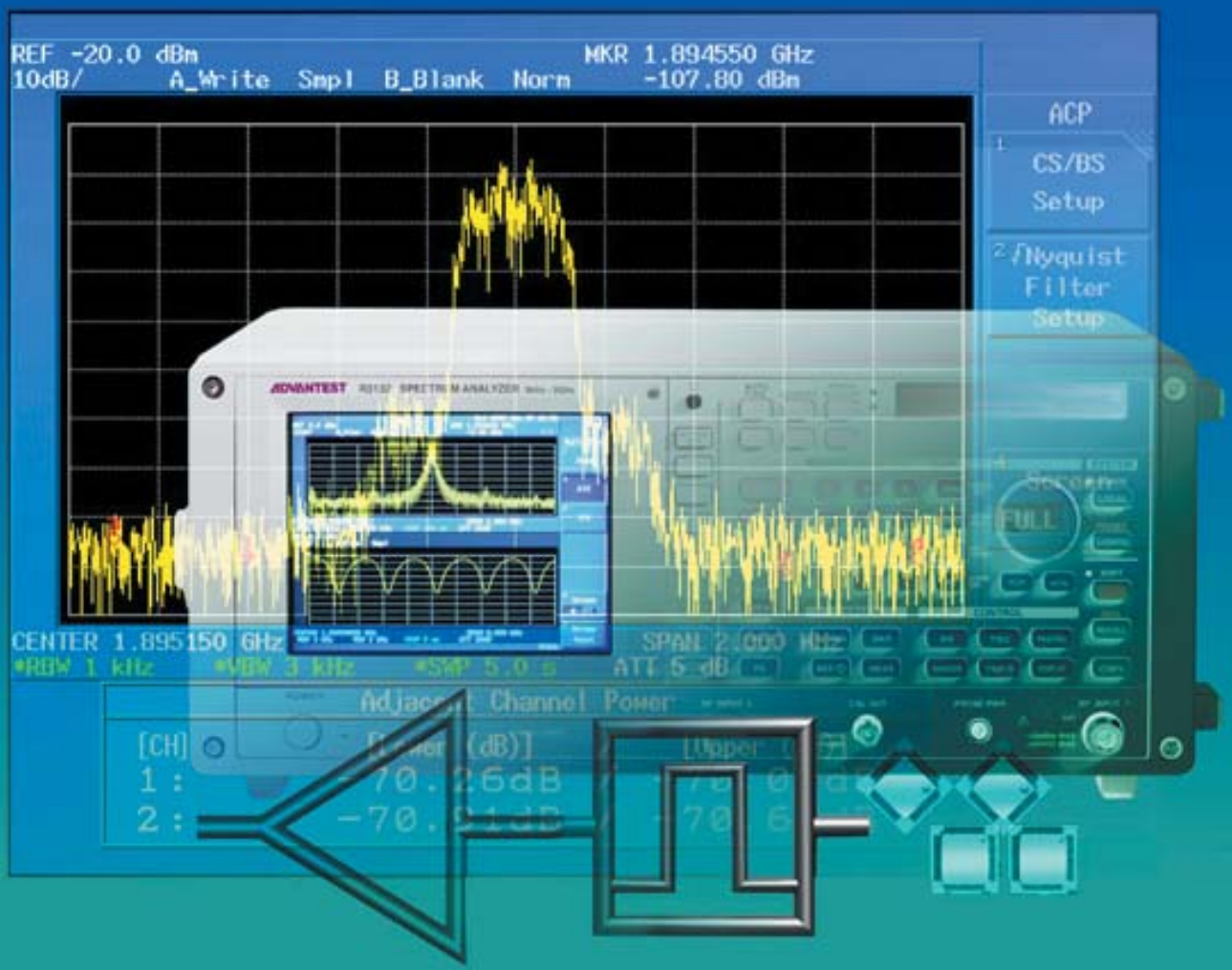
ADVANTEST

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 ±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 distor-tion 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: ≤ ±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 ≤ 2.6 GHz)
Overall level accuracy: ±1.5 dB

Faster, more real-time analyses

Refresh rate: 20 traces/second (Typical)
50 µs 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)

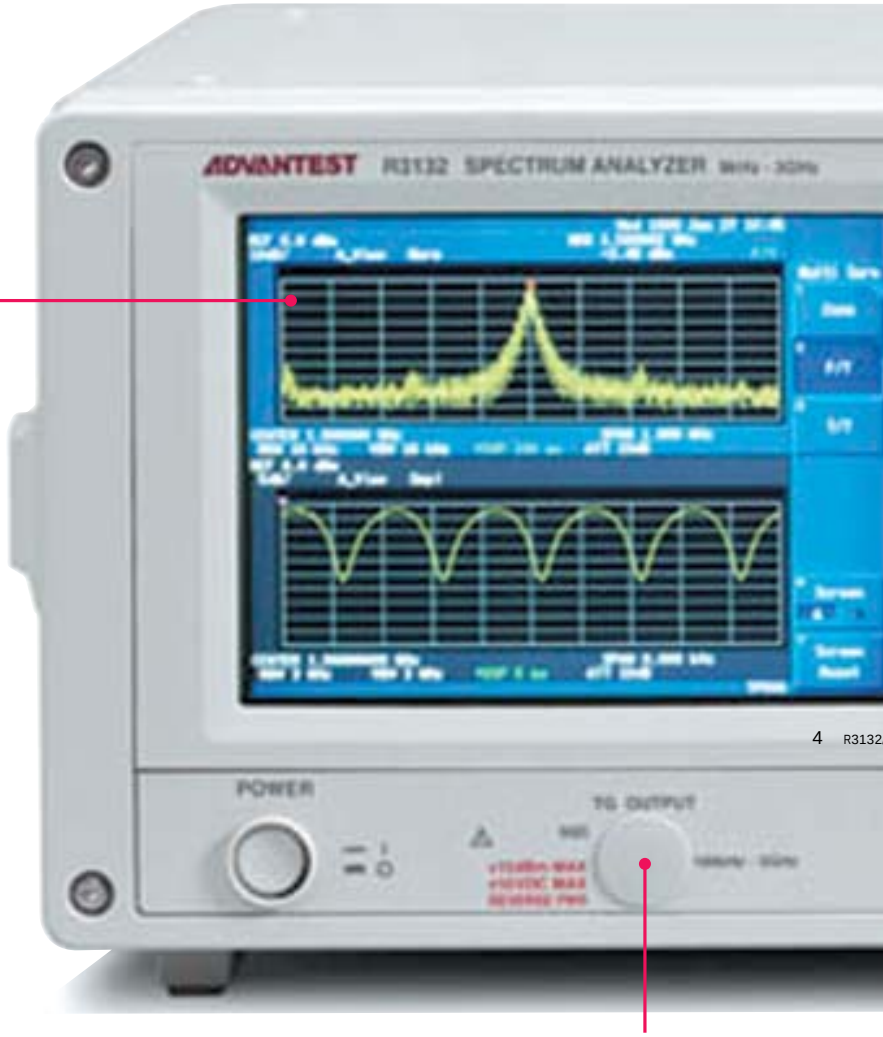
OPT.29 **Time-domain high-speed sweep Option**
Maximum sweep time setting up to 50 μs

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/75Ω)

Panels Designed for Maximum Ease of Use

Soft menu setup

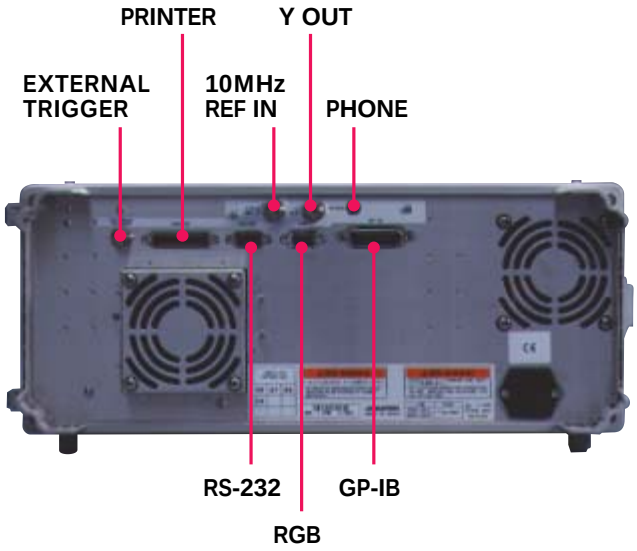


6.5-inch color LCD screen

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.

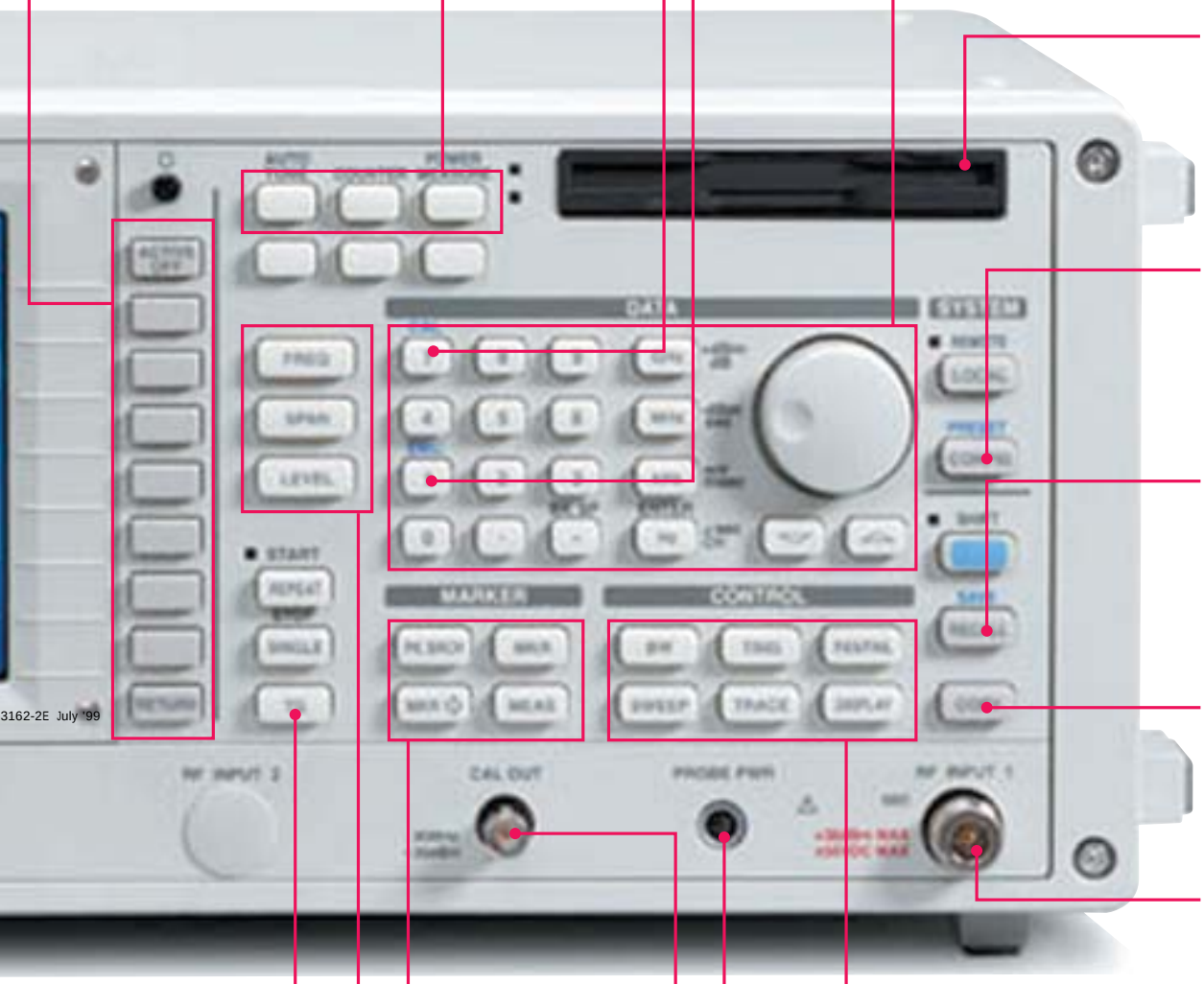


Special-purpose function keys
Function keys dedicated to Auto-TUNE, Frequency counter, and Power measurement enable users to launch measurement in a single key touch operation.

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.

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.

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

CAL OUT
Generates 30 MHz calibration signal.

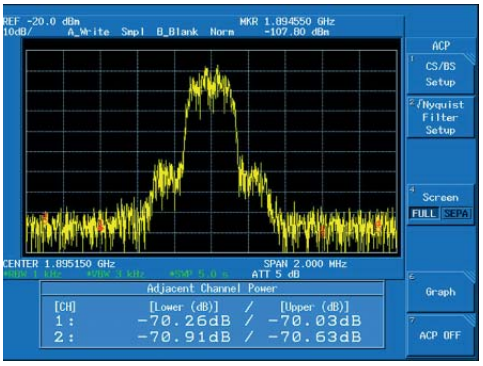
Enhanced Basic Performance

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

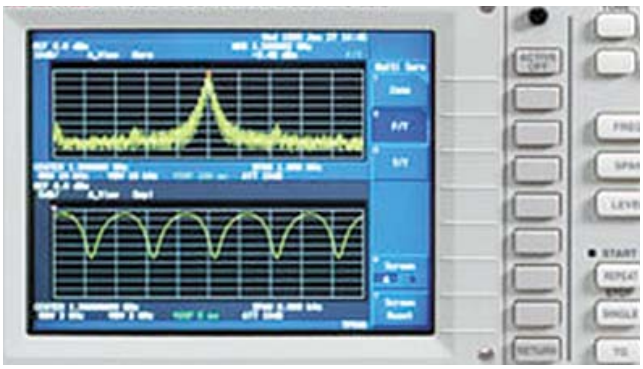
A newly developed synthesized local oscillator helps the instruments achieve frequency sweeps with a frequency span accuracy of ±1% or less. Keeping in pace with better frequency reading accuracy, the adjacent channel leakage power and occupied bandwidth measurement functions can now be measured with 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.

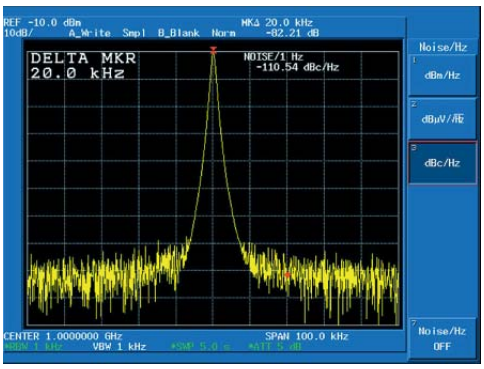


Frequency/Time Display

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 neighbor-ing characteristics of signals of interest.

**1: f ≤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 ≥200 MHz.*
**2: -30 dBm mixer input, f ≥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.*

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 transfered 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.

FD-based data editing/management

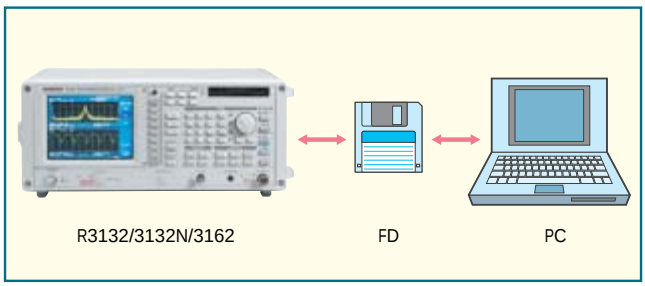
Measurement results can be written to internal save memory as trace data and can be recalled later together with the associated measurement conditions. Likewise, data saved to an FD can not only be recalled in the R3132/3132N/3162 but can also be accessed from a PC for reference.

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.

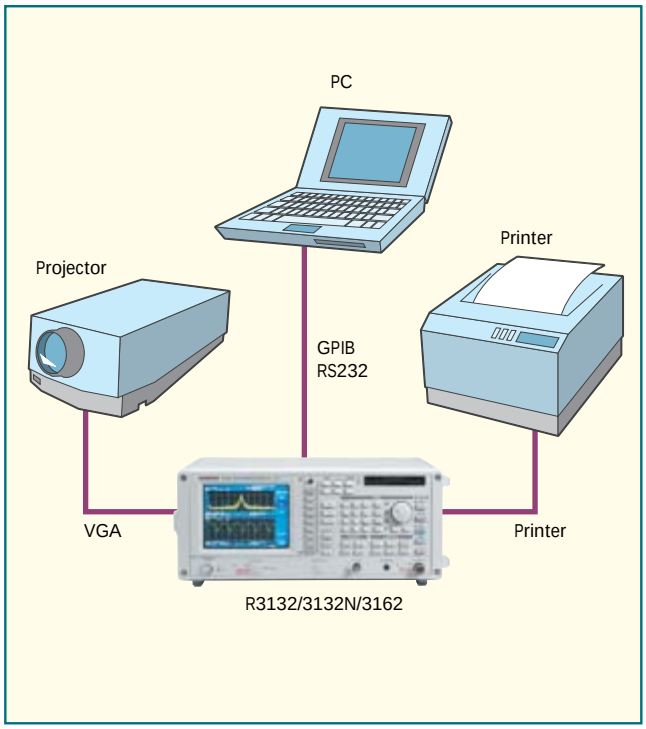
COPY Bitmap format

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.



Various I/O interfaces

GPIB, 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.



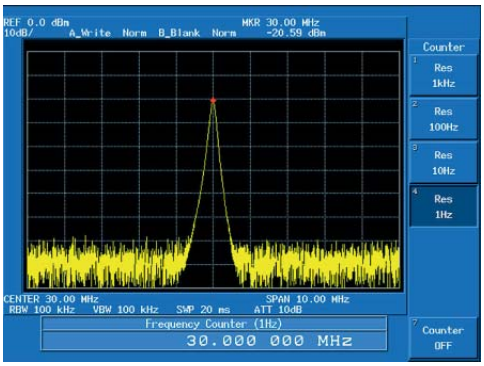
Single Key Touch Operations for Greater Ease of Operation

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.

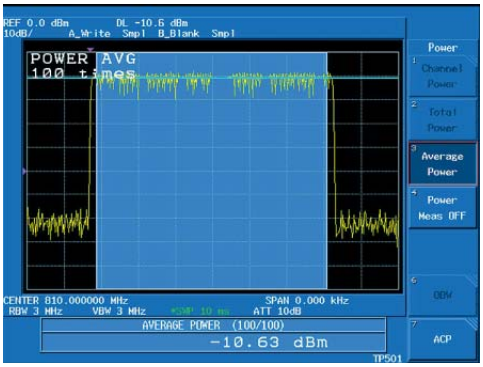
Frequency Counter

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

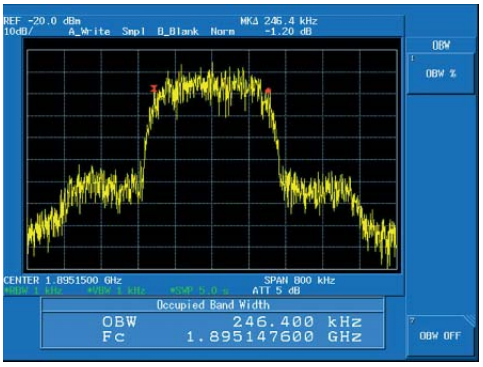
This function is useful for digital mobile communications measurement applications. Measurements made easy by this function include channel power measurement, which measures the power of signals diffused over a wide band, as in CDMA or OFDM, and average power measurement, which measures signals having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



Average Power

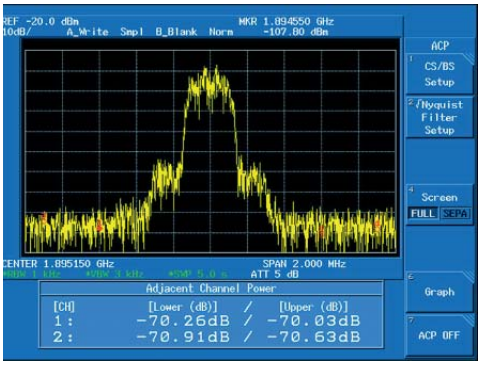
Occupied bandwidth (OBW)

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.



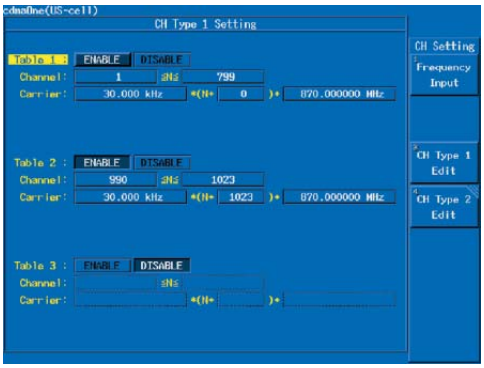
ACP measurement

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.

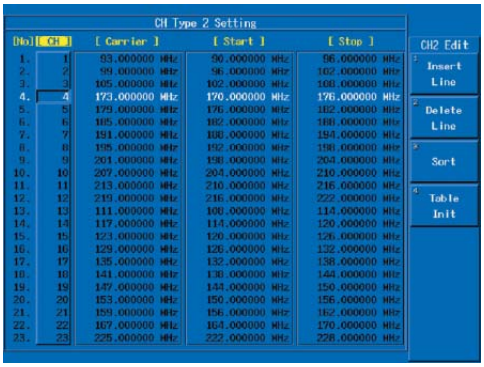
CH Type 1: for mobile communications

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



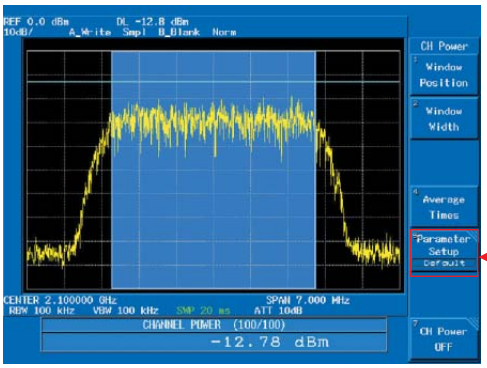
CH Type 2: for TV and CATV

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



One key measurement

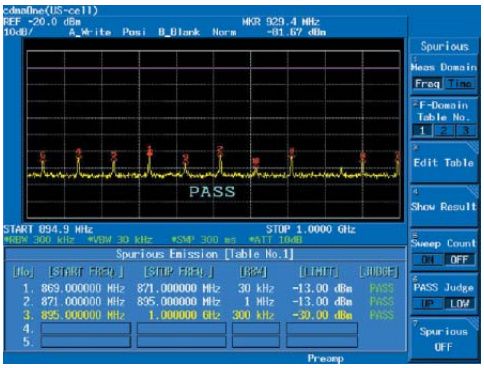
Different parameter setup can be registered for OBW/ACP/CH POWER/SPECTRUM MASK measurement, respectively. Pressing an each function key reproduces independent measurement parameter setup. These function can be measured without any parameter setup.



Default registering key

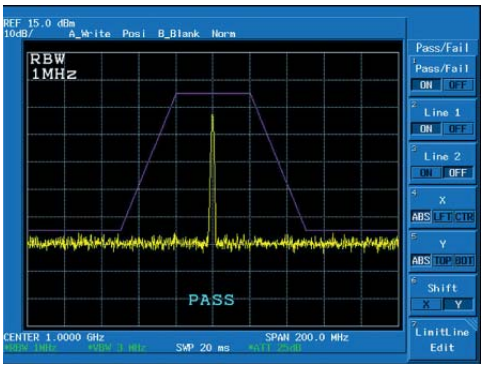
Spurious measurement function

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 setup 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.



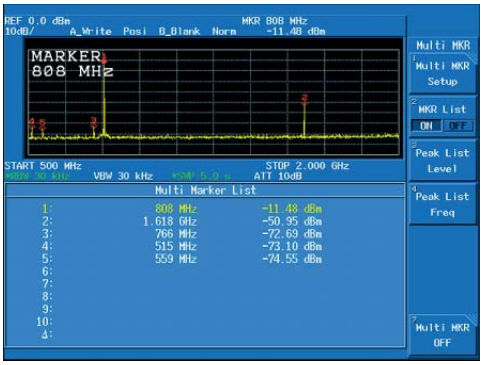
Multiscreen

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)

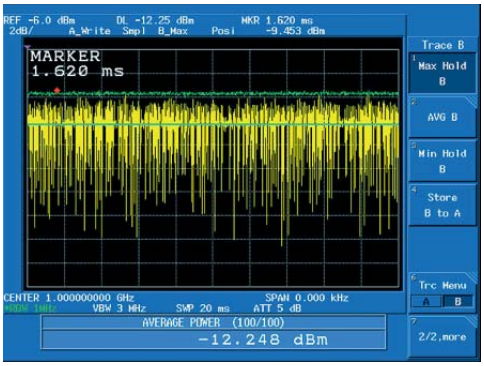
Multimarker

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.



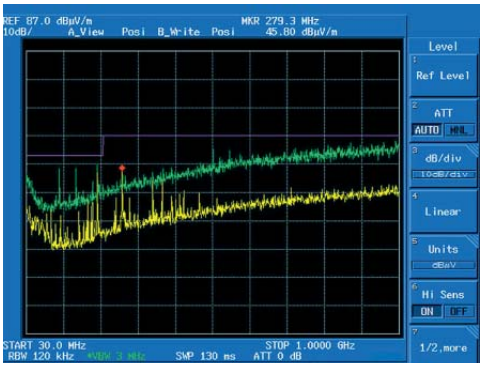
Multitrace

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 dBμV/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.

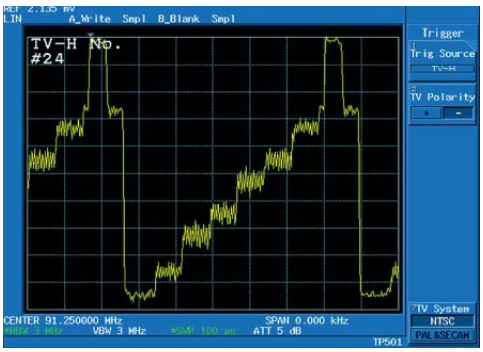


Gated sweep

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

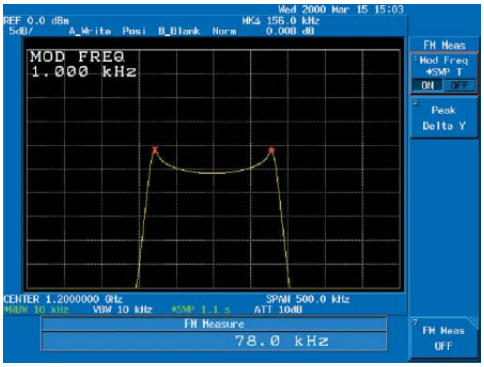
FREE RUN, LINE, VIDEO, TV, and EXT are selectable as sweep trigger sources. A positive or negative delay time can be set for a trigger point in a time-domain sweep.



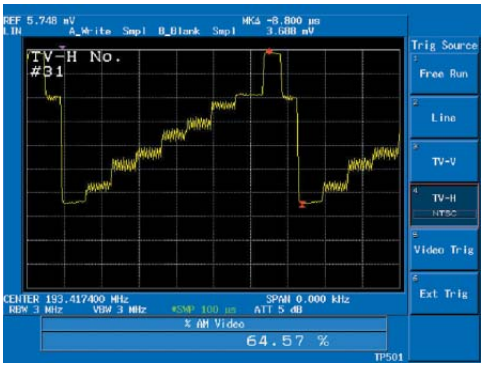
TV trigger

Versatile measurement functions

MEAS key supports Noise/Hz measurements, %AM/%AM Video/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

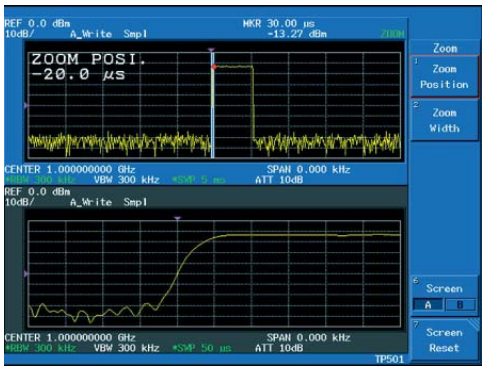
Crystal oscillator options with frequency stabilities of ±2 x 10^{-8}/day and ±1 x 10^{-7}/year are available for enhanced frequency reading accuracy and frequency counter accuracy.

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.

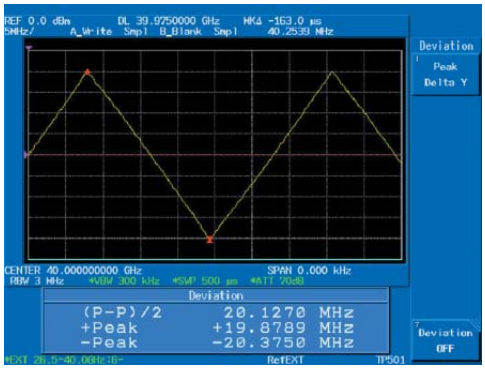
OPT.29 Time-domain high-speed sweeps

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

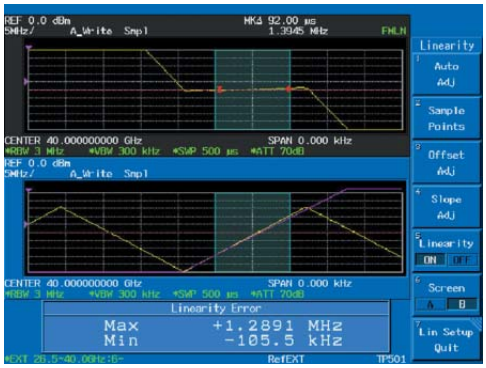


OPT.73 Wide-range FM demodulation

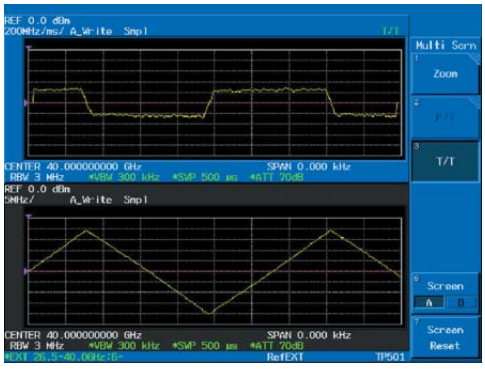
Devices such as a collision avoidance radar for preventing a collision between a car and another in front, which are installed in Intelligent Transport Systems (ITS), utilize an FM modulation in which the frequency deviation is very wide. The R3132/3132N/3162 can measure FM deviation widths up to 500 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



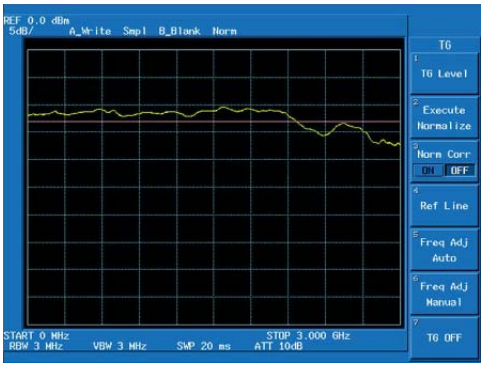
Example of Measuring Linearity



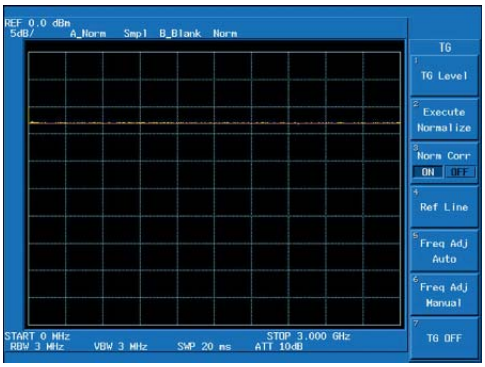
Example of Measuring Sensitivity

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 fre-quency 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.

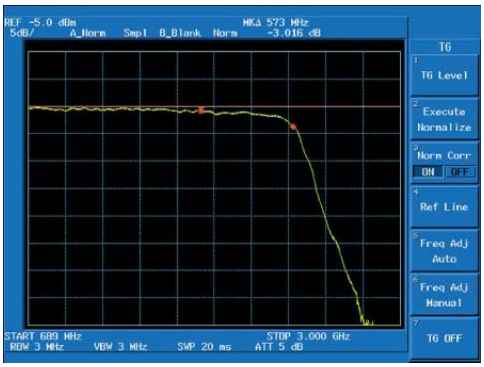


Normalization OFF



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)	± (Reading of frequency x Frequency reference accuracy + Span x 1% + RBW x 15% + 60 Hz)
Counter	
Resolution:	1 Hz to 1 kHz
Accuracy:	± (Marker frequency x Frequency reference accuracy + 1LSD) (S/N ≥ 25 dB, span ≤ 200 MHz)
Frequency reference accuracy	
Stability:	±2 x 10^{-6}/year, ±1 x 10^{-7}/year (Option 20) ±1 x 10^{-5} (0 to 50 °C), ±2 x 10^{-8}/day (Option 20)
Frequency span	
Range:	1 kHz to 3 GHz, 0 Hz (zero span)
Accuracy:	≤ ±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:	< ±20%, 1 kHz to 1 MHz < ±25%, 3 MHz < ±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 µV to 22.36 V
Preamplifier ON:	(Input ATT: 0 to 30 dB)
Log:	-82 to +10 dBm (0.1 dB step)
Linear:	17.76 µV to 707.1 mV
Input ATT range:	0 to 50 dB (5 dB step)

Dynamic range

Average nose 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 ≤ f < 800MHz) ≤ -80 dBc(f ≤ 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:	≤ ±0.5 dB (100 kHz to 3 GHz)*2 ≤ ±2 dB (9 kHz to 3 GHz)
Preamplifier ON:	≤ ±1 dB (100 kHz to 2.7 GHz) ≤ ±2 dB (9 kHz to 3 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:	≤ ±1.5 dB/80 dB ≤ ±1dB/10 dB ≤ ±0.2 dB/1 dB
Linear:	±5% of reference level
Input ATT switching error:	≤ ±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 = -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 µs to 1s (Option 29, zero span)
Accuracy:	< ±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)	±(Reading of frequency x Frequency reference accuracy + Span x 1% + RBW x 15% + 60 Hz)
Counter	
Resolution:	1 Hz to 1 kHz
Accuracy:	±(Marker frequency x Frequency reference accuracy + 1LSD) (S/N ≥25 dB, span ≤200 MHz)
Frequency reference accuracy	
Stability:	±2 x 10^{-6}/year, ±1 x 10^{-7}/year (Option 20) ±1 x 10^{-5} (0 to 50°C), ±2 x 10^{-8}/day (Option 20)
Frequency span	
Range:	1 kHz to 3 GHz, 0 Hz (zero span)
Accuracy:	≤±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:	<±20%, 1 kHz to 1 MHz <±25%, 3 MHz <±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 dBµV to average noise level
Maximum input level (Input ATT ≥10 dB)	
Preamplifier OFF:	+134 dBµV, ±50 VDC max.
Preamplifier ON:	+120 dBµV, ±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:	+44.8 dBµV to +148.8 dBµV (0.1 dB step)
Linear:	172.8 µV to 27.39 V
Preamplifier ON:	(Input ATT: 0 to 30 dB)
Log:	+26.8 dBµV to +118.8 dBµV (0.1 dB step)
Linear:	21.75 µV to 866 mV
Input ATT range:	0 to 50 dB (5 dB step)

Dynamic range

Average nose level:	RBW 1 kHz, VBW 10 Hz, input ATT 0 dB, f ≥10 MHz
Preamplifier OFF:	-6 dBµV + 2f (GHz) dB*1
Preamplifier ON:	-21 dBµV + 3f (GHz) dB
1 dB gain compression:	f ≥200 MHz
Preamplifier OFF:	> +107 dBµV (mixer input level)
Preamplifier ON:	> +82 dBµV (RF input level)
Spurious response:	Preamplifier OFF, Mixer input +77 dBµV
2nd-order harmonic distortion:	≤-70 dBc (100 MHz ≤ f <800MHz) ≤-80 dBc (f ≤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:	≤ +7 dBµV
Preamplifier ON:	≤ +2 dBµV

Amplitude accuracy

Frequency response:	After auto calibration at ATT = 10 dB
Preamplifier OFF:	≤±0.5 dB (100 kHz to 2.2 GHz)*2 ≤±2 dB (9 kHz to 2.2 GHz)
Preamplifier ON:	≤±1 dB (100 kHz to 2.2 GHz) ≤±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:	≤±1.5 dB/80 dB ≤±1dB/10 dB ≤±0.2 dB/1 dB
Linear:	±5% of reference level
Input ATT switching error:	≤±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 dBµV, ATT = 10 dB, 2 dB/div, RBW = 300 kHz, 100 kHz < f ≤2.2GHz after auto calibration)

Sweep

Sweep time:	20 ms to 1000 s, 50 µs to 1s (Option 29, zero span)
Accuracy:	<±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
Preamplifier ON:	<2.5:1 (9 kHz to 2.2 GHz)
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
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)

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, marker frequency)	±(Reading of frequency x Frequency reference accuracy + Span x 1% + RBW x 15% + 60 Hz)
Counter	
Resolution:	1 Hz to 1 kHz
Accuracy:	±(Marker frequency x Frequency reference accuracy + 1LSD) (S/N ≥ 25 dB, span ≤ 200 MHz)
Frequency reference accuracy	
Stability:	±2 x 10^{-6}/year, ±1 x 10^{-7}/year (Option 20) ±1 x 10^{-5} (0 to 50°C), ±2 x 10^{-8}/day (Option 20)
Frequency span	
Range:	1 kHz to 8 GHz, 0 Hz (zero span)
Accuracy:	≤ ±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:	< ±20%, 1 kHz to 1 MHz < ±25%, 3 MHz < ±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 µV to 397.63 V
Preamplifier ON:	(Input ATT: 0 to 30 dB)
Log:	-82 to +10 dBm (0.1 dB step)
Linear:	17.76 µV to 707.1 mV
Input ATT range:	0 to 75 dB (5 dB step)

Dynamic range

Average nose 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 ≤ 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, 50Ω 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:	≤ ±0.5 dB (100 kHz to 3 GHz)*2 ≤ ±2 dB (9 kHz to 3.3 GHz) ≤ ±2 dB (3.2 to 8 GHz)
Preamplifier ON:	≤ ±1 dB (100 kHz to 2.7 GHz) ≤ ±2 dB (9 kHz to 3.3 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:	≤ ±1.5 dB/80 dB ≤ ±1 dB/10 dB ≤ ±0.2 dB/1 dB
Linear:	±5% of reference level
Input ATT switching error:	≤ ±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 = -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 µs to 1s (Option 29, zero span)
Accuracy:	< ±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
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 H
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*:	**≤ (2 % of measuring range)**
Offset error*:	**≤ (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):	**≤ 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:	**± 0.5 dB (30 MHz, -10 dBm, 20 to 30°C)**
Output level flatness:	**± 1.0 dB (100 kHz to 1 GHz) ± 1.5 dB (100 kHz to 3 GHz) (-10 dBm, 30 MHz reference)**
Spurious	
Harmonics:	**≤ -20 dBc (output level = -10 dBm)**
Non-harmonics:	**≤ -30 dBc (output level = -10 dBm)**

Specifications may change without notification.

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