

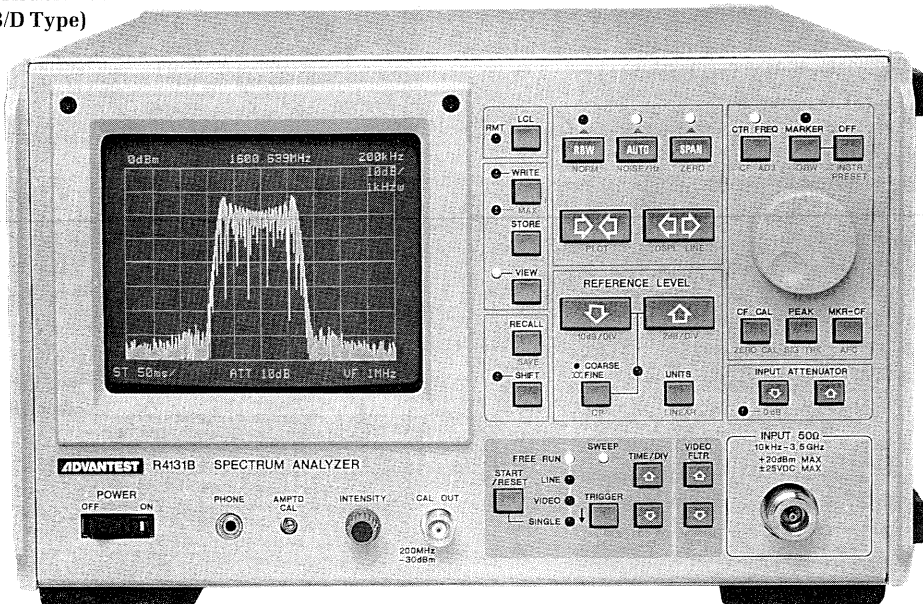
# Spectrum Analyzers

10 kHz to 3.5 GHz

## R4131 Series

**NEW** (R4131C/CN/D/DN)

- Excellent Skirt Characteristics:  $-80$  dBc
- Built-In AFC Function (B/D Type)
- Save/Recall Functions, Including Waveforms
- Auto-Recall Function



## R4131 Series Spectrum Analyzer

The R4131 Series incorporates the performance of the already-popular TR4131 Series of 3.5 GHz spectrum analyzers and provides additional features as well. Weighing just 10 kg (22 lbs), these analyzers have a measurement-condition memory function which includes waveforms, an auto-recall function which recalls measurement conditions when power is switched on and other features to simplify operation. In addition to these new features, these analyzers use the proven spectrum analysis expertise of ADVANTEST, with standard features of directly readable field strength measurements compensated for antenna calibration factor and quasipeak value measurements conforming to CISPR standards.

The R4131 series features a maximum input sensitivity of  $-116$  dBm, a dynamic range of 70 dB and a skirt characteristics of  $-80$  dBc or better.

Especially, the B type analyzer provides AFC (Automatic Frequency Control), enabling highly stable spectrum analysis.

The TR4153A/4153B and TR4154 Tracking Generators can be added to these analyzers to enable frequency-characteristic measurements with a wide dynamic range. For use in measuring systems, GPIB is as standard, as well as direct plotting and video output for use in system applications.

### ■ 10 kHz to 3.5 GHz Coverage in a 10 kg Package

The R4131, weighing just 10 kg, covers the wide frequency range of 10 kHz to 3.5 GHz, and is designed for both high performance and portability. The R4131 can be used in such diverse applications as 3rd harmonic measurements of 900 MHz-band mobile radio equipment, received field strength measurements of satellite broadcasts and evaluation/maintenance of CATV systems.

### ■ Choose from 4 Models, Depending upon Your Application.

The R4131 consists of 4 models, enabling selection for various application requirements. All models feature high performance and set of features and functions for various applications.

	R4131A/C	R4131AN/CN	R4131B/D	R4131BN/DN
Frequency range	10 kHz to 3.5 GHz			
Input impedance	50 $\Omega$	75 $\Omega$	50 $\Omega$	75 $\Omega$
Center frequency display accuracy	$\pm 10$ MHz		$\pm 100$ kHz	
Positive/negative display	N/A		YES	
Field strength measurement	standard		standard	
Quasi-peak value measurement	standard		standard	
GPIB	standard		standard	
Occupied band width measurement	N/A		Optional	N/A

### ■ Save/Recall Function for Conditions and Waveforms

The R4131 Series has a save/recall function which operates for not only measurement condition settings but for waveforms as well. Three sets of conditions and waveforms are stored and recalled. This enables a stored waveform to be used as a reference in comparison measurements at different locations. Independent from this function, is an auto-recall function that serves to automatically set the desired measurement conditions when power is switched on, a great convenience in making onsite measurements.

### ■ Video Signal Modulation Analysis

#### Specifications

##### Frequency

**Frequency range:** 10 kHz to 3.5 GHz

**Center frequency display:** Displayed on the CRT with a maximum resolution of 1 kHz

**Center frequency display accuracy:** After zero calibration at local feed through.

R4131A/4131AN/4131C/4131CN	R4131B/4131BN/4131D/4131DN
±10 MHz ±15 MHz under GPIB control	Below 2.5 GHz: ±(100 kHz ±3% of span) at a sweep time of 5 ms to 0.5 s/div. Above 2.5 GHz: ±10 MHz

**Frequency span:** 50 kHz to 4 GHz in ten divisions on the horizontal scale on the CRT, selectable in 1-2-5 sequence.

With zero span, operates as a fixed tuned receiver.

**Frequency span accuracy:** ±5%

##### Stability:

**Frequency stability** at fixed frequency After 30-min. warm-up

R4131A/4131AN/4131C/4131CN	R4131B/4131BN/4131D/4131DN
±100 kHz/5 min. or better	Below 2.5 GHz: ±10 kHz/10 min. or better at sweep time 5 ms/div. to 0.5 s/div. Above 2.5 GHz: ±100 kHz/5 min. or better

**Residual FM** 2 kHz<sub>p-p</sub> max./100 ms

**Noise sideband:** -80 dBc max. at resolution bandwidth of 1 kHz (at 20 kHz from the carrier, with a 10 Hz video filter)

##### Resolution:

###### Resolution bandwidth

(3-dB points) 1 kHz to 1 MHz in 1, 3, 10 sequence

(6-dB points) 9 kHz, 120 kHz, when QP mode is selected

###### Selectivity (ratio of 60 dB:3 dB resolution bandwidths)

15:1 max.

**Resolution bandwidth accuracy** ±20%, CISPR standard or better in QP mode

**Marker display:** Can be set at any point.

**Resolution** Max. 1 kHz (Depending on the span.)

**Measurement accuracy** Center frequency display accuracy + frequency span accuracy

##### Amplitude

###### Screen display range:

**LOG mode** With respect to reference level 80 dB for a 10 dB/div display and 20 dB for a 2 dB/div display, or 40 dB for a 5 dB/div display in QP mode

**LIN mode** 10 div

##### Linearity:

**LOG mode** ±0.15 dB/1 dB, ±1 dB/10 dB, ±1.5 dB/70 dB or above

**LIN mode** ±5% of fullscale

##### Reference level:

**LOG mode** -69 dBm to +40 dBm (40.25 dBμV to 150 dBμV for the R4131AN/4131BN/4131CN/4131DN) (for 10 dB/div, 10 dB and 1 dB steps, and for 1 dB/div and 5 dB/div, 1 dB and 0.25 dB steps)

**LIN mode** 72.77μV to 22.36 V (102.9 μV to 31.62 V for R4131AN/4131BN/4131CN/4131DN)

**Reference level accuracy:** ±1 dB in LOG mode (in the reference level range of 0 to -59 dBm (110 dBμV to 51 dBμV for the R4131AN/R4131BN/4131CN/4131DN), at 200 MHz, with attenuation at 10 dB after level calibration)

**Reference level units:** Selectable as dBm, dBμV, dBmV or dBμV/m When dBμV/m is selected, an automatic correction is made for the antenna calibration factor.

##### Marker display:

**Resolution** 0.2 dB (for 10 dB/div) or 0.05 dB (for 2 dB/div)

**dBm/Hz** Rms noise level is displayed normalized with respect to the 1-Hz-bandwidth noise at the marker position.

##### Dynamic range:

###### Average noise level

R4131A/4131B	R4131AN/4131BN	R4131C/4131D	R4131CN/4131DN
-116 dBm + 1.55 f (GHz) dB or less	-114 dBm + 1.55 f (GHz) dB or less	-110 dBm or less	-108 dBm or less

**2nd and 3rd order distortion** 70 dB or greater (when input level is -30 dBm, at 10 MHz or above)

###### Frequency response (with 10 dB attenuation)

R4131A/4131C	R4131B/4131D	R4131AN/4131BN R4131CN/4131DN
±1 dB or less (100 kHz ≤ f ≤ 2 GHz) ±3.5 dB or less (10 kHz ≤ f ≤ 3.5 GHz)	±1 dB or less (100 kHz ≤ f ≤ 2 GHz) ±2 dB or less (10 kHz ≤ f ≤ 3.5 GHz)	±1.5 dB or less (100 kHz to 1.5 GHz) ±2.5 dB or less (10 kHz to 2 GHz) ±4 dB or less (2 GHz to 3.5 GHz)

**Residual response** With attenuation 0 dB, input termination 50 Ω, frequency > 100 kHz

R4131A/4131B	R4131AN/4131BN	R4131C/4131D	R4131CN/4131DN
-100 dBm or less	-98 dBm or less	-95 dBm or less	-93 dBm or less

**Video filter:** 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 300 kHz, 1 MHz

**Resolution bandwidth switching accuracy:** ±1 dB (+20°C to 30°C)

**Gain compression:** 1 dB max. for -10 dBm input

##### Sweep

**Sweep time:** 5 ms/div to 100 s/div selectable in 1-2-5 sequence

**Sweep time accuracy:** ±15%

**Trigger modes:** Free-run, line, video and single (reset, start)

##### Input

**RF input:** Approx. 50 Ω, N connector (75 Ω, NC connector for the R4131AN/4131BN/4131CN/4131DN)

**Maximum input level:** +20 dBm (127 dBμV for the R4131AN/4131BN/4131CN/4131DN), ±25 VDC max. (with 20 dB or greater input attenuation)

**Input attenuator:** 0 to 50 dB in 10 dB steps

**Input attenuator switching accuracy:** ±1 dB (10 kHz ≤ frequency ≤ 2 GHz) or ±1.5 dB (2 GHz < frequency ≤ 3.5 GHz), with respect to 10 dB attenuation

##### Input VSWR (at 10 dB input attenuation or greater):

R4131A/4131B/4131C/4131D	R4131AN/4131BN/4131CN/4131DN
1.5 max. (100 kHz ≤ frequency ≤ 2 GHz) 2.0 max. (2 GHz ≤ frequency ≤ 3.5 GHz)	1.5 max. (100 kHz to 1.5 GHz) 2 max. (10 kHz to 2 GHz) 2.5 max. (2 GHz to 3.5 GHz)

##### Display Section

**Display:** Waveform, setting conditions, grid

**CRT:** 5.5-inch, phosphor, green display (R4131A/AN/B/BN) amber display (R4131C/CN/D/DN)

**Trace:** WRITE waveform and VIEW waveform (up to 2 waveform displayed on the CRT)

**WRITE:** Posi-peak and sample display

R4131A/4131AN/4131C/4131DN	R4131B/4131BN/4131D/4131DN
Posi-peak and sample display	Posi-peak, sample and pose/nega display

**MAX HOLD:** For every repetition from the beginning of the function, the maximum signal level along the horizontal axis is displayed.

**MARKER:** Frequency and level at the marker point are measured and displayed.

**PEAK SEARCH:** The marker is moved to the point of maximum level on the displayed waveform.

**MRK CF:** The center frequency is changed to the marker frequency.

# Spectrum Analyzers

10 kHz to 3.5 GHz

## R4131 Series

**ZERO CAL:** Improves the center frequency accuracy for local feedthrough

**PLOT:** Direct plotting via the GPIB (using an ADVANTEST or HP plotter)

**NORMALIZE:** Display of values relative to an internally stored reference response.

**SAMPLE:** Display of instantaneous time-signal levels at each analysis position for each sweep

### Output

**Calibration output signal:** 200 MHz  $\pm$  30 kHz, -30 dBm (80 dB $\mu$ V for the R4131AN/4131BN/4131CN/4131DN)  $\pm$  0.5 dB

**Monitor output:** Approx. 8  $\Omega$ , enables monitoring using an earphone.

**Recorder outputs:** Analog output of WRITE waveform only

X axis Approx. -5 V to +5 V (approx. 10 k $\Omega$ )

Y axis Approx. 0 V to +4 V (approx. 220  $\Omega$ )

**IF output:** 3.58 MHz IF output, approx. 50  $\Omega$

**Video output:** Approx. 1 Vp-p, approx. 75  $\Omega$  (composite signal for external CRT)

**Probe power output:**  $\pm$ 15 V, 4-pin connector

**GPIB:** Fully controllable over the GPIB for automatic testing as well as direct plotting without an external controller.

### General Specifications

**Save/recall:** Up to 3 sets of measurement conditions, including waveforms, can be stored in memory and auto-recall can be used to automatically recall stored conditions when power is applied.

**Operating environment:** 0°C to +50°C

**Storage environment:** -20°C to +70°C

**Power requirements:** Specified at time of ordering

Option No.	Standard	40
Line voltage (V)	90 to 132	198 to 250

50/60 Hz, 120 VA max.

**Dimensions:** Approx. 300(W)  $\times$  177(H)  $\times$  460(D) mm

**Weight:** Approx. 10 kg (22 lbs.)

### Standard Accessories

Item	Model	Remarks
Power cable	MP-43	
Input cable	MI-02	Connector UG-88/U BNC-BNC (for R4131A/4131B/4131C/4131D)
Input cable	A01234	Connector BCP-C3 BNC-BNC (for R4131AN/4131BN/4131CN/4131DN)
Connector adaptor	JUG-201A-U	N-BNC adaptor (for R4131A/4131B/4131C/4131D)
Connector adaptor	BA-A165	NC-BNC adaptor (for R4131AN/4131BN/4131CN/4131DN)
Connector adaptor	NPC-NFJ	C15 type adaptor (for R4131AN/4131BN/4131CN/4131DN)

### Option (R4131B/4131BN/4131D/4131DN)

#### Occupied Frequency Bandwidth Measurement (Option 04)

The bandwidth within which 99% of the radiated power is included is calculated from the measured spectral data and this width is displayed digitally.

#### Occupied Bandwidth Measurement and 3 dB Down Measurement (Option 14)

The bandwidth at the 3 dB down point and occupied bandwidth can be measured by using a tracking generator, for example.

### Recommended Accessories

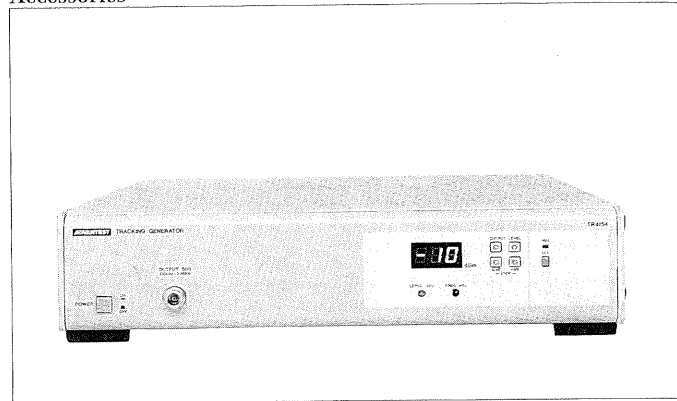
A02235 Rack-Mounted Set (JIS)

A02433 Rack-Mounted Set (EIA)

A02027 Panel-Mounted Set

A02802 Front Cover

### Accessories



### TR4154 Tracking Generator

The TR4154 can be combined with the TR4135 and R4131 Series spectrum analyzer for simply frequency response measurements over the range of 100 kHz to 3.5 GHz. It generates a signal having a frequency which precisely tracks the analyzer's frequency, thereby enabling measurements with a wide dynamic range.

### Specifications

**Frequency range:** 100 kHz to 3.5 GHz

**Output level:** 0 dBm to -59 dBm (switchable in 1 dB steps)

**Output level accuracy:**  $\pm$ 0.5 dB (at 200 MHz, -10 dB output and +20°C to +30°C)

**Output level flatness:**

2 dBp-p (at 100 kHz to 2 GHz, -10 dBm output)

4 dBp-p (at 100 kHz to 3.5 GHz, -10 dBm output)

**Output level switching accuracy:** with respect to -10 dBm output,

over an output level range of 0 to -59 dBm

$\pm$ 2 dB (frequency range of 100 kHz to 3.5 GHz)

$\pm$ 2.5 dB (frequency range of 100 kHz to 3.5 GHz)

**Spurious output components:** at 0 dBm, output

Harmonics  $\leq$  20 dB

Non-harmonics  $\leq$  30 dB

**Tracking generator leakage:** -110 dBm or less

**Output impedance:** Approx 50  $\Omega$

**VSWR:**

1.5 max. (100 kHz to 2 GHz)

2 max. (2 GHz to 3.5 GHz) (at output level of -10 dBm or lower)

### General Specifications

**Output connector type:** N

**Operating temperature range:** 0°C to 40°C

**Power requirements:** Specified at time of ordering

Option No.	Standard	32	43	44
Line voltage (V)	90 to 110	103 to 132	198 to 242	207 to 250

50 Hz/60 Hz

**Dimensions:** Approx. 424(W)  $\times$  90(H)  $\times$  500(D) mm

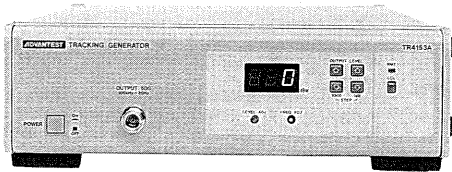
### Standard Accessories

Item	Model	Remarks
Power cable	A01402	
Output cable	MI-04	Connector UG-21D/U N-N
Connecting cable	A01002	Connector SMA-SMA 2 cables
Connecting cable	MI-02	Connector UG-88/U BNC-BNC

# Spectrum Analyzers

Portable and Light Weight

## R4131 Series



### TR4153A Tracking Generator

When used with the R4131 series Spectrum Analyzers, the TR4153A Tracking Generator lets you easily measure frequency characteristics up to 2000 MHz. Because it can generate signals that precisely comply with the sweep frequencies of spectrum analyzers, you can measure a wide dynamic range of the frequency characteristics of filters and amplifiers.

When used with the R4131 series Spectrum Analyzers, the TR4153A Tracking Generator ensures more precise measurement because its normalize function eliminates errors due to cables and other devices used in the measuring system.

In addition, because the TR4153A incorporates a 10 dB-step attenuator, it is ideally suited for amplifier measurements for which the input level of the measured object (DUT) must be attenuated.

#### Specifications

**Frequency range:** 100 kHz to 2 GHz  
**Output impedance:** Approx. 50 Ω  
**Output VSWR:** 1.5 max. (at -10 dBm output)  
**Output level flatness:** ±1 dB max. (with respect to 200 MHz output, over an output level range of 0 to -59 dBm and frequency range of 100 kHz to 2 GHz)  
**Output level variable range:** 0 to -59 dBm in 1 dB steps (continuous adjustment over the range 0 to 1.5 dB or greater using the level adjustment)  
**Output level switching accuracy:** ±0.2 dB/1 dB (0 to -9 dB) ±1.0 dB/10 dB (0 to -50 dB)  
**Spurious output components:** Harmonics ≤ 20 dBc, non-harmonics ≤ 30 dBc (at 0 dBm output)  
**Tracking generator leakage:** -110 dBm

**GPIB:**  
**Standard** enables remote control and data output

#### General Specifications

**Output connector type:** N

**Operating environment:**

Temperature 0°C to 40°C, Humidity 85% max.

**Power requirements:** Specified at time of ordering

Option No.	Standard	32	43	44
Line voltage (V)	90 to 110	103 to 132	198 to 242	207 to 250

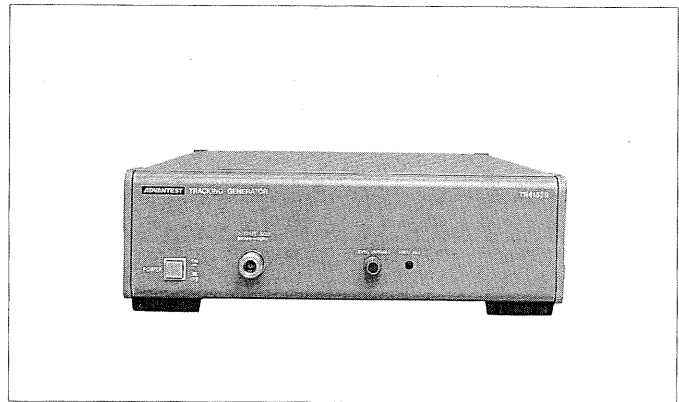
50 Hz/60 Hz, 50 VA max.

**Dimensions:** Approx. 300(W) × 90(H) × 440(D) mm

**Weight:** 10 kg max.

#### Standard Accessories

Name	Model	Product code	Remarks
Power cable	A01402		
Output cable	MI-04		UG-21D connector to N-N
Connecting cable	A01002		SMA-SMA connectors, 2 cables
Connecting cable	MI-02		UG-88/U, BNC-BNC



### TR4153B Tracking Generator

The TR4153B can be combined with the TR4131 Series spectrum analyzer for use in frequency response measurements of devices such as amplifiers and filters over the frequency range of 100 kHz to 2 GHz. It generates a signal having a frequency which precisely tracks the analyzer's frequency, thereby enabling measurements with a wide dynamic range.

#### Specifications

**Frequency range:** 100 kHz to 2 GHz  
**Output impedance:** Approx. 50 Ω  
**Output VSWR:**  
 1.5 max. (100 kHz to 1.5 GHz)  
 2.0 max. (100 kHz to 2.0 GHz)  
**Output level flatness:** ±0.7 dB max. (with respect to 200 MHz output, over an output level range of 0 to -10 dBm and frequency range of 100 kHz to 2 GHz)  
**Output level variable range:** 0 to -10 dBm or greater, continuously variable  
**Spurious output components:** Harmonics ≤ 20 dBc, non-harmonics ≤ 30 dBc (at 0 dBm output)  
**Tracking generator leakage:** -110 dBm

**General Specifications**

**Output connector type:** N

**Operating environment:**

Temperature 0°C to 40°C

Humidity 85% max.

**Power requirements:** Specified at time of ordering

Option No.	Standard	32	43	44
Line voltage (V)	90 to 110	103 to 132	198 to 242	207 to 250

50 Hz/60 Hz

**Power consumption:** 50 VA max

**Dimensions:** Approx. 300(W) × 90(H) × 440(D) mm

**Weight:** 10 kg max.

#### Standard Accessories

Name	Model	Product code	Remarks
Power cable	A01402		
Output cable	MI-04		UG-21D connector to N-N
Connecting cable	A01002		SMA-SMA connectors, 2 cables
Connecting cable	MI-02		UG-88/U, BNC-BNC