

ADVANTEST

R3131
Spectrum Analyzer

A personal spectrum analyzer utilized
in diverse applications



R3131



R3131

The R3131 is an easy-to-use personal spectrum analyzer which combines high accuracy necessary for digital radio measurement with excellent operability and usability.

The R3131 can be used in diverse fields, for a multitude of applications.



Front Panel Layout

Common Keys

Auto Tune, counter and power measurements made simple by these keys.

Data Entry Keys

The data entry keys arranged together with the FREQ, SPAN, and LEVEL basic functions improves operability.

Floppy Disk Drive

Measurement parameters and results can be recorded on a 3.5-inch floppy disk. Because the bit map and text formats are compatible, the recorded data can easily be transferred to a PC.



5.7-inch B/W STN Display

Marker Keys

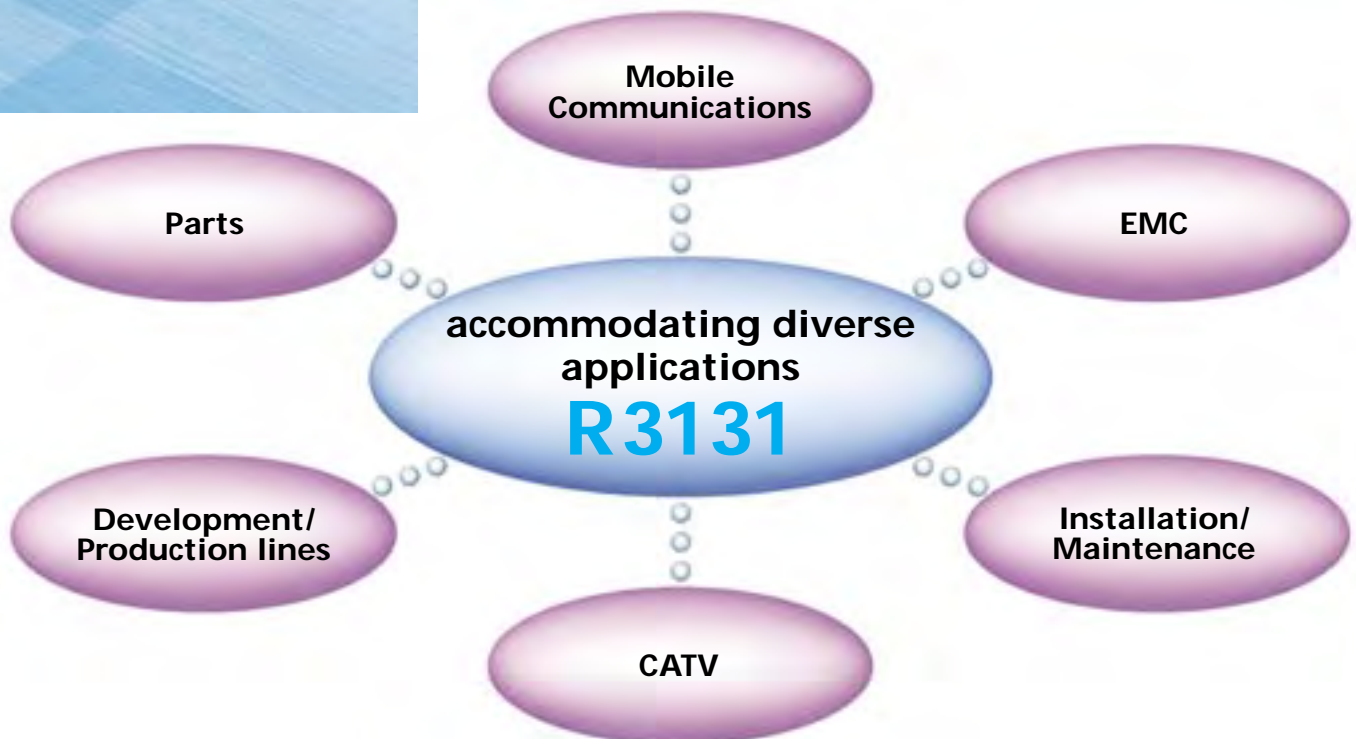
Various marker functions like delta marker and peak search function are available.

Control Keys

For setting bandwidth, sweep and various parameters, R3131 meets to all the measurements.

Features

- Built-in high accuracy OBW, ACP, and Power measurement functions which can be applied to digital radio measurement
 - Frequency stabilization
 - Improved SPAN accuracy
 - Improved level accuracy
- Improved ease of use through Auto TUNE function
- Total level accuracy guaranteed by Auto CAL function
- Standard interfaces: GPIB, RS232C, Centronics, and FD drive
- Large character display allows results to be seen
- Substantial EMC measurement function
- Improved system operation speed
- Operation key arrangement for ease of use
- Compact and light weight (12kg) with a space-saving design
- High performance realized within an economical platform
- Tracking generator option (OPT.74)



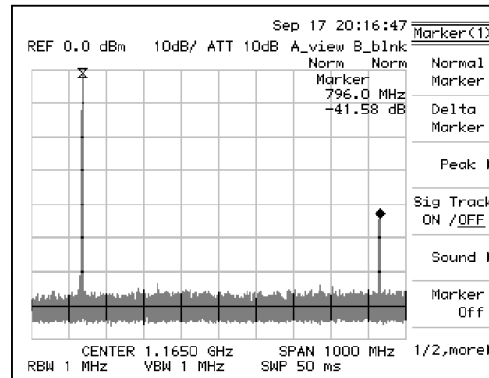
Independent operation keys improve operability

AUTO TUNE



AUTO TUNE

Searches for the signal with the maximum level within the 3 GHz band and sets the center frequency automatically. Then, reproduces the setting which existed immediately before execution of AUTO TUNE, allowing observation under the same measurement conditions.

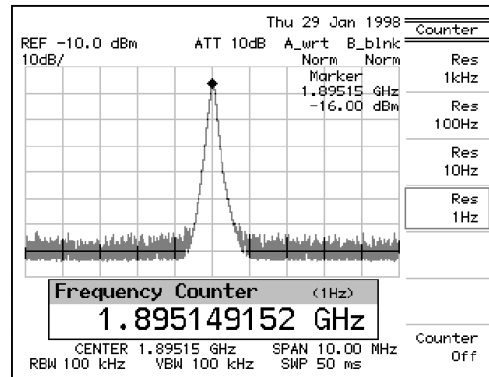


COUNTER



COUNTER

Performs frequency measurement with the built-in frequency counter simply by moving the marker to the signal. You can select a measurement resolution from 1 Hz up to 1 kHz. The measurement results are displayed with enlarged characters, for easy viewing.

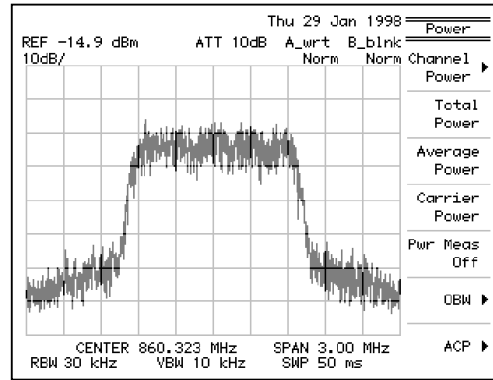


POWER MEASURE



POWER MEASURE

The R3131 can measure the power within the specified band of frequency diffuse signals and the total power of multi-carrier signals. It can also be used to measure the occupied frequency bandwidth (OBW) and adjacent channel leakage power (ACP) which are essential to transmission characteristics testing for radio equipment.

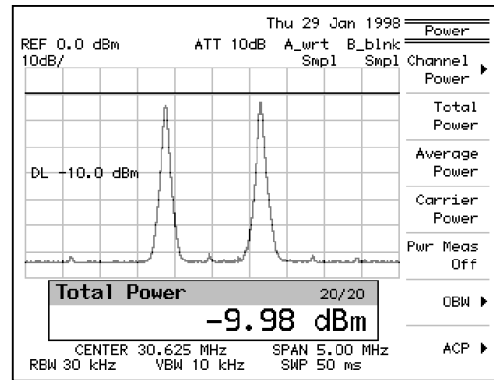
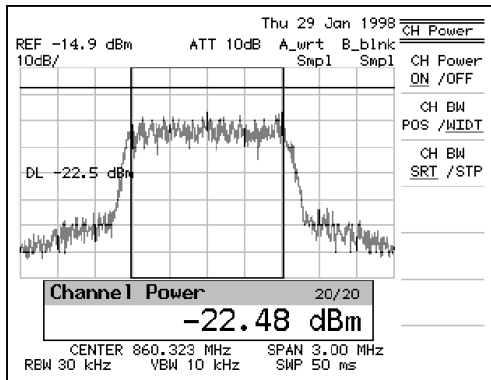


Channel Power

The R3131 allows you to measure the total power within the window and display it as the channel power simply by setting the measurement window to the specified occupied bandwidth.

Total Power

Obtains the total power from the spectrum displayed on the screen. This function is useful for total power measurement of multi-carrier signals.

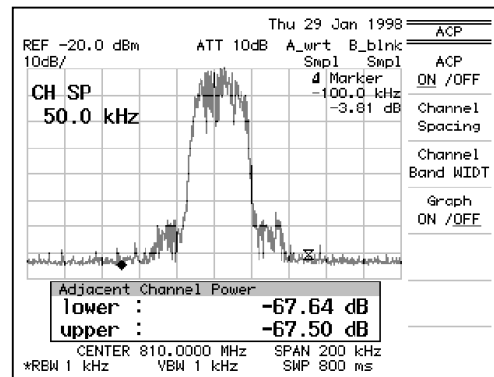
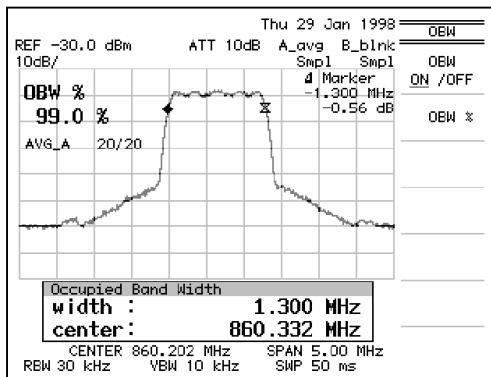


OBW

Measures the frequency band which contains 99% of the total power of the spectrum displayed on the screen. In addition, the % value of OBW can be set to any desired value.

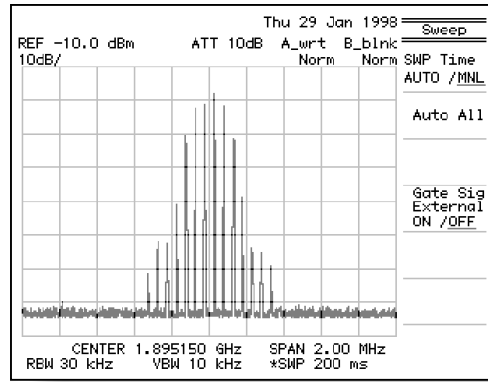
ACP

The measurement results can be displayed in graphical form, including the upper and lower point data offset from the carrier and the leakage power values at all the displayed frequency points.

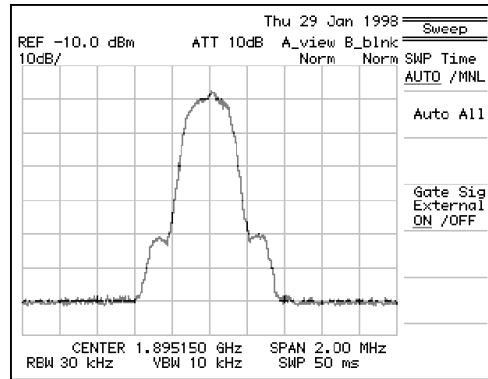


GATED SWEEP

Burst signals could not directly be observed with former spectrum analyzers. The R3131 allows spectrum analysis of the burst signal by supplying a trigger signal synchronizing with the burst transmission.



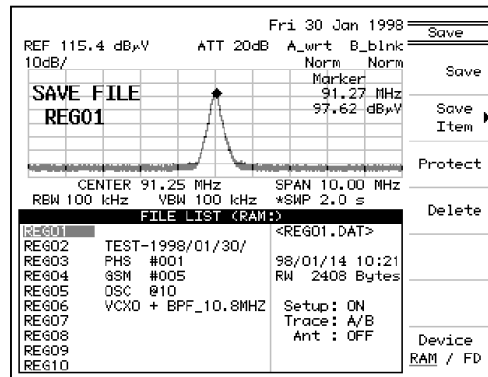
GATED SWEEP OFF



GATED SWEEP ON

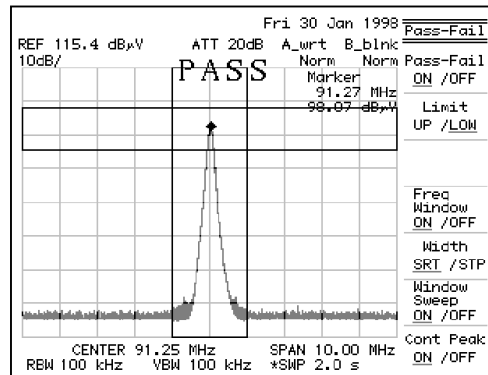
SAVE/RECALL

The R3131 allows you to store and recall measured waveform data and measurement conditions. The R3131 unit offers up to 10 dedicated files for storage. In addition, the built-in standard floppy disk drive allows, you to store them on MS-DOS formatted floppy disks.



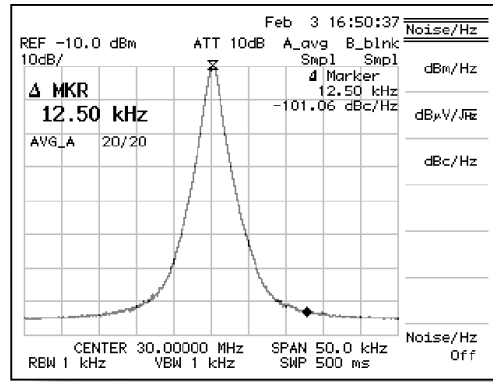
PASS/FAIL

Sets the limited judgment value for the level axis using a window. If the marker falls within the window, the PASS judgment results; otherwise, the FAIL judgment results. Since the limit value is set as an absolute value, you can make measurement with the same judgment value with different REF levels. In addition, by setting the limit window for the frequency axis, the portion where the X and Y axes overlap is judged as the PASS region.



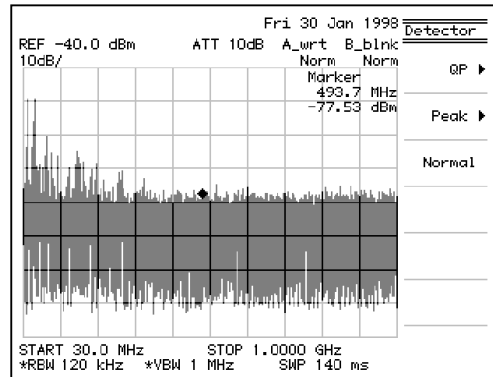
Diverse measurement functions

The MEAS key incorporates the XdB Down measurement function which is useful for noise measurement, AM modulation measurement, 2-signal 3rd-order distortion measurement, and filter cut-off frequency measurement. In noise measurement, bandwidth conversion can easily be made and the PBW calibration function for improvement of measurement accuracy is effective. The PBW calibration function is a new calibration function which performs correction, in power measurement, based on conversion of the R3131 resolution bandwidth filter to an ideal filter, thereby allowing measurement with higher accuracy.



EMC

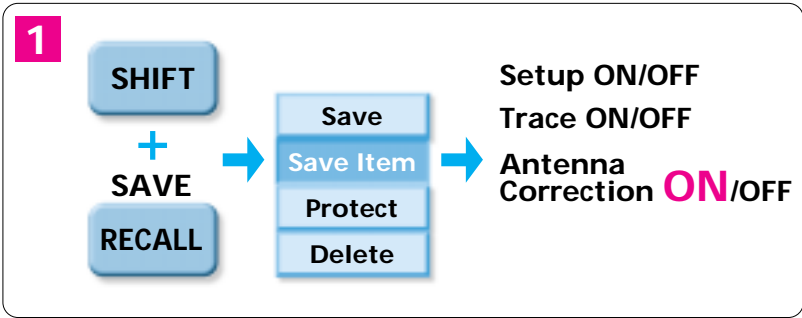
This function measures electromagnetic interference generated by various electronic equipment. This function incorporates the 9 kHz and 120 kHz RBW and QP detector conforming to the CISPR Pub.16-1 standard. In addition, using the AM/FM demodulation signal fed from the PHONE jack on the rear panel, you can identify broadcasting radio waves which act as external noise. Prior to measurement of noise emission on the approved site, this function is very useful for preparatory evaluation and solution.



Antenna and Level Correction Functions (EDIT of Corr.table is not performed by the R3131 unit.)

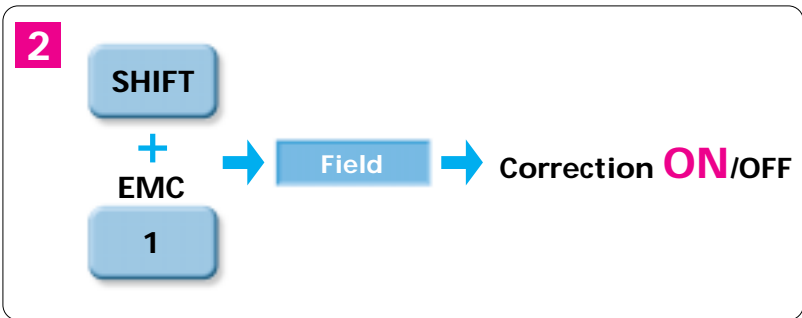
Various antenna correction factors provided by Advantest are built-in the R3131. Simply by selecting the Model name of the antenna, the level indication of the R3131 is calibrated to an absolute value, allowing you to read the value directly in unit

of $\text{dB}\mu/\text{m}$. When you use an antenna from other manufacturers, you can reflect its antenna correction factor in the level indication of the R3131 by performing steps **1** and **2** below.



1. Set Antenna Correction to ON and SAVE the file.
2. OPEN the file from the floppy disk using Excel on the PC.
3. Enter the frequency and correction level in the [ANT CORR] area and then overwrite it on the floppy disk.
4. Load the floppy disk in the R3131 and then RECALL the file. The Correction table is created.

MAX. 50 Points

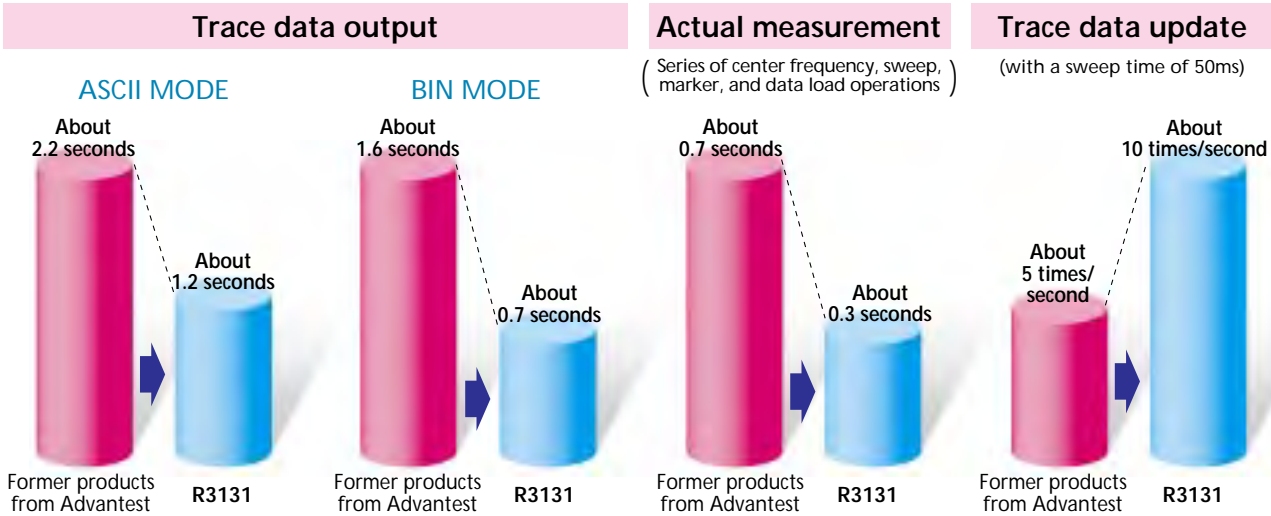


Set Correction to ON. The corrected data is reflected on the screen data.

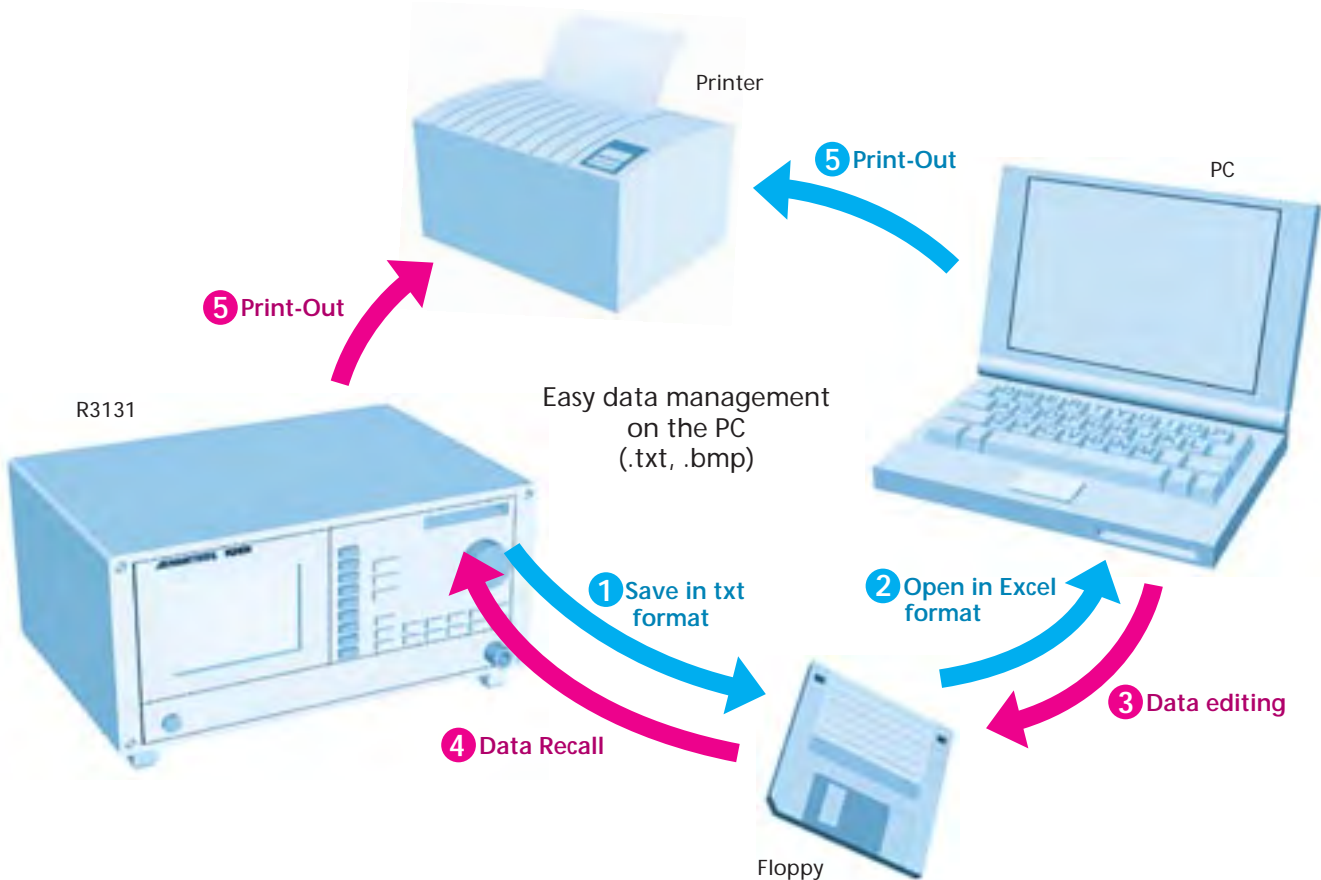
Improved system throughput

The throughput of production and adjustment lines is largely affected by the measurement time of measuring instruments and data transmission time. With newly developed internal processing technology, the R3131 has shortened the time necessary for GPIB control and data transmission by half or more in comparison with former products. In addition, by reducing the settling time of the local oscillator, the waveform update rate in unit time has been doubled.

(In either case, comparison is made under the same conditions.)

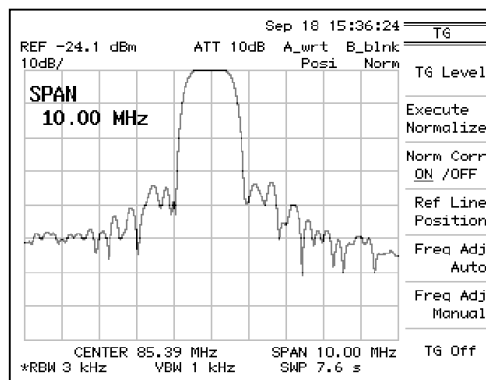


Use of Data Save/Recall of the R3131



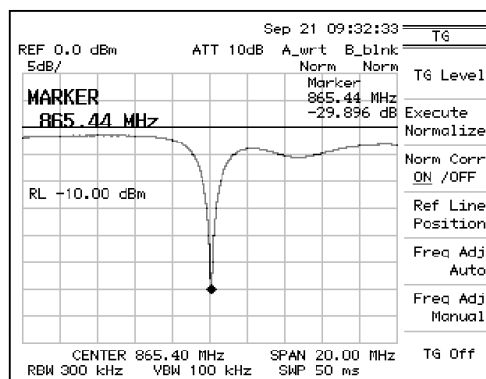
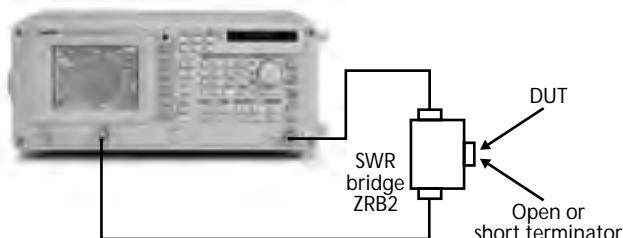
Tracking generator option (OPT.74)

The tracking generator (OPT.74) is a monoblock option which is integrated in R3131. It can generate constant level signal synchronized with sweep frequency in the frequency range up to 3 GHz and therefore can easily measure the frequency characteristic of object device. Besides, with the normalize function which cancels the frequency characteristic of measuring system, highly accurate measurement is possible. Because the output level can be set in a wide range (from 0 to -59.9 dBm, in 0.1 dB steps), it can be used to measure filter pass characteristic, cable loss, amplifier gain, etc.



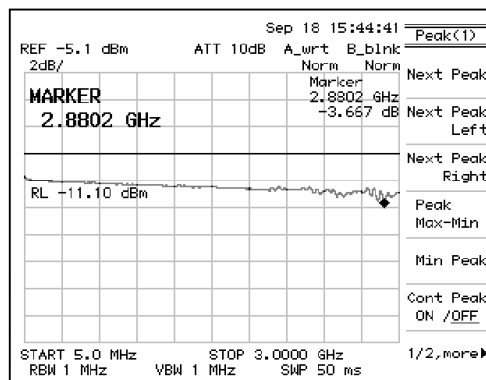
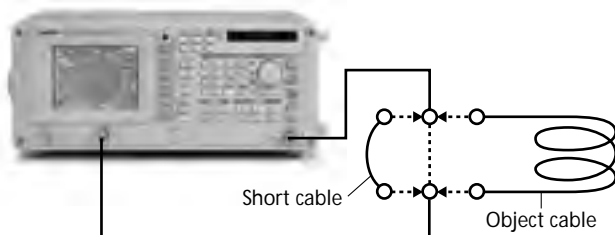
For the measurement of reflection characteristic

With the SWR bridge, the reflection characteristic of antennas and filters can be measured.



For the measurement of cable loss

With the short cable, the high-frequency loss characteristic of cable can be measured from the differential when the object cable is connected.



Specifications

Frequency

| | | |
|--------------------------------------|---|-----------|
| Range: | 9 kHz to 3 GHz | |
| Frequency reading accuracy: | \pm (Frequency reading x Frequency reference accuracy + Span x Span accuracy + 0.15 x Resolution bandwidth + 1 kHz) | |
| Marker counter accuracy: | \pm (Marker frequency x Frequency reference accuracy + 1 LSD) (S/N \geq 25 dB, SPAN \leq 200 MHz) | |
| Marker counter resolution: | 1 Hz to 1 kHz | |
| Frequency reference source accuracy: | \pm 2 ppm/year \pm 5 ppm at operating temperature range | |
| Frequency span: | zero, 50 kHz to 3 GHz | |
| Frequency span accuracy: | \leq \pm 3% | |
| Frequency stability | | |
| Residual FM: | \leq 100 Hz-p/100 ms (zero span) | |
| Sideband noise: | \leq 100 dBc/Hz (20 kHz offset) | |
| Resolution 3 dB bandwidth: | 1 kHz to 1 MHz | 1-3 step |
| Bandwidth accuracy: | \leq \pm 20% | |
| Selectivity: | \leq 15:1 (60 dB:3 dB) | |
| 6dB bandwidth: | 9 kHz, 120 kHz | |
| Video bandwidth: | 10 Hz to 1MHz | 1-10 step |

Amplitude

| | | |
|------------------------------|--------------------------------------|--|
| Amplitude measurement range: | +20 dBm to Average noise level | |
| Maximum input level: | +20 dBm, 50 VDC | |
| Display range | | |
| LOG: | 10 dB/div 8 div, 1,2,5 dB/div 10 div | |
| LIN: | 10%/div of reference level | |
| Reference level range | | |
| LOG: | -64 dBm to + 40 dBm | |
| LIN: | +141.1 μ V to + 22.36 V | |
| Input attenuator range: | 0 to 50 dB 10 dB step | |

Sweep

| | | |
|----------------------|----------------------------|--|
| Sweep time: | 50 ms to 500 s | |
| Sweep time accuracy: | \leq \pm 3% | |
| Trigger mode: | FREE RUN, VIDEO, EXT, LINE | |
| Sweep mode: | REPEAT, SINGLE | |

Dynamic range

| | | |
|--------------------------------|--|--|
| Average noise level: | -113 dBm +2 f (GHz) dB (at RBW 1 kHz, VBW 10 Hz, INPUT ATT 0 dB, frequency \geq 1 MHz) | |
| 1 dB gain compression: | $>$ -5 dBm (mixer input level, $f \geq$ 20 MHz) | |
| Secondary harmonic distortion: | \leq -70 dB (input frequency \geq 10 MHz, mixer input level -30 dBm) | |
| 3rd Order Intermodulation: | \leq -70 dB (input frequency \geq 10 MHz, mixer input level -30 dBm, $\Delta f >$ 50 kHz) | |
| Other input spurious: | \leq -60 dB (offset \geq 20 MHz, mixer input level -30 dBm) | |
| Residual response: | \leq -100 dBm (Frequency \geq 1 MHz, INPUT ATT = 0 dB, input 50 Ω terminated) | |

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Amplitude accuracy

| | | |
|--|---|--|
| Calibration signal: | 30 MHz, -20 dBm \pm 0.3 dB | |
| Frequency response: | \leq \pm 0.5 dB (100 kHz to 3 GHz, ATT = 10 dB) \leq \pm 1 dB (100 kHz to 2 GHz) \leq \pm 2 dB (9 kHz to 3 GHz) (after calibration at 30 MHz reference) | |
| Scale display accuracy | | |
| LOG: | \leq \pm 0.5 dB (0 to -20 dB) (after auto calibration) \leq \pm 1.5 dB/70 dB (after auto calibration) \leq \pm 1.0 dB/10 dB (after auto calibration) \leq \pm 0.2 dB/1 dB (after auto calibration) | |
| LIN: | \pm 5% of reference level | |
| Input attenuator switching accuracy: | \leq \pm 0.3 dB (10 dB reference, 30 MHz) | |
| Resolution bandwidth switching accuracy: | \leq \pm 0.5 dB (after auto calibration) | |
| IF gain error: | \leq \pm 0.5 dB (after auto calibration) | |
| Total level accuracy: | \pm 1.5 dB (after auto calibration, REF = -50 to 0 dBm, ATT = 10 dB, 2 dB/div, RBW = 300 kHz, $f >$ 100 kHz) | |

Input/output

| | | |
|-------------------------------|--|--|
| RF input connector/impedance: | N type jack/50 Ω (nominal) | |
| VSWR: | \leq 1.5 (100 kHz to 2 GHz, INPUT ATT \geq 10 dB) \leq 2.0 (9 kHz to 3 GHz, INPUT ATT \geq 10 dB) | |
| 10 MHz REF. input: | BNC jack, 50 Ω | |
| Input range: | -10 dBm to +10 dBm | |
| Ext. trigger input: | BNC jack, 10 k Ω (nominal), DC coupling | |
| Phone output: | Mini monophonic jack, 8 Ω | |
| GPIO interface: | IEEE-488 bus connector | |
| Serial interface: | D-SUB 9-pin | |
| Printer interface: | D-SUB 25-pin, ESC/P, PCL | |
| Floppy disk drive: | 3.5-inch, 1.4 Mbyte, MS-DOS format | |

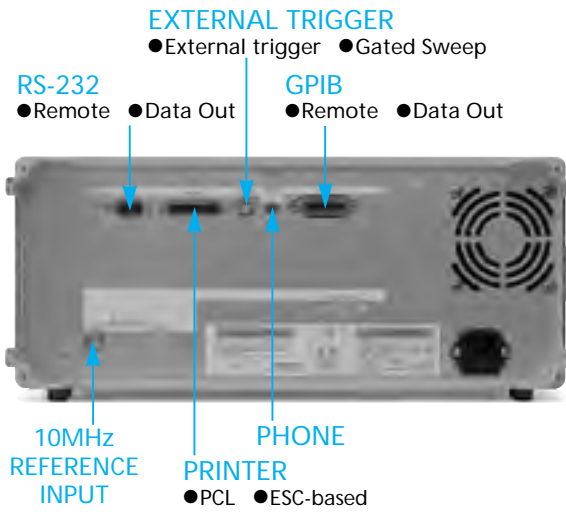
General specifications

| | | |
|-----------------------|---|--|
| Operating conditions: | 0°C to +50°C, 85%RH max. (without condensation) | |
| Storage conditions: | -20°C to + 60°C | |
| Power supply: | 100/200 VAC, auto switching 100 VAC ; 100 V to 120 V, 50 Hz/60 Hz 220 VAC ; 220 V to 240 V, 50 Hz/60 Hz | |
| Power consumption: | 200 VA max. (100 VAC) | |
| Weight: | 12 kg or less | |
| Dimensions: | Approx. 424 mm (W) x 177 mm (H) x 300 mm (D) | |

OPT.74 Tracking Generator

| | | |
|-------------------------------|---|--|
| Frequency range: | 100 kHz to 3.0 GHz | |
| Output level range: | 0 dBm to -59.9 dBm (0.1 dB step) | |
| Output level accuracy: | \leq \pm 0.5 dB (30 MHz, -10 dBm, 20°C to 30°C) | |
| Output level flatness: | at -10 dBm, referenced to 30 MHz \leq \pm 1.0 dB (100 kHz to 1.0 GHz) \leq \pm 1.5 dB (100 kHz to 3.0 GHz) | |
| Output level switching error: | at referenced to -10 dBm \leq \pm 1.0 dB (100 kHz to 1.0 GHz, output level \geq -30 dBm) \leq \pm 2.0 dB (100 kHz to 2.6 GHz) \leq \pm 3.0 dB (100 kHz to 3.0 GHz) | |
| Output spurious | | |
| Harmonic: | \leq -20 dBc (output level = -10 dBm) | |
| Non-harmonic: | \leq -30 dBc (output level = -10 dBm) | |

Rear panel



Applicable printer control code

- ESC/P
- ESC/P Raster
- HP PCL

Printers with the Centronics interface using the above commands as control codes can be used.

R3131 Spectrum Analyzer (OPT.74 Tracking generator option)



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