

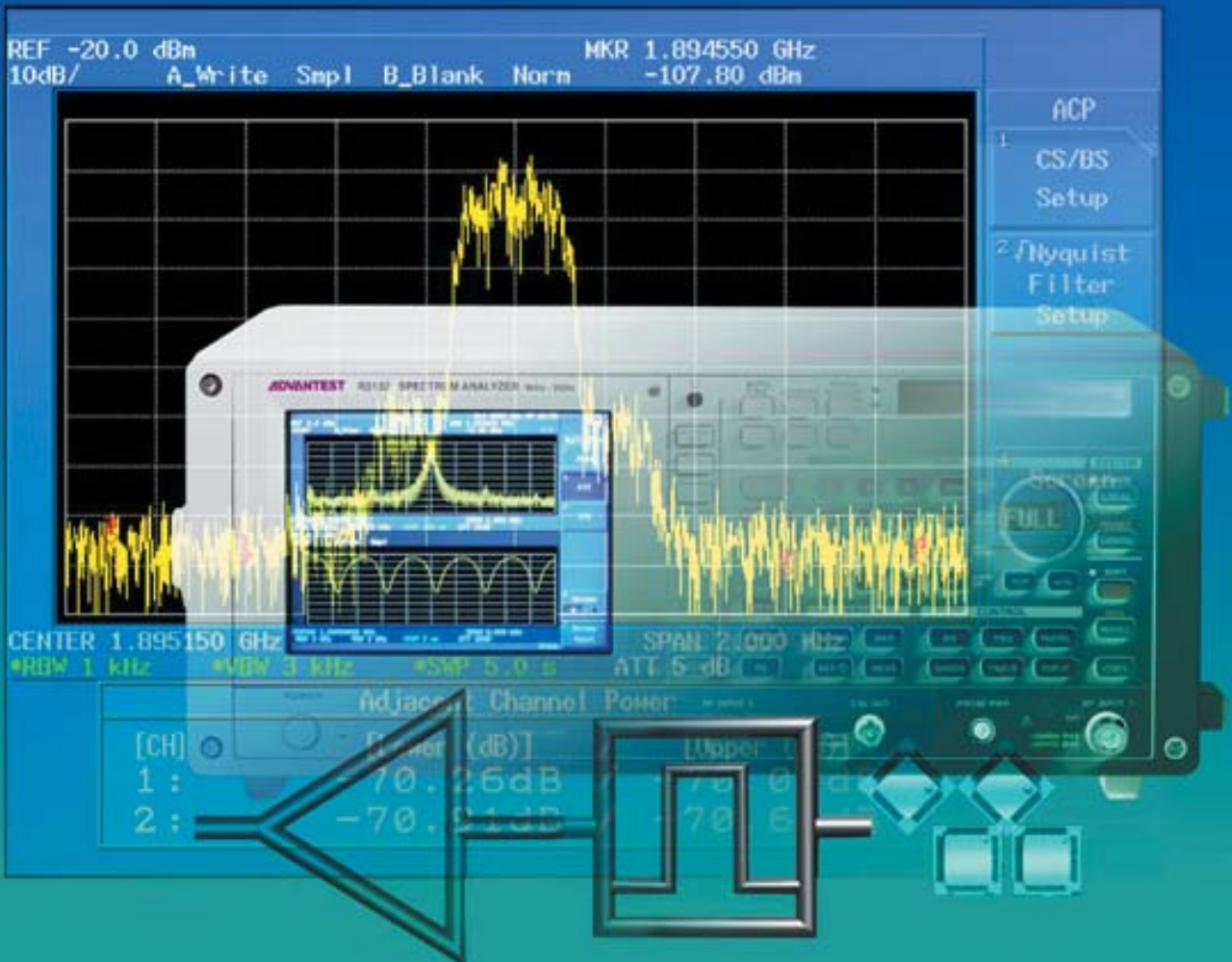
ADVANTEST

R3132/3132N/3162
Spectrum Analyzers

One Spectrum Analyzer for Versatile Applications



R3132/3132N/3162



The R3132/3132N/3162 are a low-cost implementation of the key performance of a portable spectrum analyzer manufactured to address a variety of measurement.

Built around a newly developed direct digital synthesizer, the spectrum analyzers offer a frequency span accuracy of $\pm 1\%$ or less in frequency ranges of 9 kHz to 3 GHz (R3132/3132N), and 9 kHz to 8 GHz (R3162). The built-in auto-calibration feature assures an over-all level accuracy of ± 1.5 dB. Dramatically enhanced distortion characteristics of a 1 dB gain compression point of 0 dBm input, a second-order harmonic distortion of -80 dBc, and a two-signal third-order intermodulation distortion of -80 dBc make measurement in a 117 dB broad dynamic range possible. The new synthesized local oscillator enables the R3132/3132N/3162 to speed up sweep time, updating as many as 20 traces per second.

This capability makes for more real-time waveform observation. The R3132/3132N/3162 personal spectrum analyzers are designed to fit into a broader range of applications than before.

■ Frequency range

R3132: 9 kHz to 3 GHz

R3132N: 9 kHz to 3 GHz (75 Ω input)

R3162: 9 kHz to 8 GHz

■ Frequency span accuracy

Accuracy: $\leq \pm 1\%$

■ Basic analog performance to allow broad dynamic-range measurement

Dynamic range: 117 dB or more

Signal purity: ≤ -105 dBc/Hz (20 kHz offset, $f \leq 2.6$ GHz)

Overall level accuracy: ± 1.5 dB

■ Faster, more real-time analyses

Refresh rate: 20 traces/second (Typical)

50 μ s high-speed zero span sweep (Option)

■ Application-ready measurement functions

- Digital mobile communications measurement functions
 - OBW measurement, ACP measurement, Spurious measurement
 - Total/Channel/Average power measurement
 - Default setup function effective on power measurement
- EMC measurement functions
 - 6 dB RBW: 9 kHz/120 kHz/1 MHz supported (200 Hz optionally available)
 - Built-in QP detector
 - Built-in antenna correction factor table
 - AM/FM audio demodulation function
- Frequency counter function
 - 1 Hz resolution frequency counter
- Additional general-purpose measurement functions
 - Noise/Hz measurement function with available PBW calibration
 - %AM / %AM Video / FM frequency measurement
 - Third-order measurement
 - X dB down measurement
 - Two different types of frequency channels

■ Easy-to-use standard functions

Auto-tuning, pass/fail testing, multiscreen, multimarker, large character display, trace computation function, TV trigger, and more

■ High-quality, large 6.5-inch TFT color LCD screen

■ Only 300 mm deep, compact, spacing-saving device geometry



■ **Standard with I/O interfaces to ease automatic system implementation tasks**

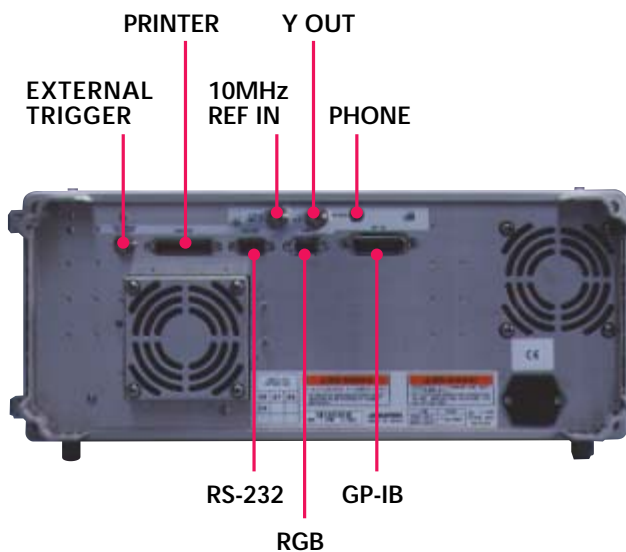
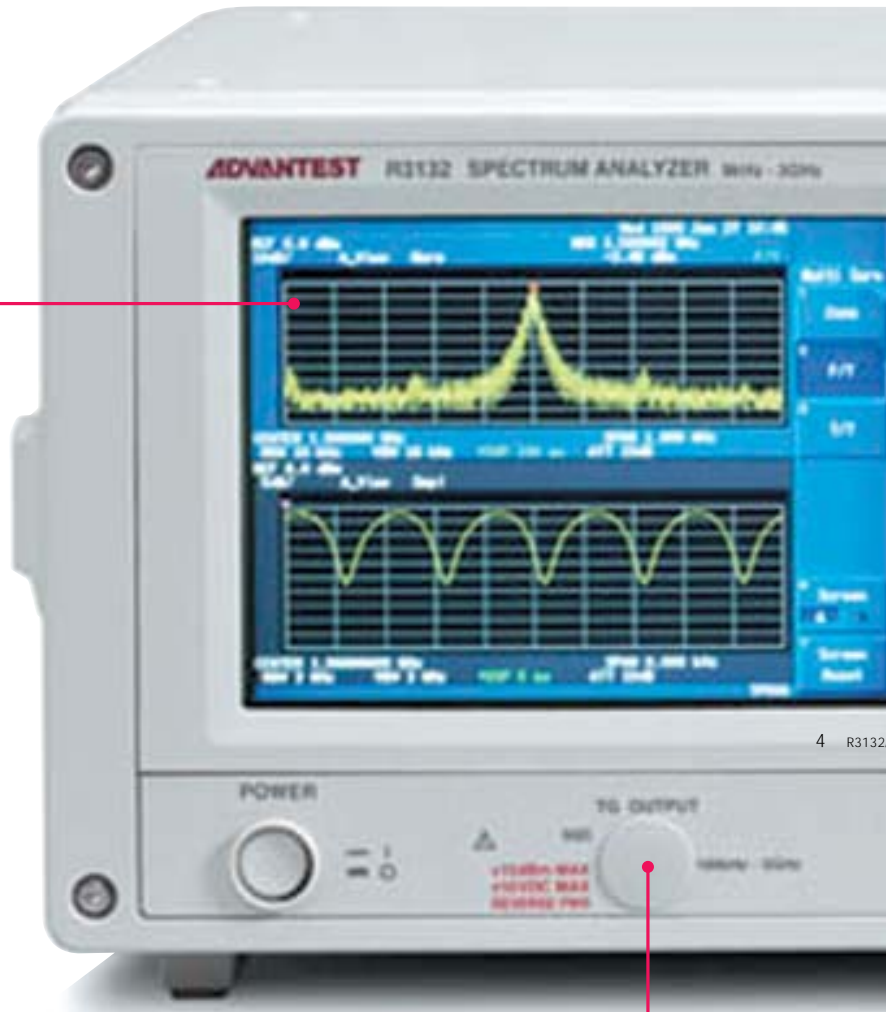
GPIB, RS232 and printer interfaces, floppy disk drive

■ **Application-ready options available**

- OPT.20** High-stability frequency reference Option
Stability : $\pm 2 \times 10^{-8}$ /day, $\pm 1 \times 10^{-7}$ /year
- OPT.27** Narrow-band resolution bandwidth Option
30 Hz, 100 Hz, 300 Hz (3 dB bandwidth)
200 Hz (6 dB bandwidth)
- OPT.29** Time-domain high-speed sweep Option
Maximum sweep time setting up to 50 μ s
- OPT.73** Wide-range FM demodulation Option
FM deviation up to 2.5 MHz can be measured
- OPT.74** Tracking generator Option
100 kHz to 3 GHz (R3132/3162)
100 kHz to 3 GHz (R3132N/75 Ω)

6.5-inch color LCD screen

A large TFT color LCD offers maximum viewing comfort. Measurement results display in a separate window in a large-sized character font for optimal visual recognition. External display VGA output is supported as standard.



TG OUTPUT (Option 74)

Generates constant-level signals synchronized with the spectrum analyzer frequency sweep in a frequency range of 100 kHz to 3 GHz.

Special-purpose function keys

Function keys dedicated to Auto-TUNE, Frequency counter, and Power measurement enable users to launch measurement in a single key touch operation.

CAL

Selects and executes automatic calibration of the instruments to ensure measurement data reliability.

EMC

Program automatic correction and QP detection required for measuring EMI.

Data entry

Data entry keys arranged at the same level as the spectrum analyzer basic measurement functions, such as FREQ, SPAN, and LEVEL.

Floppy disk drive

Writes setup conditions and wave-form data to a 3.5-inch floppy disk. Compatible with bitmap format and text data copying to a PC.

CONFIG

Program a GPIB address, an RS232 interface, a printer and so on.

SAVE/RECALL

Saves and recalls wave-form data and measurement conditions. Archive location is selectable between internal memory and the standard floppy disk drive.

COPY

Copies images of on-screen data to an external printer or floppy disk drive.

RF INPUT

Accepts signals up to +30 dBm (1 W) transmission testing together with the power measurement function.

TG function

An optional tracking generator measuring the frequency response characteristics of filters and amplifiers.

Marker

Provides a wide repertoire of marker functions, including a Δ marker and a search function. The **MEAS** key supports application-ready measurement functions, including Noise/Hz, %AM, Third-order, and X dB down measurement.

Main functions

Set spectrum analyzer basic measurement functions, such as FREQ, SPAN, and LEVEL.

CAL OUT

Generates 30 MHz calibration signal.

Controls

Setup measurement parameters, such as resolution bandwidth, sweep, and trigger, to address all measurement needs.

Probe power

Used with accessories that require an external power supply, such as an FET probe. ± 12 V, 4-pin connector.

Enhanced Basic Performance

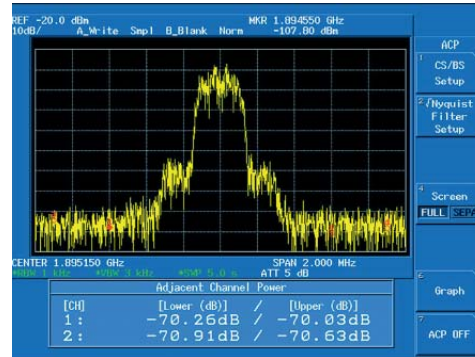
Compact and light, space-saving device geometry

The newly designed, compact, light enclosure measures Approx. 424(W) x 177 (H) x 300 (D) mm and has a weight of only 14 kg (R3162: 15 kg). The reduced depth of 300 mm helps to make effective use of the workspace. A panel cover that comes standard with the instruments can be attached to protect them against possible damage during relocation or transportation.



High-accuracy measurement

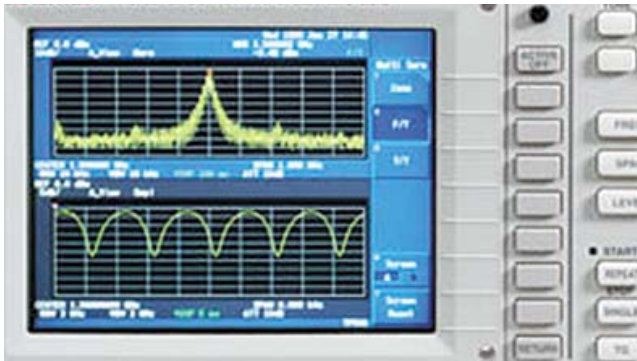
A newly developed synthesized local oscillator helps the instruments achieve frequency sweeps with a frequency span accuracy of $\pm 1\%$ or less. Keeping in pace with better frequency reading accuracy, the adjacent channel leakage power and occupied bandwidth measurement functions can now be measured with higher accuracy. In addition, an overall level accuracy of ± 1.5 dB is guaranteed in frequency ranges of 100 kHz to 3 GHz.



Example of ACP measurement

High-quality color LCD screen

The R3132/3132N/3162 provide drastically improved display performance to recommend them for use in a variety of measurement environments. The 6.5-inch TFT color LCD screen offers a maximum display resolution outracing comparable-class products. Measurement results display in a large-sized character font for optimal visual recognition.

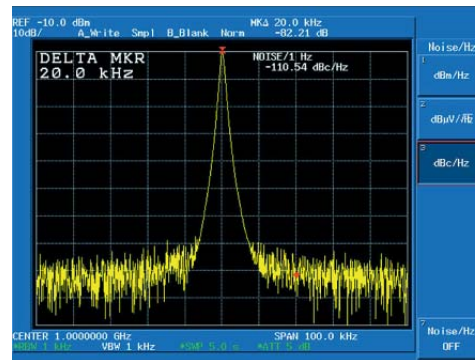


Frequency/Time Display

Superb signal purity

A spectrum analyzer would require superb signal purity to be able to test oscillator output and the transmitter characteristics of radio communications equipment. Offering low-phase noise designs⁽¹⁾ of -100 dBc/Hz (10 kHz offset, RBW 300 Hz (Option)) and -105 dBc/Hz (20 kHz offset), the R3132/3132N/3162 are best suited for evaluating the neighboring characteristics of signals of interest.

*1: $f \leq 2.6$ GHz.



Broad dynamic range and high-sensitivity measurement

The R3132/3132N/3162 offer a significantly enhanced dynamic range stemming from improved distortion characteristics of the level axis. A 1 dB gain compression point of 0 dBm or more⁽¹⁾, a second-order harmonic distortion and a two-signal third-order intermodulation distortion of -80 dBc or less⁽²⁾, are guaranteed. Further, an average display noise level of -115 dBm or less⁽³⁾ is guaranteed, providing a 115 dB dynamic range in relation to a 1 dB gain compression point of 0 dBm. A 5 dB step input attenuator selector expedites the task of evaluating distortion characteristics. Using the standard internal preamplifier⁽⁴⁾ provides an enhanced average display noise level of -144 dBm⁽⁵⁾ (Typical) for measuring weak signals with ease.

*1: $f \geq 200$ MHz.

*2: -30 dBm mixer input, $f \geq 800$ MHz.

*3: RBW 1 kHz, VBW 10 Hz, ATT 0 dB, $f=1$ GHz.

*4: R3132/3132N: 9 kHz to 3 GHz, R3162: 9 kHz to 3.3 GHz.

*5: RBW 30 Hz (Option), $f=1$ GHz.

FD-based data editing/management

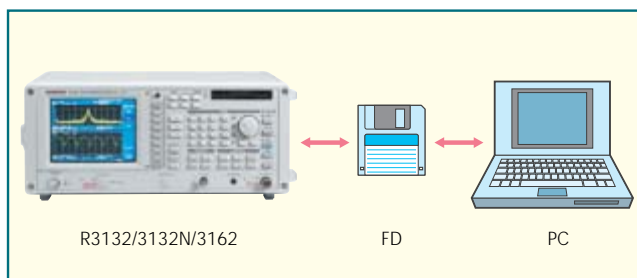
Measurement results can be written to internal save memory as trace data and can be recalled later together with the associated measurement conditions. Likewise, data saved to an FD can not only be recalled in the R3132/3132N/3162 but can also be accessed from a PC for reference.

SAVE Numeric data format

Trace data and measurement conditions can be loaded into a PC in numeric form, so that the data can be managed with applications, such as spreadsheets. Data thus loaded may be edited on the PC and then recalled in the R3132/3132N/3162.

COPY Bitmap format

If the standard floppy disk drive is specified as external storage, bitmap files are created on the FD by simply pressing the panel COPY key. This allows intricate images of onscreen data to be handled in a PC for electronic filing and documentation purposes, without needing a further modification.

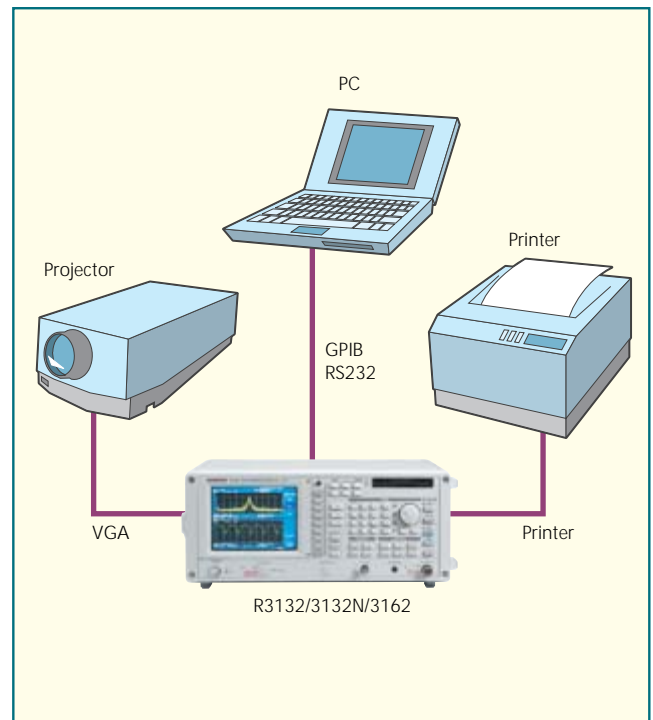


High-speed measurement

The new synthesized local oscillator speeds up iterative sweeps per unit time, updating as many as 20 traces per second (Typical) or even more and thus simplifying various tuning tasks. The instruments, when built into a system, make for a higher measurement throughput. Under GPIB interface control, data can be transferred two times faster than before, boosting the system throughput further. With the R3132/3132N/3162, the number of resolution points that make up trace data is selectable between 501 and 1,001 points. Measurement speed would benefit from measuring with 501 points where the number of points available is limited.

Various I/O interfaces

- GPIB Control and data transfer from an external controller
- RS232 Control and data transfer from an external controller
- Printer Compatible with ESC/P, ESC/P-R, and PCL.
- VGA Display image output to monitors/projectors.



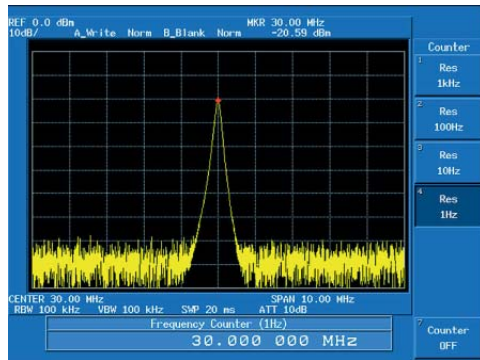
Single Key Touch Operations for Greater Ease of Operation

Auto-tune function

Searches for the maximum-level signal within the full-span frequency range and sets it as a center frequency, and then reproduces the setting in effect immediately before the execution of the auto-tuning function.

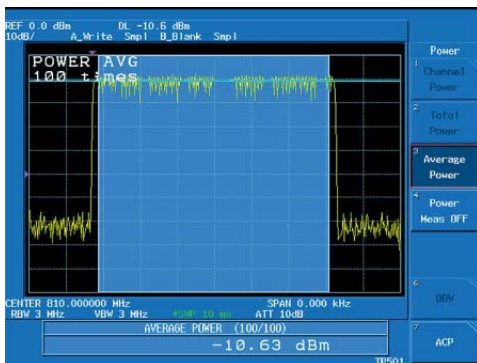
Frequency Counter

Positions the marker on the spectrum and lets the instruments measure the frequency with its built-in frequency counter to a resolution selectable from between 1 Hz and 1 kHz. This function is indispensable for measuring the frequencies of signals selected from a mix of signals, such as multicarrier signals.



Power measurement

This function is useful for digital mobile communications measurement applications. Measurements made easy by this function include channel power measurement, which measures the power of signals diffused over a wide band, as in CDMA or OFDM, and average power measurement, which measures signals having large amplitude variations. These measurements are all window-programmed.



Average Power

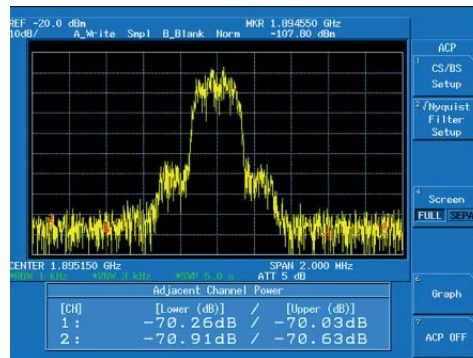
Occupied bandwidth (OBW)

Calculates the bandwidth having a specified power ratio from measured spectrum data and displays the occupied bandwidth (OBW) and center frequency (FC). The ratio to total power can be set between 10 and 99.8%.



Adjacent channel leakage power (ACP)

Allows you to measure the adjacent channel leakage power by simply programming the channel spacing and frequency bandwidth preset for a radio system. Up to five adjacent measurement points can be set.



ACP measurement

Channel setting

A channel data can be registered for channel setting. Independent two types of tables for optimum setting according to communication systems, TV broadcasting and CATV.

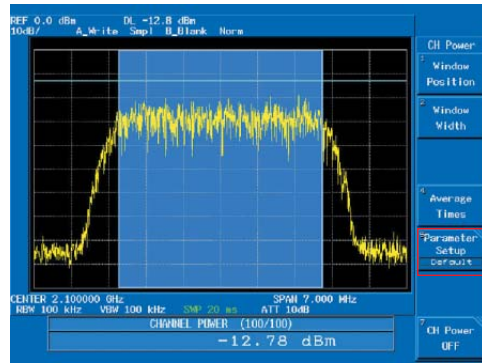
CH Type 1: for mobile communications

Channel type 1 is suitable to channel setup of fixed channel steps such as mobile communications.



One key measurement

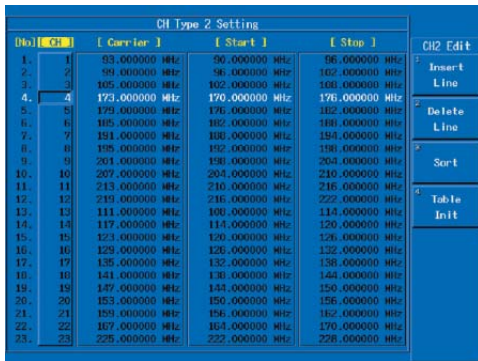
Different parameter setup can be registered for OBW/ACP/CH POWER/SPECTRUM MASK measurement, respectively. Pressing an each function key reproduces independent measurement parameter setup. These function can be measured without any parameter setup.



Default registering key

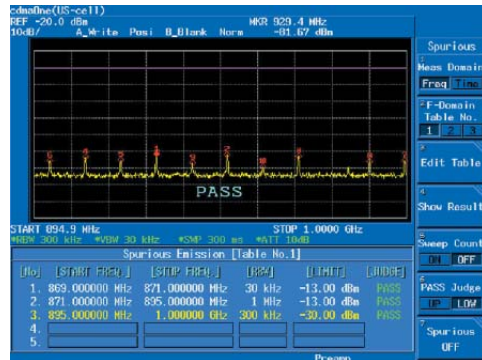
CH Type 2: for TV and CATV

Channel type 2 is suitable to channel setup of irregular channel steps such as TV broadcasting and CATV.



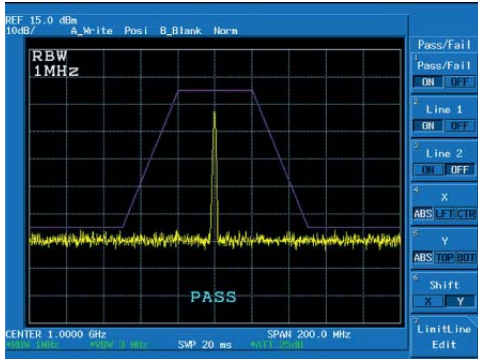
Spurious measurement function

Spurious measurement of F-Domain and T-Domain are available. These function makes for automatic measurement of spurious emission by Frequency Table. Different RBW and SWP set up can be use for each Frequency Table (Maximum 15 tables).



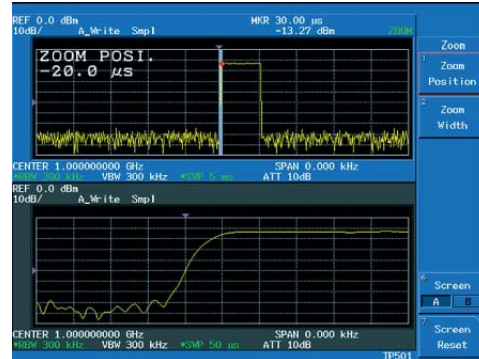
Pass/fail testing

Sets two limit lines onscreen, one as a high limit and the other as a low limit, for testing passes and failures. Limit lines can also be set on the timebase, allowing time template measurement. The limit line settings can be written to internal save memory or FD, so multiple suites of pass/fail testing conditions can be recalled for testing.



Multiscreen

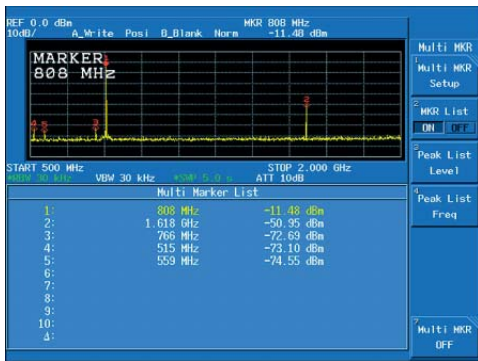
The zoom function provides an A/B split screen display. Varied signal analysis tasks supported include F-F mode, in which different frequency spectrums are displayed, F-T mode, in which AM/FM modulation components are displayed, and T-T mode, which is convenient for producing partially magnified views in a time domain.



(Sweep Time 50 μs; Option 29)

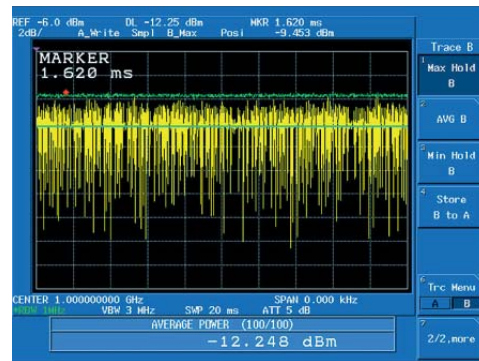
Multimarker

Up to 10 markers can be set in a single display screen. Each marker may be positioned at an optional frequency. In addition, the markers can be sorted and listed in level or frequency order after automatic peak detection.



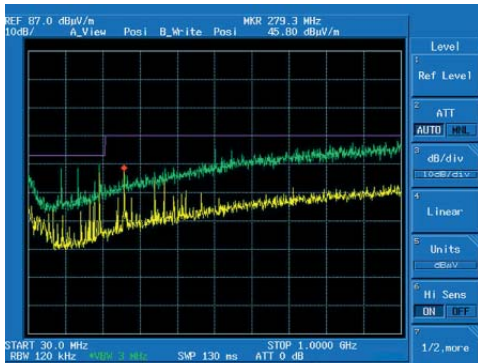
Multitrace

The two waveforms of traces A and B can be simultaneously sampled and displayed. Since the detector mode for each trace is selectable from among POSI, NEGA, SAMPLE, and NORMAL, the maximum power and the average power might be measured at the same timing, for example.



EMC measurement

This function measures electromagnetic interferences arising from electronic equipment. The instruments come standard with 9 kHz, 120 kHz, and 1 MHz 6 dB bandwidth filters and a QP detector. A 200 Hz narrow-band filter can be added optionally. AM/FM demodulated audio is available from the rear-panel PHONE jack to identify disturbing broadcast waves. Correction coefficients for the antennas provided by us are built in the R3132/3132N/3162 so that the level reading can be calibrated for direct reading in dB μ V/m by simply selecting the name of your antenna model. If an antenna not manufactured by us is used, a correction can be registered individually. For measuring weak noise lower than noise level of the spectrum analyzer, the built-in preamplifier of R3132, 3132N/3162 makes possible of sensitive measurements with calibrated level.

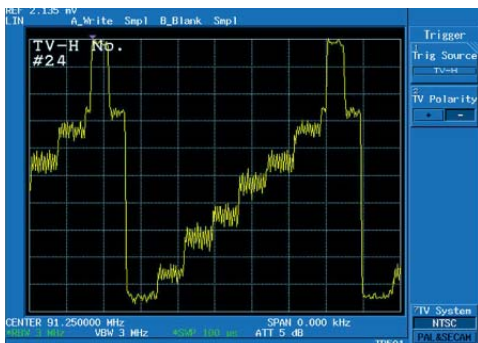


Gated sweep

Burst signals iterating in the ON and OFF states of communication could not be directly observed with spectrum analyzers in the past. The R3132/3132N/3162 allow spectral analysis of burst signals by accepting trigger signals synchronized with burst signals at their rear panel EXT TRIGGER IN connectors.

Trigger function

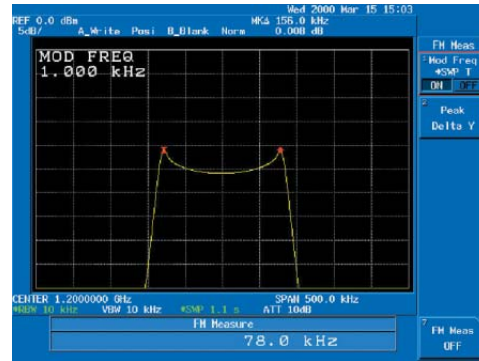
FREE RUN, LINE, VIDEO, TV, and EXT are selectable as sweep trigger sources. A positive or negative delay time can be set for a trigger point in a time-domain sweep.



TV trigger

Versatile measurement functions

MEAS key supports Noise/Hz measurements, %AM/%AM Vid-
 eo/FM measurements, Third-order measurement and XdB
 Down measurement. For Noise/Hz measurement, PBW calibration function makes for measurement with higher accuracy in power measurement by providing calibration resulted form conversion of resolution bandwidth (RBW) filter used by R3132/3132N/3162 into ideal filter.



FM measurement



Video AM depth

Wide Choice of Options

OPT.20 High-stability frequency reference

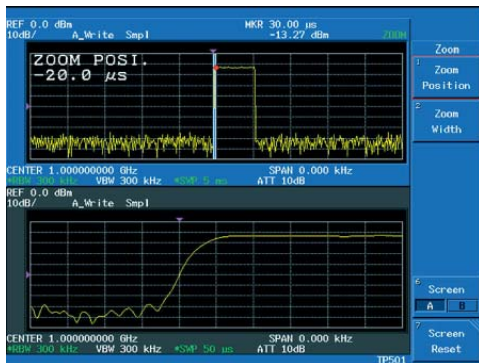
Crystal oscillator options with frequency stabilities of $\pm 2 \times 10^{-8}$ /day and $\pm 1 \times 10^{-7}$ /year are available for enhanced frequency reading accuracy and frequency counter accuracy.

OPT.27 Narrow-band resolution bandwidths

In addition to the RBW of 1 kHz to 3 MHz, 30 Hz, 100 Hz, 300 Hz (3 dB bandwidth), and 200 Hz (6 dB bandwidth) option are available for separating carrier waves and measuring neighboring noises in narrow-band radio systems. These narrow-band resolution bandwidth options allow 10 kHz offset signals in TV broadcast waves to be separated positively, assuring DU ratio measurement with confidence.

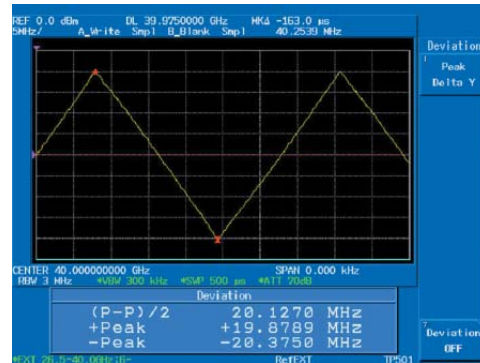
OPT.29 Time-domain high-speed sweeps

In time-domain high-speed sweeps, the sweep time can be set up to 50 μ s, allowing TDMA waveform observation during digital mobile communications measurement and offering zoomed views of the leading and trailing regions of burst signals.

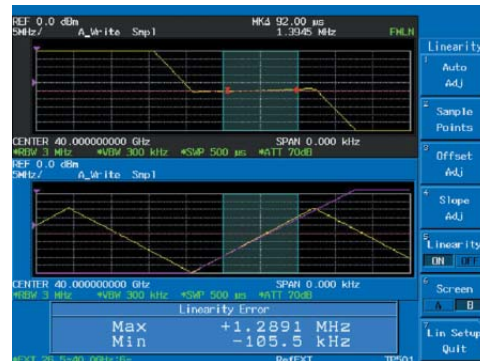


OPT.73 Wide-range FM demodulation

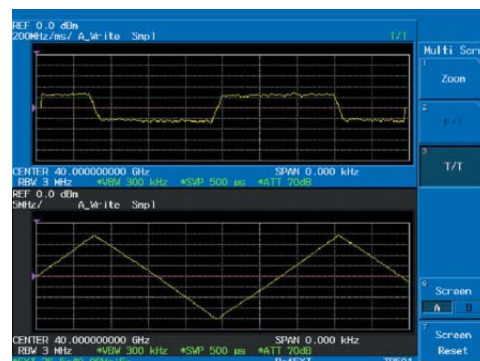
Devices such as a collision avoidance radar for preventing a collision between a car and another in front, which are installed in Intelligent Transport Systems (ITS), utilize an FM modulation in which the frequency deviation is very wide. The R3132/3132N/3162 can measure FM deviation widths up to 500 MHz (with an external mixer), whereas conventional measuring instruments can not measure these widths. At the same time, the R3132/3132N/3162 can measure modulation linearity and sensitivity. Further, since the R3132/3132N/3162 can perform a limit test during a PASS/FAIL evaluation at any given range. The function can improve the throughput of the tuning process of the production.



Example of Measuring FM Deviation



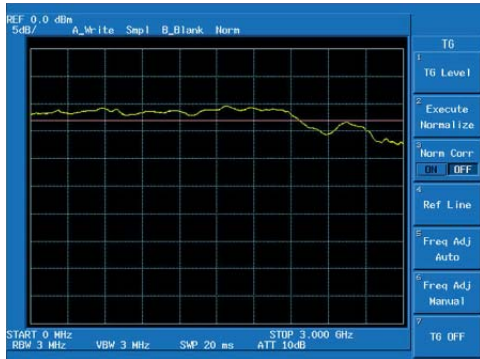
Example of Measuring Linearity



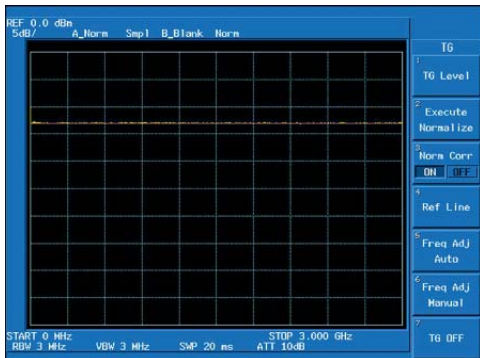
Example of Measuring Sensitivity

OPT.74 Tracking generator

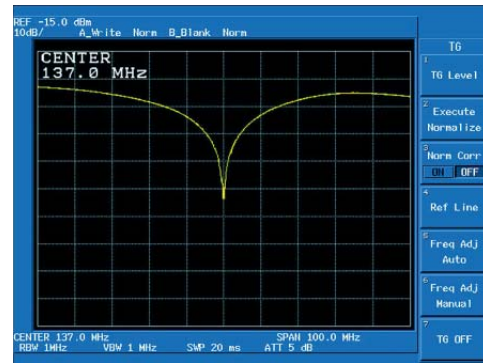
The tracking generator generates signals synchronized with frequency sweeps by a spectrum analyzer in a frequency range of 100 kHz to 3 GHz, allowing the direct measurement of the frequency response characteristics of filters and amplifiers. A normalization feature is available with the tracking generator for cancelling frequency response characteristics in a single-touch operation to ease the evaluation of the characteristics of only the signals of interest. If return losses are measured using the SWR bridge, the impedance matching characteristic of the signals of interest can be easily evaluated.



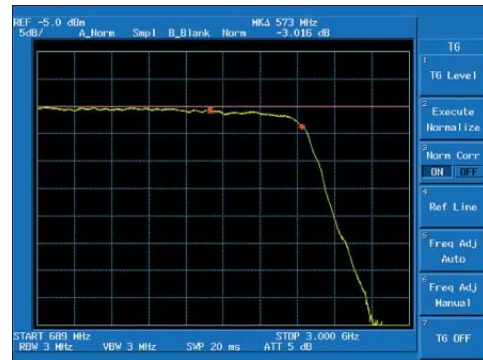
Normalization OFF



Normalization ON



Return loss measurement



Low-pass filter characteristics measurement

R3132 Specifications

Frequency

Frequency range:	9 kHz to 3 GHz		
Frequency reading accuracy: (Start, stop, center frequency, marker frequency)	\pm (Reading of frequency x Frequency reference accuracy + Span x 1% + RBW x 15% + 60 Hz)		
Counter	Resolution: 1 Hz to 1 kHz Accuracy: \pm (Marker frequency x Frequency reference accuracy + 1LSD) (S/N \geq 25 dB, span \leq 200 MHz)		
Frequency reference accuracy	Stability: $\pm 2 \times 10^{-6}$ /year, $\pm 1 \times 10^{-7}$ /year (Option 20) $\pm 1 \times 10^{-5}$ (0 to 50 °C), $\pm 2 \times 10^{-8}$ /day (Option 20)		
Frequency span	Range: 1 kHz to 3 GHz, 0 Hz (zero span) Accuracy: $\leq \pm 1\%$		
Residual FM:	≤ 60 Hzp-p/0.1s, ≤ 20 Hzp-p/0.1s (Option 20)		
Signal purity:	offset	f \leq 2.6 GHz	f > 2.6 GHz
	20 kHz	≤ -105 dBc/Hz	≤ -103 dBc/Hz
* RBW 300 Hz (Option 27)	10 kHz	≤ -100 dBc/Hz*	≤ -98 dBc/Hz*
Resolution bandwidth (3 dB)	Range: 1 kHz to 3 MHz, 1-3-10 sequence 30 Hz, 100 Hz, 300 Hz (Option 27) Accuracy: $< \pm 20\%$, 1 kHz to 1 MHz $< \pm 25\%$, 3 MHz $< \pm 20\%$ (added with Option 27) 6 dB bandwidth: 1 MHz, 120 kHz, 9 kHz 200 Hz (Option 27)		
Video bandwidth:	10 Hz to 3MHz, 1-3-10 sequence		

Amplitude range

Measuring range:	+30 dBm to average noise level		
Maximum input level (Input ATT ≥ 10 dB)	Preamplifier OFF: +30 dBm, ± 50 VDC max. Preamplifier ON: +13 dBm, ± 50 VDC max.		
Indication range:	10 x 10 div Log: 10, 5, 2, 1 dB/div Linear: 10% of the reference level/div.		
Reference level range	Preamplifier OFF: (Input ATT: 0 to 50 dB) Log: -64 to +40 dBm (0.1 dB step) Linear: 141.1 μ V to 22.36 V Preamplifier ON: (Input ATT: 0 to 30 dB) Log: -82 to +10 dBm (0.1 dB step) Linear: 17.76 μ V to 707.1 mV		
Input ATT range:	0 to 50 dB (5 dB step)		

Dynamic range

Average noise level:	RBW 1 kHz, VBW 10 Hz, input ATT 0 dB, f ≥ 10 MHz Preamplifier OFF: -117 dBm + 2f (GHz) dB* ¹ Preamplifier ON: -132 dBm + 3f (GHz) dB		
1 dB gain compression:	f ≥ 200 MHz Preamplifier OFF: > 0 dBm (mixer input level) Preamplifier ON: > -25 dBm (RF input level)		
Spurious response:	Preamplifier OFF, Mixer input -30 dBm		
2nd-order harmonic distortion:	≤ -70 dBc (100 MHz \leq f < 800MHz) ≤ -80 dBc (f \leq 800MHz)		
2 signal 3rd-order intermodulation distortion:	≤ -80 dBc (f ≥ 200 MHz, Offset > 50 kHz)		
Residual response:	When input ATT 0 dB, 50 Ω terminated, and 1 MHz to 3 GHz Preamplifier OFF: ≤ -100 dBm Preamplifier ON: ≤ -105 dBm		

Amplitude accuracy

Frequency response:	After auto calibration at ATT = 10 dB	
Preamplifier OFF:	$\leq \pm 0.5$ dB (100 kHz to 3 GHz)* ² $\leq \pm 2$ dB (9 kHz to 3 GHz)	
Preamplifier ON:	$\leq \pm 1$ dB (100 kHz to 2.7 GHz) $\leq \pm 2$ dB (9 kHz to 3 GHz)	
Calibration signal level accuracy:	-20 dBm ± 0.3 dB	
IF gain error:	After auto calibration $< \pm 0.5$ dB	
Scale indication accuracy:	After auto calibration	
Log:	$\leq \pm 1.5$ dB/80 dB $\leq \pm 1$ dB/10 dB $\leq \pm 0.2$ dB/1 dB	
Linear:	$\pm 5\%$ of reference level	
Input ATT switching error:	$\leq \pm 0.3$ dB (for 0 to 50 dB, with reference to 30 MHz/10 dB)	
Resolution bandwidth switching level error:	After auto calibration $< \pm 0.5$ dB	
Total level accuracy:	± 1.5 dB (REF = -50 to 0 dBm, ATT = 10 dB, 2 dB/div, RBW = 300 kHz, f > 100 kHz, after auto calibration)	

Sweep

Sweep time:	20 ms to 1000 s, 50 μ s to 1s (Option 29, zero span)	
Accuracy:	$\pm 2\%$	
Trigger mode:	FREE RUN, LINE, VIDEO, EXT, TV,	
Sweep mode:	REPEAT, SINGLE	

I/O

RF input	Connector: N type female Impedance: 50 Ω (nominal)	
VSWR	Preamplifier OFF: <1.5:1 (100 kHz to 2 GHz) Input ATT = 10 to 50 dB <2:1 (9 kHz to 3 GHz) Input ATT = 5 to 50 dB Preamplifier ON: <2.5:1 (9 kHz to 3 GHz)	
Probe power:	± 12 V, 4-pin connector	
Calibration output signal:	BNC female, 50 Ω (nominal) 30 MHz, -20 dBm	
10 MHz reference input:	BNC female, 500 Ω (nominal) -10 to +10 dBm	
External trigger input:	BNC female	
Sound output (demodulated audio):	Small monophonic jack	
GPIB interface:	IEEE-488 BUS connector	
RS232 interface:	D-sub 9-pin	
Printer interface:	D-sub 25-pin, ESC/P, ESC/P-R, PCL	
Video output:	VGA (15-pin, female)	
Floppy disk:	3.5-inch, MS-DOS format	

General specifications

Operating temperature:	0 to +50 °C, Relative humidity 85% or less (no dew condensation)	
Storage temperature:	-20 to +60 °C, relative humidity 85% or less	
Power supply:	100/200 VAC auto-switchable 100 VAC: 100 to 120 VAC, 50 to 60 Hz 200 VAC: 200 to 240 VAC, 50 to 60 Hz	
Power consumption:	200 VA or less	
Dimensions:	Approx. 424 (W) x 177 (H) x 300 (D) mm (excluding feet and connectors)	
Mass:	14 kg or less (excluding options, cover, and accessories)	

R3132N Specifications

Frequency

Frequency range:	9 kHz to 3 GHz		
Frequency reading accuracy: (Start, stop, center frequency, marker frequency)	\pm (Reading of frequency x Frequency reference accuracy + Span x 1% + RBW x 15% + 60 Hz)		
Counter	Resolution: 1 Hz to 1 kHz		
Accuracy:	\pm (Marker frequency x Frequency reference accuracy + 1LSD) (S/N \geq 25 dB, span \leq 200 MHz)		
Frequency reference accuracy	Stability: $\pm 2 \times 10^{-6}$ /year, $\pm 1 \times 10^{-7}$ /year (Option 20) $\pm 1 \times 10^{-5}$ (0 to 50°C), $\pm 2 \times 10^{-9}$ /day (Option 20)		
Frequency span	Range: 1 kHz to 3 GHz, 0 Hz (zero span)		
Accuracy:	$\leq \pm 1\%$		
Residual FM:	≤ 60 Hzp-p/0.1s, ≤ 20 Hzp-p/0.1s (Option 20)		
Signal purity:	offset	f ≤ 2.6 GHz	f > 2.6 GHz
	20 kHz	≤ -105 dBc/Hz	≤ -103 dBc/Hz
RBW 300 Hz (Option 27)	10 kHz	≤ -100 dBc/Hz	≤ -98 dBc/Hz*
Resolution bandwidth (3 dB)	Range: 1 kHz to 3 MHz, 1-3-10 sequence 30 Hz, 100 Hz, 300 Hz (Option 27)		
Accuracy:	< $\pm 20\%$, 1 kHz to 1 MHz < $\pm 25\%$, 3 MHz < $\pm 20\%$ (added with Option 27)		
6 dB bandwidth:	1 MHz, 120 kHz, 9 kHz 200 Hz (Option 27)		
Video bandwidth:	10 Hz to 3MHz, 1-3-10 sequence		

Amplitude range

Measuring range:	+134 dB μ V to average noise level
Maximum input level (Input ATT ≥ 10 dB)	Preamplifier OFF: +134 dB μ V, ± 50 VDC max. Preamplifier ON: +120 dB μ V, ± 50 VDC max.
Indication range:	10 x 10 div
Log:	10, 5, 2, 1 dB/div
Linear:	10% of the reference level/div.
Reference level range	Preamplifier OFF: (Input ATT: 0 to 50 dB) +44.8 dB μ V to +148.8 dB μ V (0.1 dB step) Linear: 172.8 μ V to 27.39 V Preamplifier ON: (Input ATT: 0 to 30 dB) +26.8 dB μ V to +118.8 dB μ V (0.1 dB step) Linear: 21.75 μ V to 866 mV
Input ATT range:	0 to 50 dB (5 dB step)

Dynamic range

Average noise level:	RBW 1 kHz, VBW 10 Hz, input ATT 0 dB, f ≥ 10 MHz
Preamplifier OFF:	-6 dB μ V + 2f (GHz) dB* ¹
Preamplifier ON:	-21 dB μ V + 3f (GHz) dB
1 dB gain compression:	f ≥ 200 MHz
Preamplifier OFF:	> +107 dB μ V (mixer input level)
Preamplifier ON:	> +82 dB μ V (RF input level)
Spurious response:	Preamplifier OFF, Mixer input +77 dB μ V
2nd-order harmonic distortion:	≤ -70 dBc (100 MHz \leq f < 800MHz) ≤ -80 dBc (f \leq 800MHz)
2 signal 3rd-order intermodulation distortion:	≤ -80 dBc (f ≥ 200 MHz, Offset > 50 kHz)
Residual response:	When input ATT 0 dB, 75 Ω terminated, and 1 MHz to 3 GHz
Preamplifier OFF:	$\leq +7$ dB μ V
Preamplifier ON:	$\leq +2$ dB μ V

Amplitude accuracy

Frequency response:	After auto calibration at ATT = 10 dB
Preamplifier OFF:	$\leq \pm 0.5$ dB (100 kHz to 2.2 GHz) ^{*2}
Preamplifier ON:	$\leq \pm 2$ dB (9 kHz to 2.2 GHz) $\leq \pm 1$ dB (100 kHz to 2.2 GHz) $\leq \pm 2$ dB (9 kHz to 2.2 GHz)
Calibration signal level accuracy:	-20 dBm ± 0.3 dB
IF gain error:	After auto calibration < ± 0.5 dB
Scale indication accuracy:	After auto calibration
Log:	$\leq \pm 1.5$ dB/80 dB $\leq \pm 1$ dB/10 dB $\leq \pm 0.2$ dB/1 dB $\pm 5\%$ of reference level
Linear:	
Input ATT switching error:	$\leq \pm 0.3$ dB (for 0 to 50 dB, with reference to 30 MHz/10 dB)
Resolution bandwidth switching level error:	After auto calibration < ± 0.5 dB
Total level accuracy:	± 1.5 dB (REF = +57 to +107 dB μ V, ATT = 10 dB, 2 dB/div, RBW = 300 kHz, 100 kHz < f ≤ 2.2 GHz after auto calibration)

Sweep

Sweep time:	20 ms to 1000 s, 50 μ s to 1s (Option 29, zero span)
Accuracy:	< $\pm 2\%$
Trigger mode:	FREE RUN, LINE, VIDEO, EXT, TV,
Sweep mode:	REPEAT, SINGLE

I/O

RF input	Connector: N type female
Impedance:	75 Ω (nominal)
VSWR	Preamplifier OFF: < 1.5:1 (100 kHz to 2.2 GHz) Input ATT = 10 to 50 dB < 2:1 (9 kHz to 2.2 GHz) Input ATT = 5 to 50 dB < 2.5:1 (9 kHz to 2.2 GHz)
Preamplifier ON:	
Probe power:	± 12 V, 4-pin connector
Calibration output signal:	BNC female, 75 Ω (nominal) 30 MHz, -20 dBm
10 MHz reference input:	BNC female, 500 Ω (nominal) -10 to +10 dBm
External trigger input:	BNC female
Sound output (demodulated audio):	Small monophonic jack
GPIO interface:	IEEE-488 BUS connector
RS232 interface:	D-sub 9-pin
Printer interface:	D-sub 25-pin, ESC/P, ESC/P-R, PCL
Video output:	VGA (15-pin, female)
Floppy disk:	3.5-inch, MS-DOS format

General specifications

Operating temperature:	0 to +50 °C, Relative humidity 85% or less (no dew condensation)
Storage temperature:	-20 to +60°C, relative humidity 85% or less
Power supply:	100/200 VAC auto-switchable 100 VAC: 100 to 120 VAC, 50 to 60 Hz 200 VAC: 200 to 240 VAC, 50 to 60 Hz 200 VA or less
Power consumption:	
Dimensions:	Approx. 424 (W) x 177 (H) x 300 (D) mm (excluding feet and connectors)
Mass:	14 kg or less (excluding options, cover, and accessories)

R3162 Specifications

Frequency

Frequency range:	9 kHz to 8 GHz		
Frequency band:	Frequency band	Band	
	9 kHz to 3.3 GHz	0	
	3.2 GHz to 6.6 GHz	1-	
	6.5 GHz to 8 GHz	1+	
Frequency reading accuracy: (Start, stop, center frequency, accuracy + Span x 1% + RBW x 15% + 60 Hz marker frequency)	\pm (Reading of frequency x Frequency reference accuracy + 1 LSD) (S/N \geq 25 dB, span \leq 200 MHz)		
Counter	Resolution: 1 Hz to 1 kHz Accuracy: \pm (Marker frequency x Frequency reference accuracy + 1 LSD) (S/N \geq 25 dB, span \leq 200 MHz)		
Frequency reference accuracy	Stability: $\pm 2 \times 10^{-6}$ /year, $\pm 1 \times 10^{-7}$ /year (Option 20) $\pm 1 \times 10^{-5}$ (0 to 50°C), $\pm 2 \times 10^{-8}$ /day (Option 20)		
Frequency span	Range: 1 kHz to 8 GHz, 0 Hz (zero span) Accuracy: $\leq \pm 1\%$		
Residual FM:	≤ 60 Hzp-p/0.1s, ≤ 20 Hzp-p/0.1s (Option 20)		
Signal purity:	offset	f ≤ 2.6 GHz	f > 2.6 GHz
	20 kHz	≤ -105 dBc/Hz	≤ -103 dBc/Hz
<i>* RBW 300 Hz (Option 27)</i>	10 kHz	≤ -100 dBc/Hz*	≤ -98 dBc/Hz*
Resolution bandwidth (3 dB)	Range: 1 kHz to 3 MHz, 1-3-10 sequence 30 Hz, 100 Hz, 300 Hz (Option 27) Accuracy: $< \pm 20\%$, 1 kHz to 1 MHz $< \pm 25\%$, 3 MHz $< \pm 20\%$ (added with Option 27) 6 dB bandwidth: 1 MHz, 120 kHz, 9 kHz 200 Hz (Option 27)		
Video bandwidth:	10 Hz to 3MHz, 1-3-10 sequence		
Amplitude range			
Measuring range:	+30 dBm to average noise level		
Maximum input level (Input ATT ≥ 10 dB)	Preamplifier OFF: +30 dBm, 0 VDC max. Preamplifier ON: +13 dBm, 0 VDC max.		
Indication range:	10 x 10 div Log: 10, 5, 2, 1 dB/div Linear: 10% of the reference level/div.		
Reference level range	Preamplifier OFF: (Input ATT: 0 to 75 dB) Log: -64 to +65 dBm (0.1 dB step) Linear: 141.1 μ V to 397.63 V Preamplifier ON: (Input ATT: 0 to 30 dB) Log: -82 to +10 dBm (0.1 dB step) Linear: 17.76 μ V to 707.1 mV		
Input ATT range:	0 to 75 dB (5 dB step)		
Dynamic range			
Average noise level:	RBW 1 kHz, VBW 10 Hz, input ATT 0 dB, f ≥ 10 MHz Preamplifier OFF*1: Band 0: -117 dBm + 2f (GHz) dB Band 1-: -115 dBm + 0.5f (GHz) dB Band 1+: -115 dBm + 0.5f (GHz) dB Preamplifier ON: -132 dBm + 3f (GHz) dBm (at 1 MHz to 3.3 GHz)		
1 dB gain compression:	f ≥ 200 MHz Preamplifier OFF: > 0 dBm (mixer input level) Preamplifier ON: > -25 dBm (RF input level)		
Spurious response:	Preamplifier OFF		
2nd-order harmonic distortion:	Frequency range	Mixer input	Distortion level
	100 MHz \leq f < 800 MHz	-30 dBm	≤ -70 dBc
	f ≥ 800 MHz (Band 0)	-30 dBm	≤ -80 dBc
	f ≥ 3.3 GHz	-10 dBm	≤ -100 dBc
2 signal 3rd-order intermodulation distortion:	≤ -80 dBc (Mixer input -30 dBm, f ≥ 200 MHz, Offset > 50 kHz)		
Image/multiple/outband response:	≤ 70 dBc		

Residual response:	When input ATT 0 dB, 50 Ω terminated
Preamplifier OFF:	≤ -100 dBm (1 MHz to 3.3 GHz) ≤ -90 dBm (> 3.3 GHz)
Preamplifier ON:	≤ -105 dBm (1 MHz to 3.3 GHz)

Amplitude accuracy

Frequency response:	After auto calibration Preselector peak After adjustment at ATT = 10 dB
Preamplifier OFF:	$\leq \pm 0.5$ dB (100 kHz to 3 GHz)*2 $\leq \pm 2$ dB (9 kHz to 3.3 GHz) $\leq \pm 2$ dB (3.2 to 8 GHz)
Preamplifier ON:	$\leq \pm 1$ dB (100 kHz to 2.7 GHz) $\leq \pm 2$ dB (9 kHz to 3.3 GHz)
Calibration signal level accuracy:	-20 dBm ± 0.3 dB
IF gain error:	After auto calibration $< \pm 0.5$ dB
Scale indication accuracy:	After auto calibration
Log:	$\leq \pm 1.5$ dB/80 dB $\leq \pm 1$ dB/10 dB $\leq \pm 0.2$ dB/1 dB
Linear:	$\pm 5\%$ of reference level
Input ATT switching error:	$\leq \pm 0.3$ dB (for 0 to 50 dB, with reference to 30 MHz/10 dB)
Resolution bandwidth switching level error:	After auto calibration $< \pm 0.5$ dB
Total level accuracy:	± 1.5 dB (REF = -50 to 0 dBm, ATT = 10 dB, 2 dB/div, RBW = 300 kHz, f = 100 kHz to 3 GHz, after auto calibration)
Sweep	
Sweep time:	20 ms to 1000 s, 50 μ s to 1s (Option 29, zero span)
Accuracy:	$< \pm 2\%$
Trigger mode:	FREE RUN, LINE, VIDEO, EXT, TV,
Sweep mode:	REPEAT, SINGLE

I/O

RF input	
Connector:	N type female
Impedance:	50 Ω (nominal)
VSWR	
Preamplifier OFF:	$< 2:1$ (9 kHz to 3.3 GHz) $< 2:1$ (3.2 to 8 GHz) Input ATT = 10 to 75 dB
Preamplifier ON:	$< 2.5:1$ (9 kHz to 3.3 GHz)
Probe power:	± 12 V, 4-pin connector
Calibration output signal:	BNC female, 50 Ω (nominal) 30 MHz, -20 dBm
10 MHz reference input:	BNC female, 500 Ω (nominal) -10 to +10 dBm
External trigger input:	BNC female
Sound output (demodulated audio):	Small monophonic jack
GPIO interface:	IEEE-488 BUS connector
RS232 interface:	D-sub 9-pin
Printer interface:	D-sub 25-pin, ESC/P, ESC/P-R, PCL
Video output:	VGA (15-pin, female)
Floppy disk:	3.5-inch, MS-DOS format

General specifications

Operating temperature:	0 to +50 °C, Relative humidity 85% or less (no dew condensation)
Storage temperature:	-20 to +60 °C, relative humidity 85% or less
Power supply:	100/200 VAC auto-switchable 100 VAC: 100 to 120 VAC, 50 to 60 Hz 200 VAC: 200 to 240 VAC, 50 to 60 Hz
Power consumption:	200 VA or less
Dimensions:	Approx. 424 (W) x 177 (H) x 300 (D) mm (excluding feet and connectors)
Mass:	15 kg or less (excluding options, cover, and accessories)

*1 Temperature range at 20 to 30°C 2 dB is added in the range of 0 to 50°C

*2 Temperature range at 20 to 30°C 0.5 dB is added in the range of 0 to 50°C

Options

OPT.73 Wide-range FM demodulation

Measuring amplitude range: > -50 dBm + input attenuation value
(at center frequency 1 GHz, RBW Wide,
-20 dB or more than reference level)

FM Deviation

Measuring range 2.5 MHz, 1 MHz, 500 kHz, 250 kHz, 100 kHz,
50 kHz, 25 kHz, 10 kHz
Linearity error*: \leq (2 % of measuring range)
Offset error*: \leq (4 % of measuring range + K + Readout of
frequency x Frequency reference accuracy)
K: 8 kHz (measuring range 2.5 MHz to 250 kHz)
2 kHz (measuring range 100 kHz to 10 kHz)

Demodulation frequency
bandwidth (3 dB): \leq 300 kHz (nominal)

** These errors are values obtained by executing "FM Demod ALL CAL" software,
after warming up the R3132/3132N/3162 for 30 minutes or more.*

OPT.74 Tracking generator

Frequency range: 100 kHz to 3.0 GHz
Output level range: 0 to -59.9 dBm
Output level accuracy: \pm 0.5 dB (30 MHz, -10 dBm, 20 to 30°C)
Output level flatness: \pm 1.0 dB (100 kHz to 1 GHz)
 \pm 1.5 dB (100 kHz to 3 GHz)
(-10 dBm, 30 MHz reference)

Spurious

Harmonics: \leq -20 dBc (output level = -10 dBm)
Non-harmonics: \leq -30 dBc (output level = -10 dBm)

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