0)<br>$\leq -127.5$ dBm (typ., 3.15 GHz to 7.9 GHz, band 1)<br>$\leq -119.5$ dBm (typ., 7.8 GHz to 15.2 GHz, band 2)<br>$\leq -115.5$ dBm (typ., 15.1 GHz to 30 GHz, band 4) |

## ■ 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 1M $\Omega$ (parallel capacity <100 pF) and 50 $\Omega$                                          |
| Input level range | Differential voltage range: 0.1 to 1 Vp-p (at input terminal)<br>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<br>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)<br>*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.)<br>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)<br>When including the zero drift in range1 (10 μW range) is as follows.<br>±1.2% (W mode), ±0.052 dB (dBm mode, dB (RELATIVE) mode)<br>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<br>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.<br>ON/OFF operation can be performed using the standby switch on the rear panel.<br>*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.<br>When mounted, the tilt handle (standard) is eliminated. |
|----------|--------------------------------------------------------------------------------------------------------------------|

### ■ Option 48: Rack Mount (JIS)

|          |                                                                                                                    |
|----------|--------------------------------------------------------------------------------------------------------------------|
| Function | Mounts the rack mount for JIS standard-compatible rack.<br>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                                                                     |
|-----------------|--------------------------------------------------------------------------|
| MS2687B         | <b>Main frame</b><br>Spectrum Analyzer                                   |
|                 | <b>Standard accessories</b>                                              |
|                 | 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                                           |
|                 | <b>Options</b>                                                           |
| MS2687B-01      | Precision Frequency Reference (aging rate: $\pm 5 \times 10^{-10}$ /day) |
| MS2687B-02      | Narrow Resolution Bandwidths (FFT)                                       |
| MS2687B-04      | Digital Resolution Bandwidth                                             |
| 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                                         |
|                 | <b>Measurement software</b>                                              |
| MX268701B       | W-CDMA Measurement Software                                              |
| MX268702A       | GSM Measurement Software                                                 |
| MX268703A       | cdma Measurement Software                                                |
| MX268704A       | 1xEV-DO Measurement Software                                             |
| MX268705A       | $\pi/4$ DQPSK Measurement Software                                       |
| MX268730A       | WIRELESS LAN Measurement Software                                        |
| MX268751A       | W-CDMA Release5 Uplink Measurement Software                              |
| MX268760A       | TD-SCDMA Measurement Software                                            |
|                 | <b>Warranty</b>                                                          |
| MS2687B-90      | Extended Three Year Warranty Service                                     |
| MS2687B-91      | Extended Five Year Warranty Service                                      |

| Model/Order No. | Name                                                                                  |
|-----------------|---------------------------------------------------------------------------------------|
|                 | <b>Application parts</b>                                                              |
| 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         | $\pi/4$ DQPSK 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           | GPIO Cable, 1 m                                                                       |
| J0008           | GPIO Cable, 2 m                                                                       |
| J1047           | Ethernet Cross Cable                                                                  |
| MA1612A         | Four-port Junction Pad (5 MHz to 3000 MHz)                                            |
| MA1621A         | 50Ω → 75Ω Impedance Transformer<br>(75 Ω, 9 kHz to 3 GHz, $\pm 100$ V, NC-type)       |
| MP614B          | 50Ω → 70 Ω Impedance Converter<br>(50 MHz to 1200 MHz, 1.5 dB or lower)               |
| J0395           | Fixed Attenuator for High-power<br>(30 dB, 30 W, DC to 9 GHz)                         |
| B0472           | Fixed Attenuator for High-power<br>(30 dB, 100 W, DC to 18 GHz)                       |
| J0078           | High Power Attenuator<br>(N type, 20 dB, 10 W, DC to 18 GHz)                          |
| 34AKNF50        | Ruggedized K-to-Type N Adapter                                                        |
| MA2507A         | DC Block Adaptor (50Ω, 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<br>(supplied with B0488 as standard) |
| B0481B          | Carrybone                                                                             |
| B0479           | Soft Carrying Case (rucksack type)                                                    |
| MA4601A         | Power Sensor<br>(100 kHz to 5.5 GHz, -30 to +20 dBm, N connector)                     |
| MA4701A         | Power Sensor<br>(10 MHz to 18 GHz, -30 to +20 dBm, N connector)                       |
| MA4703A         | Power Sensor<br>(50 MHz to 26.5 GHz, -30 to +20 dBm, APC3.5(P) connector)             |
| MA4705A         | Power Sensor<br>(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)                                                    |
| 1091-27         | Coaxial Adapter (DC to 18 GHz, 50Ω, N · P - SMA · J)                                  |

## ■ MS2687B Spectrum Analyzer specifications when external mixer is used.

| External Mixer | Frequency                          | Frequency range: 18 GHz to 110 GHz<br>Frequency band:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                 |                           |   |                    |   |    |                    |   |   |                  |   |   |                  |         |   |                  |          |   |                  |          |   |                   |
|----------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|---------------------------|---|--------------------|---|----|--------------------|---|---|------------------|---|---|------------------|---------|---|------------------|----------|---|------------------|----------|---|-------------------|
|                |                                    | <table> <tr> <th>Band</th><th>Frequency range</th><th>Local harmonics order [N]</th></tr> <tr> <td>K</td><td>18 GHz to 26.5 GHz</td><td>4</td></tr> <tr> <td>Ka</td><td>26.5 GHz to 40 GHz</td><td>6</td></tr> <tr> <td>Q</td><td>33 GHz to 50 GHz</td><td>8</td></tr> <tr> <td>U</td><td>40 GHz to 60 GHz</td><td>9 or 10</td></tr> <tr> <td>V</td><td>50 GHz to 75 GHz</td><td>11 or 12</td></tr> <tr> <td>E</td><td>60 GHz to 90 GHz</td><td>13 or 14</td></tr> <tr> <td>W</td><td>75 GHz to 110 GHz</td><td>16</td></tr> </table> | 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 |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                 |                           |   |                    |   |    |                    |   |   |                  |   |   |                  |         |   |                  |          |   |                  |          |   |                   |
|                | 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)                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |                 |                           |   |                    |   |    |                    |   |   |                  |   |   |                  |         |   |                  |          |   |                  |          |   |                   |



Specifications are subject to change without notice.

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