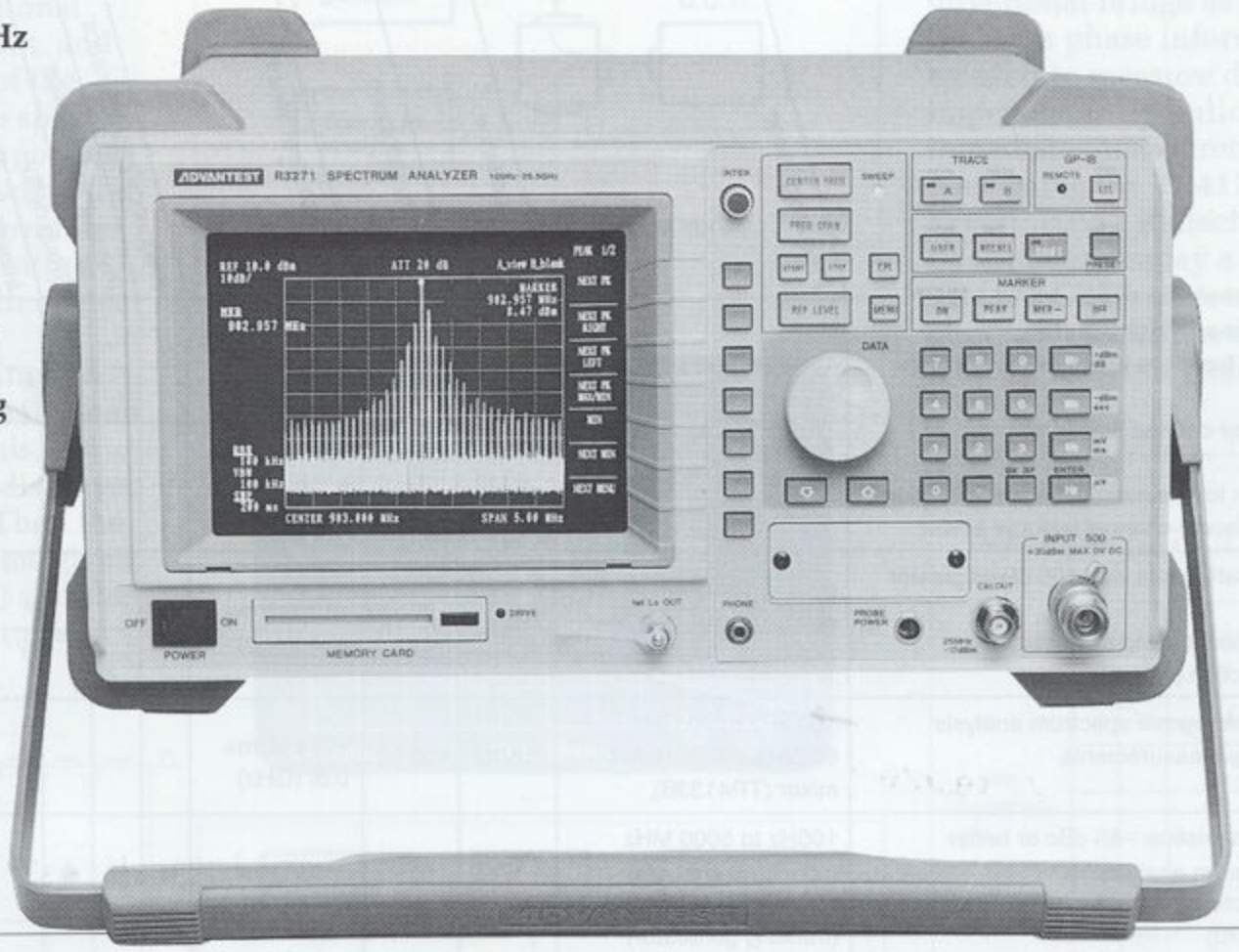
Spectrum Analyzers

100 Hz to 26.5 GHz (60 GHz)

R3271

- Excellent Spectrum Purity: –110 dBc/Hz (10 kHz away from Carrier)
- Resolution Bandwidth of 10 Hz to 3 MHz
- Can Sweep the Complete Bandwidth Continuously and Repeatedly
- A Frequency Counter with 1 Hz Resolution
- A Voice can be Demodulated Using an Internal Speaker
- A Portable System Employing a Large CRT Display
- Conforms to MIL-T-28800 Standards and Built to Last



R3271
Spectrum Analyzer

The R3271 spectrum analyzer is designed to analyze pulse RF signals used for radar or to analyze the spectrums of microwaves and quasi-millimetric waves used for satellite broadcasting, satellite communications, or mobile communication. The R3271 can measure the ultra-broad bandwidth of 100 Hz to 26.5 GHz in one sweep operation. It can also perform the sweep continuously and repeatedly. A newly developed high-purity synthesizer enables a high signal purity of –110 dBc/Hz (10 kHz offset frequency) in a frequency band lower than 2.5 GHz. The R3271 spectrum analyzer is thus ideally suited for mobile radiocommunication, for which narrower bandwidths and digitalization are being advanced. In the past, such high-performance equipment was used only for advanced research and development; however, this level of performance is now needed on a commercial level. This portable, high-performance microwave spectrum analyzer was thus produced using Advantest's latest RF technology.

■ High-Precision Measurements by Software Calibration

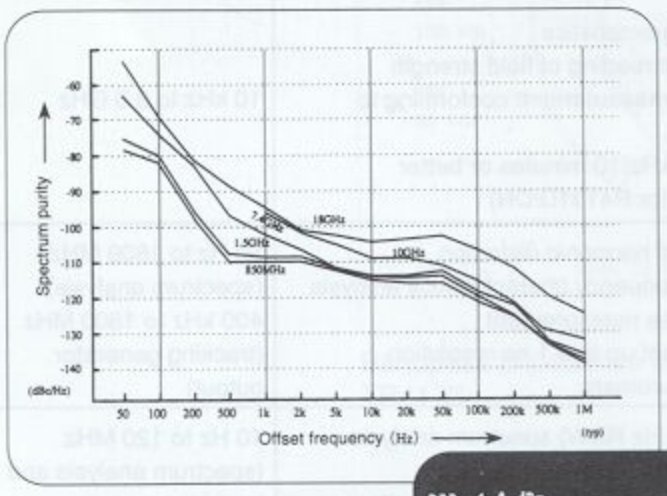
An internal CPU corrects not only the intermediate frequency (IF), but also the frequency characteristic, including an attenuator, to improve the accuracy of amplitude measurement. During noise measurement, the power bandwidth is also corrected.

■ A Portable System Employing a Larger CRT Display

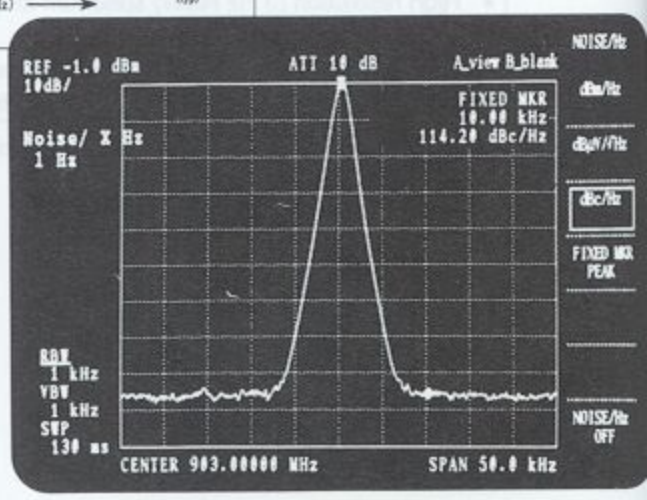
The R3271 portable spectrum analyzer employs an eight-inch CRT display that monitors measurement results, thus ensuring accurate monitoring performance and easy operations.

■ Highest Spectrum Purity

In a frequency band lower than 2.6 GHz, a high signal purity of –110 dBc/Hz (10 kHz offset frequency) can be attained by means of a newly developed high-purity synthesizer. This enables measurement of nearby spurious emissions over a wide dynamic range. At offset frequencies of 23 GHz and 10 kHz, a signal purity of –110 dBc/Hz can also be obtained.



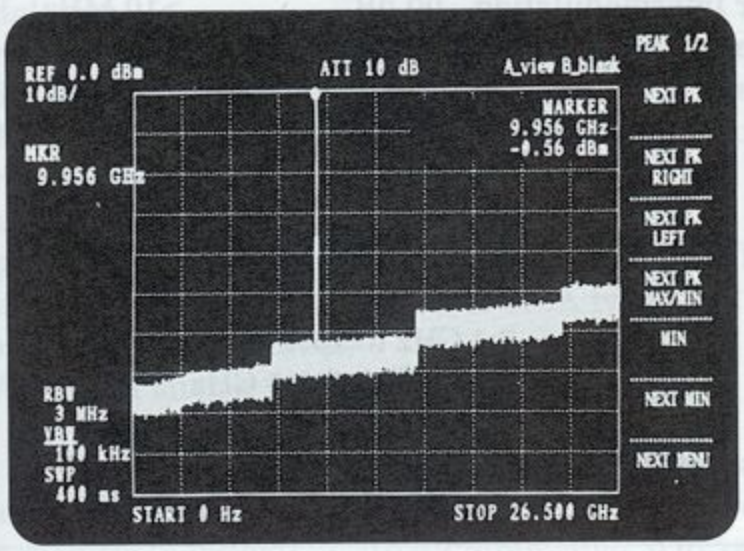
◀ Excellent signal purity



Signal purity at offset frequency of 10 kHz ▶

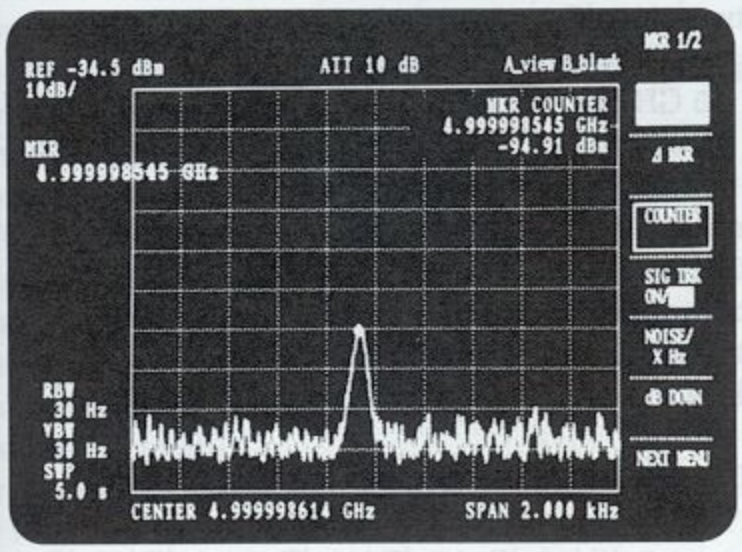
Measurement Over Wide Frequency and Dynamic Ranges

The R3271 can repeatedly and continuously sweep a wide frequency range of 100 Hz to 26.5 GHz. The use of a low-noise IF amplifier reduces the noise level. A preselector also widens the dynamic range of the amplitude measurement.



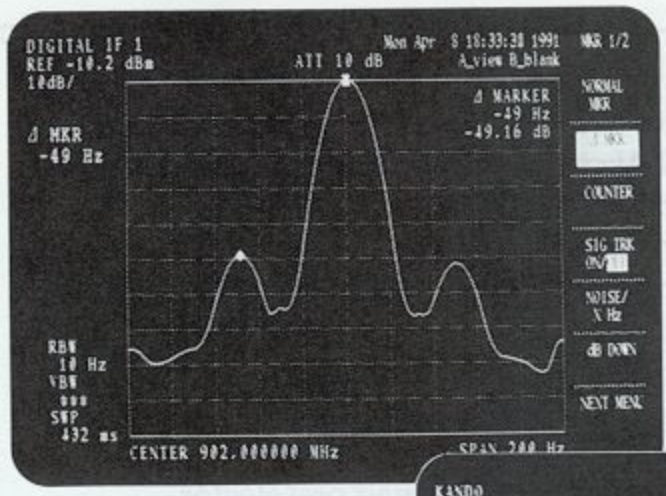
Frequency Counter with 1 Hz Resolution

A frequency counter with 1 Hz resolution can produce stable and precise frequency measurements by using a reference oscillator with stability of 2×10^{-8} (or an optional 5×10^{-9}/day). This frequency counter can also precisely measure the frequency of faint signals as well as the frequency of signals hidden by stronger signals.



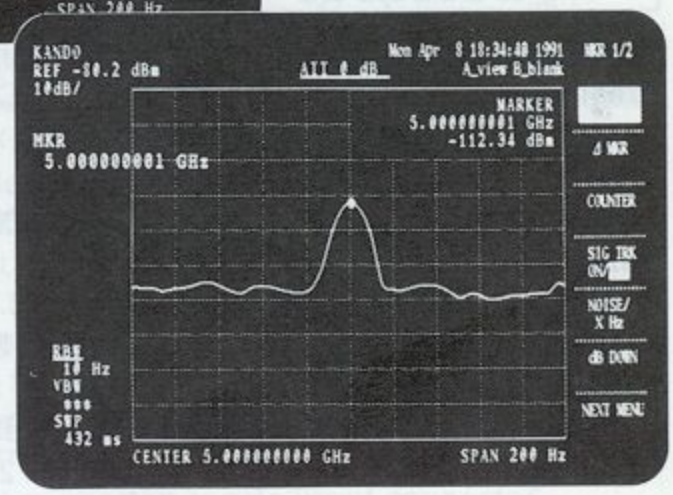
Resolution Bandwidth of 10 Hz to 3 MHz

For frequency resolution, the R3271 incorporates a narrow-band (10 Hz) IF bandwidth filter that can separate nearby signals from the wide IF bandwidth filter (3 MHz) to improve the measurement sensitivity to a pulsed RF signal. The R3271 can thus be used for a wide variety of measurements. The narrow-band IF bandwidth filter also incorporates a digital IF filter, thus enabling both nearby characteristics measurements with high selectivity and high-speed measurements.



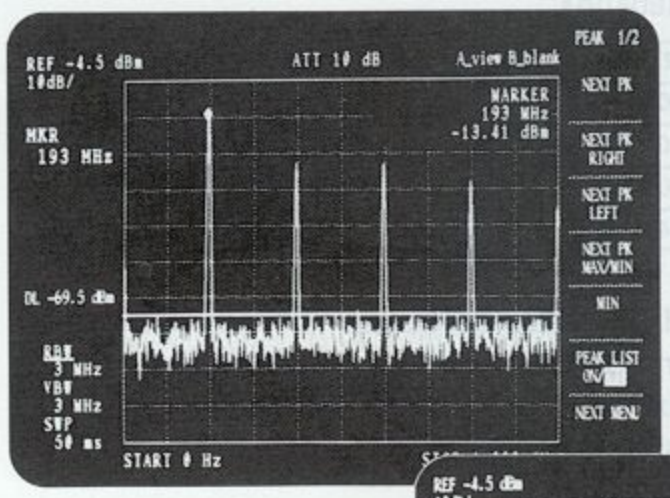
◀ Measure at high speed using a digital IF filter with high selectivity

Faint signals measured using a digital IF filter ▶

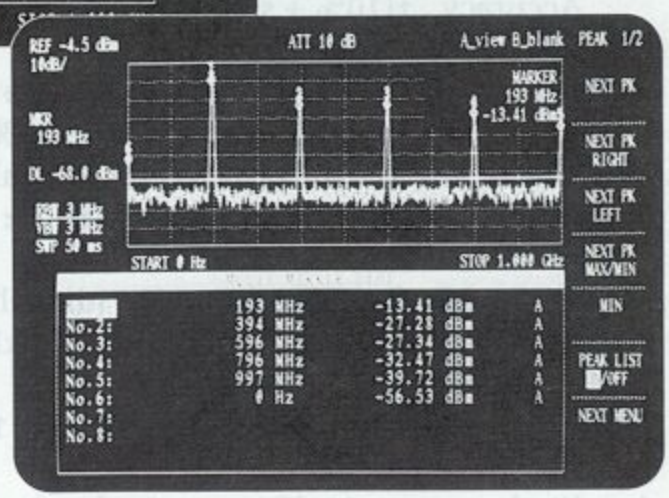


Eight-Point Multimarker and List Function

In addition to a Δ marker and a peak marker, the R3271 can display an eight-point multimarker. It can also display a list of this multimarker. The multimarker display list significantly increases measurement speed and improves operability by using a definition function.



◀ Spurious emission measurement example



Spectrum Analyzers

100 Hz to 26.5 GHz (60 GHz)

R3271

Specifications

Frequency

Frequency range: 100 Hz to 26.5 GHz
18 GHz to 60 GHz (325 GHz tunable with external mixers)

Frequency Band	Harmonic Mode (N)
100 Hz to 3.6 GHz	1
3.5 GHz to 7.5 GHz	1
7.4 GHz to 15.4 GHz	2
15.2 GHz to 23.3 GHz	3
23 GHz to 26.5 GHz	4

Preselector: 3.5 GHz to 8 GHz using VIG tuned preselector
Frequency readout accuracy (Start, Stop, CF, Marker): ± (freq readout × freq reference accuracy + span × span accuracy + 0.15 × res BW + 10 Hz)
Span accuracy ±3% (span > 2 MHz), ±5% (span ≤ 2 MHz)
Count frequency marker:
Resolution 1 Hz to 1 kHz
Count accuracy (S/N ≥ 25 dB) ± (marker freq × freq reference accuracy + 5 Hz × N + 1 LSD)
Delta marker count accuracy (S/N ≥ 25 dB) ± (delta marker freq × freq reference accuracy + 10 Hz × N + 2 LSD)
Frequency reference accuracy: $\pm 2 \times 10^{-8}$/day, $\pm 1 \times 10^{-7}$/year, $\pm 5 \times 10^{-9}$/day (Opt. 21)
Frequency stability:
Residual FM (zero span) <3 Hz × $N_{p\text{-}p}$/0.1s
Drift (after warm up 1 H) <2.5 kHz × sweep time (minute) × N
50 kHz < span ≤ 2MHz
<60Hz × sweep time (minute) × N
span ≤ 50 kHz
Spectral purity: Noise sidebands

offset	f≤ 2.6 GHz	f> 2.6 GHz
1 kHz	< –100 dBc /Hz	< (–95+20 logN) dBc / Hz
10 kHz	< –110 dBc /Hz	< (–108+20 logN) dBc / Hz
20 kHz	< –110 dBc /Hz	< (–108+20 logN) dBc / Hz
100 kHz	< –114 dBc /Hz	< (–110+20 logN) dBc / Hz

Frequency span:
Lin span Range 200 Hz to 8 GHz, zero span
Accuracy ±3% (span > 2 MHz), ±5% (span ≤ 2 MHz)
Log span Range 1 kHz to 1 GHz, 1, 2, 3 decades selected
Accuracy ±(10% + stop freq × 0.1%)
Resolution bandwidth (–3 dB):
Range 10 Hz to 3 MHz 1, 3, 10 sequence
Accuracy ±15% 100 Hz to 1 MHz, ±25% 30 Hz (25°C ± 10°C), 3 MHz, ±50% 10 Hz to 100 Hz (digital IF)
Selectivity (–60 dB/–3 dB) <15:1 100 Hz to 3 MHz
<20:1 30 Hz
5:1 (nominal) 10 Hz to 100 Hz (digital IF)
Bandwidth (–6 dB) 200 Hz, 9 kHz, 120 kHz
Conformed to CISPR standard
Video bandwidth range: 1 Hz to 3 MHz 1, 3, 10 sequence

Amplitude Range

Amplitude range: +30 dBm to noise level
Maximum input:
Average continuous power +30 dBm (1 W) (Input atten ≥ 10 dB)
DC 0 V
Display range:
Scale caliblation 10×10 division graticule
Log 10, 5, 2, 1, 0.5, 0.2, 0.1 dB/div
Linear 10% of reference level/div
QP log 40 dB (5 dB/div)
Input attenuator range: 0 to 70 dB (10 dB step)

Dynamic Range

Maximum dynamic range:
1 dB gain compression to noise level
130 dB–1.55f (GHz) dB, 10 MHz to 3.6 GHz
Signal distortion harmonic 85 dB 10 MHz to 3.6 GHz
110 dB >3.5 GHz
Third order Intermodulation 90 dB >10 MHz
Displayed average noise level: 10 Hz res BW, 0 dB input atten, 20 times ave.

–100 dBm	1 kHz
–110 dBm	10 kHz
–111 dBm	100 kHz
–{135–1.55f (GHz)} dBm	1 MHz to 3.6 GHz
–130 dBm	3.5 GHz to 7.5 GHz
–123 dBm	7.4 GHz to 15.4 GHz
–116 dBm	15.2 GHz to 23.3 GHz
–110 dBm	23 GHz to 26.5 GHz

Gain compression (1 dB): –5 dBm mixer input level >10 MHz
Spurious response:

		Freq range	Mixer level
Second harmonic distortion	<–70 dBc	10 MHz to 3.6 GHz	–30 dBm
	<–100 dBc	>3.5 GHz	–10 dBm
Third order intermodulation distortion	<–70 dBc	10 MHz to 3.6 GHz	–30 dBm
	<–75 dBc	>3.6 GHz	–30 dBm
Residual responses (no signal at input, 0 dB RF attention)	<–100 dBm	1 MHz to 3.6 GHz	
	<–90 dBm	300 kHz to 26.5 GHz	

Amplitude Accuracy

Frequency response:
In band flatness (10 dB input atten)
±1.5 dB 100 Hz to 3.6 GHz, ±1.0 dB 50 MHz to 2.6 GHz,
±1.5 dB 3.5 GHz to 7.5 GHz, ±3.5 dB 7.4 GHz to 15.4 GHz,
±4.0 dB 15.4 GHz to 23.3 GHz, ±4.0 dB 23 GHz to 26.5 GHz
Additional uncertainly due to band switching ±0.5 dB
Frequency response referenced to CAL signal (10 dB input atten)
±5 dB 100 Hz to 26.5 GHz
Calibrator accuracy: –10 dBm ±0.3 dB
IF gain uncertainty: After automatic calibration
±0.5 dB 0dBm to –50 dBm, ±0.7 dB 0dBm to –80 dBm
Scale fidelity:
Log ±0.2 dB/1 dB, ±1 dB/10 dB, ±1.5 dB/90 dB
Linear ±5% of reference level
QP mode log ±1.0 dB/30 dB, ±2 dB/40 dB, ±1.0 dB/40 dB (25°C ± 10°C)
Input attenuator switching accuracy: 20 to 70 dB settings referenced to 10 dB
±1.1 dB/10 dB step, 2.0 dB max, 0 to 12.4 GHz
±1.3 dB/10 dB step, 2.5 dB max, 12.4 GHz to 18 GHz
±1.8 dB/10 dB step, 3.5 dB max, 18 GHz to 26.5 GHz
Resolution bandwidth switching uncertainty:
At reference BW 300 kHz, after automatic calibration
≤ ±0.3 dB 100 Hz to 3 MHz
≤ ±1 dB 30 Hz
≤ ±1.5 dB 10 Hz to 100 Hz (digital IF)
Pulse digitization uncertainty: (pulse response mode PRF > 700/sweeptime) Peak to Peak
Log 1.2 dB (RBW ≤ 1 MHz), 3 dB (RBW : 3 MHz)
Linear 4% of ref level (RBW ≤ 1 MHz), 12% of ref level (RBW : 3 MHz)

SWEEP

Sweep time:
SPAN = 0 50 µs to 1000 s and manual sweep
SPAN ≥ 200 Hz 20 ms to 1000 s and manual sweep
Accuracy ±3%
Sweep trigger: Free run, line, single, video, TV-H, TV-V, external

Demodulation

Spectrum demod:
Modulation type AM and FM
Audio output Speaker and phone jack with volume control
Marker pause time 100 ms to 1000 s

Inputs/Outputs

RF Input:
Connector type N type (adaptable to SMA type : R3271)
Impedance 50 Ω (nominal)
VSWR (input atten ≥ 10 dB, at turned frequency)
< 1.5 : 1 for ≤ 3.6 GHz (nominal)
< 2.5 : 1 for > 3.6 GHz (nominal) R3271
LO emission level (average)
< –80 dBm (nominal) 10 dB input atten, 0 to 26.5 GHz

Video output:
Connector BNC female, rear panel
Impedance (AC coupled) 75 Ω (nominal)
Amplitude Approx. 1 V P-P (Composite video signal)

Probe power: 4 pin connector front panel
Voltage +15 V, –15 V
Current 150 mA max, each

Phone output: (Demodulated audio)
Connector Subminiature Monophonic jack, rear panel
Power output 0.2 watt 8 Ω (nominal)

GPIB interface: A standardly provided GPIB function enables remote operation and data input/output.
Connector IEEE-488 bus Connector
Direct plotter output Supports R9833, HP7470A, HP7475A, HP7440A, HP7550A

General Specifications

Environment temperature:
Operating temperature 0°C to 50°C
Non-operating temperature –20°C to +60°C
Humidity RH 85%

Power supply: Automatically selections between 100 VAC and 220 VAC

	100 VAC	200 VAC
Voltage	90 V to 132 V	198 V to 250 V
Power Consumption	Max. 400 VA	Max. 400VA
Frequency	48 Hz to 440 Hz	48 Hz to 66 Hz

Dimensions: 353 (W) × 177 (H) × 450 (D) mm (without handle, feet, and front cover)
Weight: 22 kg (nominal)

Accessories

Product	Model	Remarks
Power cable	A01412	
Input cable	MC-61	Connector UG-88/U
Input cable	MI-09	Connector 3DW-P2
Connector adaptor	JUG-201A/U	N-BNC Adaptor
Memory card		one card (32 K bytes)
Front cover		

Options

Option 15 Controller Function
Option 16 External mixer (26.5 GHz to 40 GHz)
Option 17 External mixer (40 GHz to 60 GHz)
Option 21 5×10^{-9}/day X 'tal
Option 71 Delayed Sweep

The delayed sweep can be used to analyze the frequency of only the portion specified in the zero-span mode (time domain) and to expand the portion specified in the zero-span mode. Any gate signal is internally produced from a trigger signal source. This gate signal enables the portion you wish to analyze to be gated, the frequency to be analyzed partially, and the time domain waveform to be expanded.

Delayed Sweep Specifications
Trigger signal source: External trigger signal (input from the external trigger input connector). VIDEO and TV-V
Delay time: 200 ns to 1.5 s with a resolution of 100 ns
Delayed sweep time: 50 µs to 1000 s (the resolution is the same as that set in the sweep time.)

Gated Sweep Specifications
Trigger signal source: Produce a gate signal. Input from the external trigger input connector or gate input connector.
Frequency domain analysis External trigger input and gate input
Time domain analysis External trigger input, gate input, VIDEO and TV-V
Gate position: 300 ns to 100 ns with resolution of 100 ns
Gate width: 1 µs to 1.5 s with a resolution of 100 ns