ADVANTEST

Signal Analyzers

R3671/3681

High Performance Spectrum and Broadband modulation analysis in one versatile instrument

ADVANTEST

With growing data communications traffic, broadband radio communication systems such as radio-LANs, are being developed that employ various modulation formats. For example, IMT-2000 and other mobile communication systems already use multicarrier methods. Broadband radio signals are already being used in the RF band. To push this envelope for higher quality data transmissions, researchers and developers are studying higher frequency/broader band carriers. In this kind of radio communications environment, new measuring instruments are needed that are not only more efficient than ever, but also more flexible to support new test requirements and communication standards.

The R3671 and R3681 are one of these new measuring instruments for this new era of test and measurement requirements. The R3671 and R3681 are high performance signal analyzers. Employing our unique RF technology, the R3671 and R3681 achieve an Average Display Noise Level of –158 dBm*[1)], a Third-Order Intercept Point (TOI) specification of +26 dBm*[2)], and a signal purity of –122 dBc/Hz*[3)] to enable measurements over a wide dynamic range. The R3671 and R3681 also have unique noise correction functions that enhances their dynamic range (–84 dBc [typical]) for W-CDMA adjacent leakage power (ACLP) measurements.

The R3671 and R3681 come standard with broadband modulation analysis functions (bandwidth 25 MHz) as well as RF measurement functions. By adding the dedicated signal analysis options for the respective communication systems to the R3671/3681, you can expand the functionality of transmitter testers. Furthermore, with an optional RF signal generator that supports digital modulation, the R3671 and R3681 provide ease of implementation of the optimum testing systems for evaluating high-frequency devices.

**1 Typical value at RBW of 1 Hz and 1 GHz with built-in preamplifier off*
**2 Typical value at 2 to 3.5 GHz*
**3 Typical value at 800 MHz and 10 kHz offset*

- **Series Models Designed to Enable Selection of Optimum Frequency Range**
  R3671 (20 Hz to 13 GHz):
  Used for mobile communication bandwidths
  R3681 (20 Hz to 32 GHz):
  Used for various methods of research and development
- **High-Performance Spectrum Analysis**
- **Flexible Digital Modulation Analysis**
  3GPP/cdma2000/GSM/Bluetooth®/W-LAN
- **Digital Modulation RF SG That Can Be Mounted Inside**
  R3671: 50 MHz to 3 GHz
  R3681: 50 MHz to 6 GHz
- **Stable Measurement with More Digital Circuits**
- **Variety of User Interfaces and I/O Interfaces Supported**
  Large 12-inch TFT display (touch screen)
  Mouse, keyboard, USB, LAN, GP-IB, VGA, and FDD interfaces

Variety of Available Options (common to the R3671 and R3681)

- **OPT.11** Wideband demodulator (modulation analysis: bandwidth expanded to 50 MHz)
- **OPT.22** High-stability frequency reference source ±3 x 10^{-10}/day ±5 x 10^{-8}/year
- **OPT.50** 3GPP modulation analysis software (HSDPA supported)
- **OPT.52** cdma2000 1xEV-DV modulation analysis software (supporting cdmaOne and cdma2000 1x)
- **OPT.54** cdma2000 1xEV-DO modulation analysis software (supporting revision A)
- **OPT.56** GSM (EDGE) modulation analysis software
- **OPT.57** Bluetooth modulation analysis software
- **OPT.59** IEEE802.11b/g modulation analysis software
- **OPT.60** WiBro modulation analysis software
- **OPT.64** Single-carrier general-purpose modulation analysis software
- **OPT.68** OFDM (IEEE802.11a) modulation analysis software
- **OPT.71** 2-ch arbitrary waveform generator (AWG) module
- **OPT.72** Digital modulation signal generator module
  R3671: 50 MHz to 3 GHz R3681: 50 MHz to 6 GHz
  The OPT.72 includes the capabilities of the OPT.71 (AWG).
- **OPT.73** 3GPP multi-carrier generator
- **OPT.74** Pulse modulator
- **OPT.80** C/N measurement software
- **OPT.83** AMP measurement software

R3671 Package Options

Build a cost-effective system with one of the special R3671 packages equipped with your favorite options.

Package No.	Combinations and Descriptions
1	**R3671+50** Suitable for evaluation of RF transmission characteristics and modulation analysis testing involving 3GPP
2	**R3671+52** Suitable for evaluation of RF transmission characteristics and modulation analysis testing involving cdma2000
3	**R3671+50+52** Suitable for evaluation of RF transmission characteristics and modulation analysis testing involving 3GPP/cdma2000
4	**R3671+72+73** Suitable for evaluation of RF transmission characteristics through 3 GHz digital modulation SG
5	**R3671+72+73+50** Suitable for modulation analysis testing of 3GPP devices
6	**R3671+72+73+52** Suitable for modulation analysis testing of cdma2000 devices
7	**R3671+72+73+50+52** Suitable for modulation analysis testing of 3GPP/cdma2000 devices

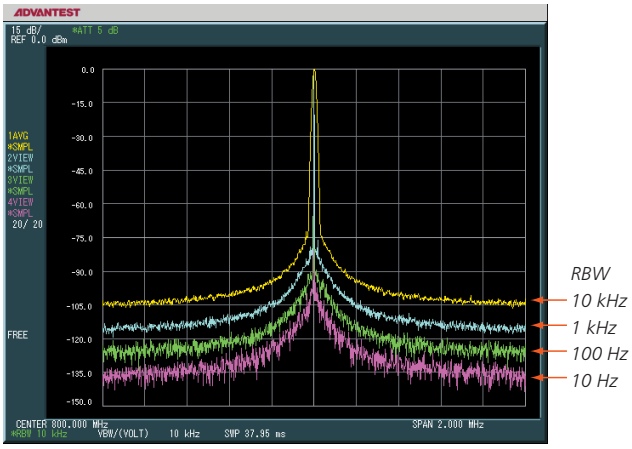
High-Performance Spectrum Analysis

Dynamic range measurement

By making full use of the latest RF techniques, the R3671 and R3681 enable measurement over a wide dynamic range:

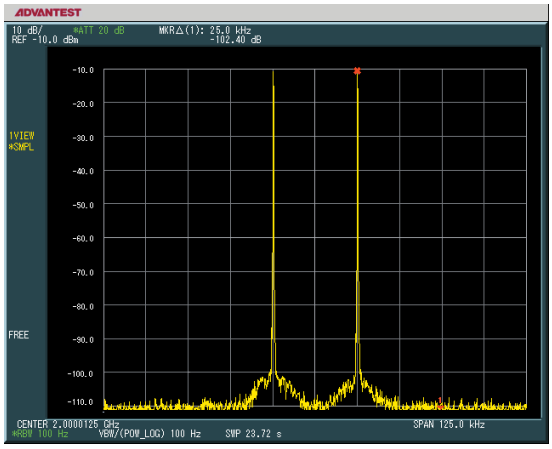
- **Average Display Noise Level: –158 dBm typ. (RBW=1 Hz, @ 1 GHz)**
  Built-in Preamplifier On: –168 dBm typ. (RBW=1 Hz, @ 1 GHz)
- **1 dB Compression Point: +10 dBm typ. (@ 200 MHz to 3.5 GHz)**
- **Third-Order Intercept Point (TOI): +26 dBm typ. (@ 2 to 3.5 GHz)**
- **Built-in Attenuator: 5 dB steps**
- **Resolution Bandwidth (RBW):**
  1 Hz to 10 MHz (Sequences 1, 2, 3, and 5)
- **Dynamic Display Range: 10 div. fixed**
  0.1 to 1 dB/div. (0.1 dB steps)
  1 to 20 dB/div. (1 dB steps)
- **Steep Shape Factor**
  Approximately 3 times the conventional value. This greatly narrows the carrier near-field measurement resolution.

■ Wide Dynamic Display Range

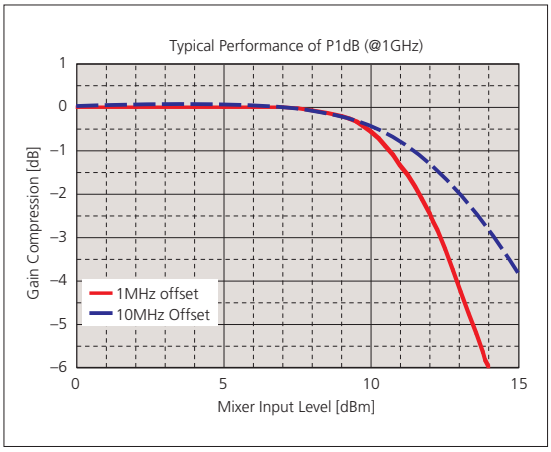


Dynamic display range: 150 dB

■ Low Distortion

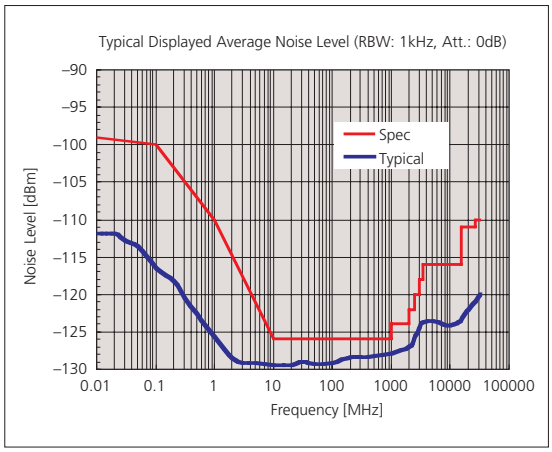


Characteristic phase noise (typical)



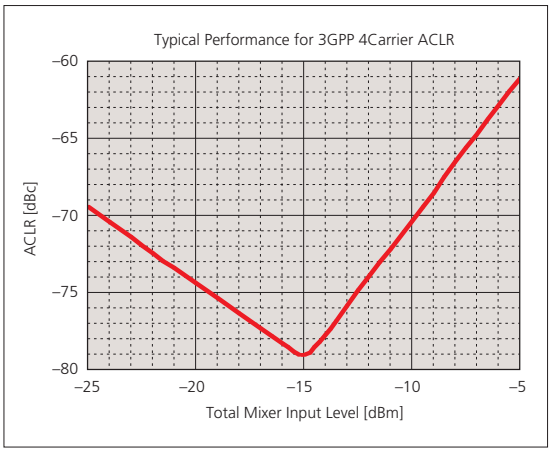
Gain compression characteristics (typical values in two-signal measurement)

■ Low Noise Level



Average display noise level (typical values)

■ Wide Dynamic Range

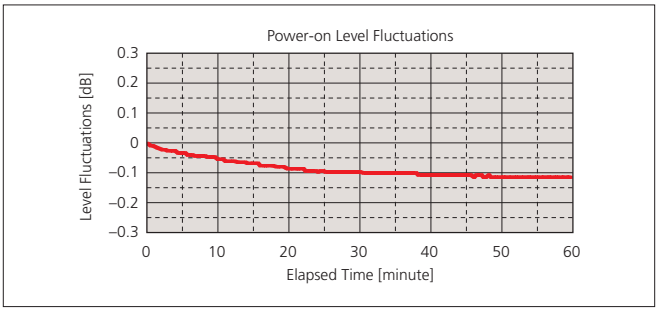


Limits of measurement on W-CDMA four-carrier ACLR (typical values)

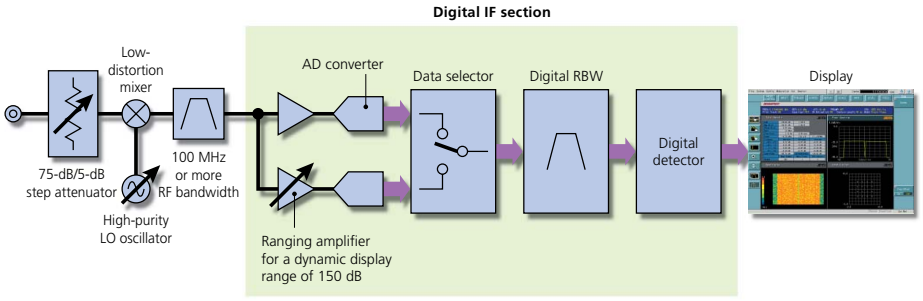
Highly Accurate Measurement

The R3671 and 3681 provide highly accurate measurement by adopting high-performance digital IF technology.

- **General Level Accuracy: >±0.73 dB (50 MHz to 2.5 GHz, 10 dB ATT, 100 kHz RBW)**
- **Level Display Linearity: Inaccuracy reduced**
- **Level Display Stability: Instability significantly improved**
- **Self-calibration: Calibration time shortened**



Less fluctuation after power-on



Superb Signal Purity

The superb signal purity provided by a highly pure frequency synthesizer and the 150 dB dynamic display range are effective for measuring spurious signals close to carriers.

Signal purity (@ 800 MHz)

10 kHz offset: –120 dBc/Hz or more

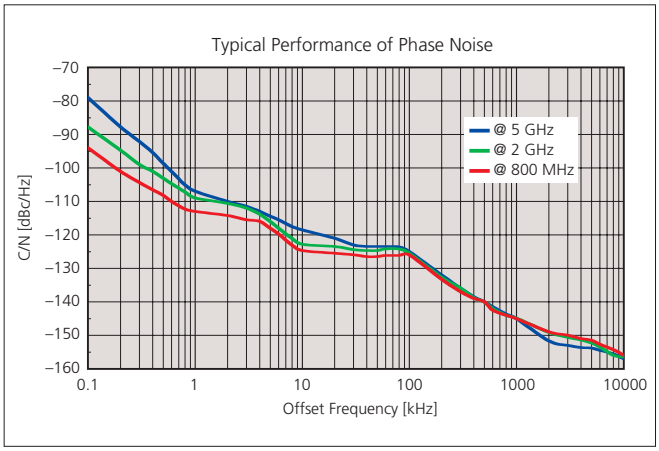
1 MHz offset: –140 dBc/Hz or more

10 MHz offset: –155 dBc/Hz or more

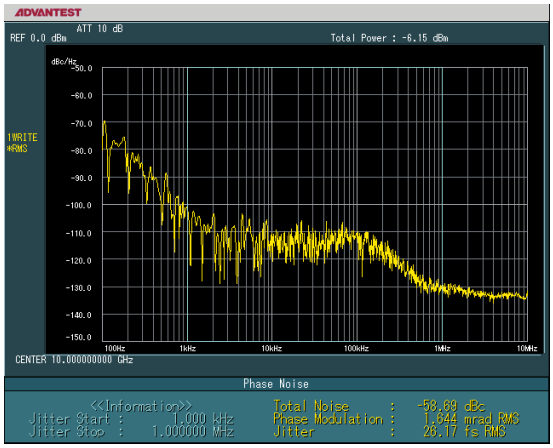
■ OPT.80 C/N Measurement Software

The C/N measurement software OPT.80 can plot offset frequencies from carrier frequencies on the horizontal axis and phase noise associated with the frequencies on the vertical axis. OPT.80 is useful for developing and troubleshooting generators and frequency synthesizers.

- **Offset Frequency Range: 10 Hz to 1 GHz**
- **Up to 8 Decades Logged and Displayed**
- **Signal Track Function for Carrier Frequency Signal Tracking Measurement**
- **Effective Values of Phase Jitters Calculable**



Phase noise characteristics (typical values)



Sample of phase jitter measurement by C/N measurement software

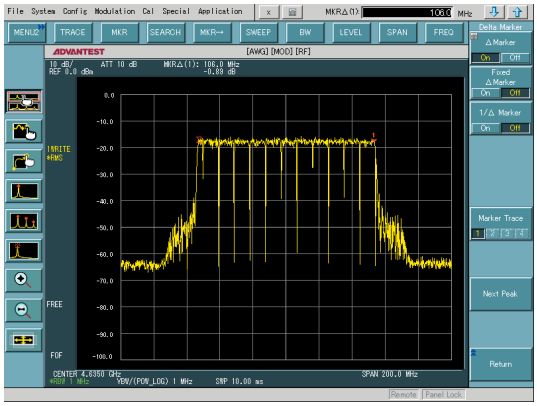
Signal Generator (OPT.71/72/73/74)

2-ch Arbitrary Waveform Generator Option (OPT.71)

The 2-ch arbitrary waveform generator (AWG) option, OPT.71, can generate arbitrary waveforms based on waveform data created by the user. The OPT.71 facilitates generation of different types of signals.

- **Sampling Rate by Broadband Modulation: 12.5 to 200 MHz**
- **High-Capacity Waveform Data Memory: 128M samples (for I and Q altogether)**
- **Built-in Bit-Error-Rate Counter**
- **Tools for Conversion of Data Created by User into AWG (OPT.71) Format, Such as By Means of MATLAB**
- **Specific Waveform Generator Software for Generating Different Types of Regulated Carrier Waveforms**
- **Clipping function provided via the waveform generation software**

■ 100 MHz Broadband Modulation Signal Generator



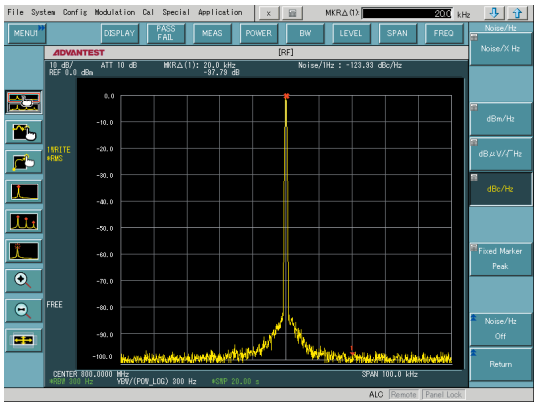
AWG Waveform Characteristics

SG (OPT.72)

The SG OPT.72 can generate signals with digital modulation. The OPT.72 includes a highly pure synthesizer, broadband orthogonal modulator, and arbitrary waveform generation (AWG) function to provide flexibility in generating modulated signals. The OPT.72 also has a BER counter, which is indispensable for measuring communication quality.

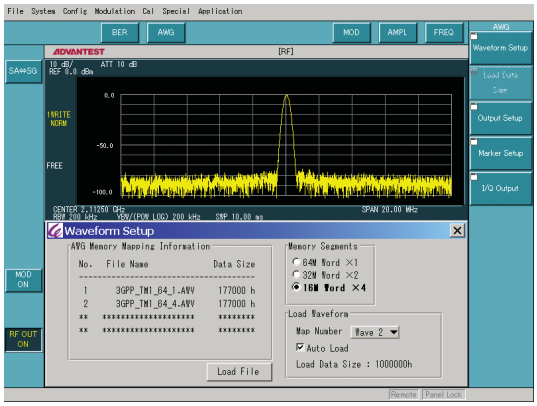
- **RF Output Frequency Range: 50 MHz to 3 GHz (R3671) 50 MHz to 6 GHz (R3681)**
- **Sampling Rate by Broadband Modulation: 12.5 to 200 MHz**
- **High-Capacity Waveform Data Memory: 128M samples (for I and Q altogether)**
- **Built-in Bit-Error-Rate Counter**
- **Generator (this option) Integrated in Analyzer (body)**
- **Function for listing data for up to four waveforms, and easy switching and generation of arbitrary modulated signals**

■ Superb Signal Purity



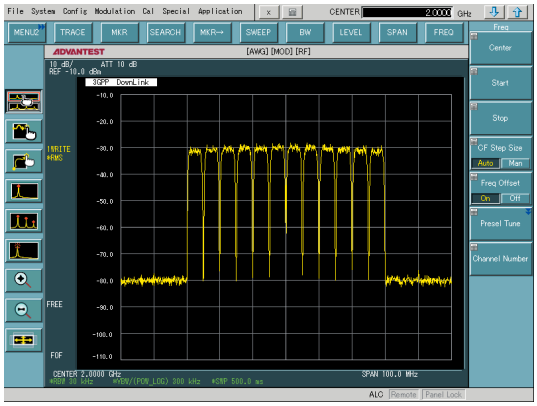
Noise/1 Hz: -123 dBc/Hz (20-kHz offset) @ 800 MHz

■ Easy Setup



Waveform setup window

■ A variety of RF-modulated signals generated



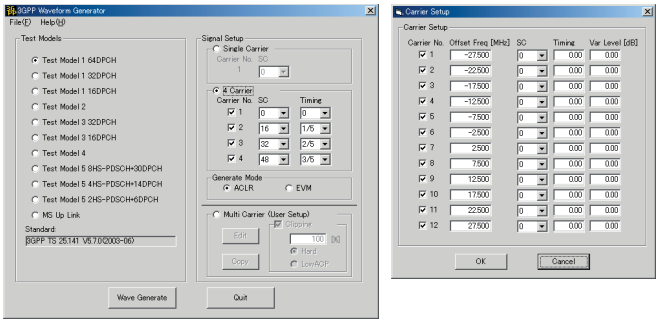
3GPP12 carrier signal generation window

3GPP Multi-Carrier Generator (OPT.73)

The 3GPP multi-carrier generator OPT.73 has a GUI that allows 3GPP-defined test model signals to be generated easily. With its baseband filters intended for 3GPP multi-carrier signals, the OPT.73 can generate high ACLR signals.

- **Dedicated Software for Easy Generation of Test Model Signals**
- **Dedicated Baseband Filters for Generating High ACLR Signals**
- **Generation of 3GPP-Defined Four-Carrier and Twelve-Carrier Signals**

■ Easy Generation of Test Model Signals



Pulse Modulation Function (OPT74)

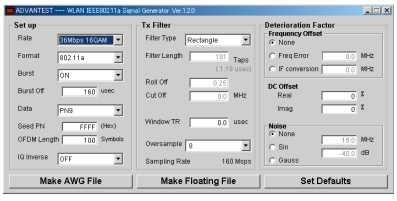
Combining this option (OPT74) with the digital modulation SG (OPT72), allows pulse modulation to be applied to SG output.

- **MAKER1 OUT connector and RAMP IN connector added to the rear panel**
- **Burst on/off ratio of SG output increased to 60 dB or more when using RAMP IN**
- **"Sample & hold" added as another SG ALC mode**

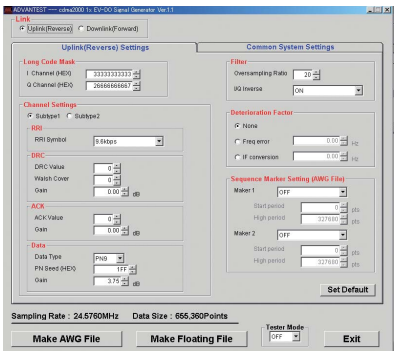
Waveform Generation and Conversion Software Lineup (Freeware)

- **Signal format conversion tool for AWG**
- **IEEE802.11a signal generation tool**
  (IEEE802.11g signal generation is also supported.)
- **IEEE802.11b signal generation tool**
- **3GPP signal generation tool**
- **EVDO signal generation tool (supporting revision A)**
- **EVDV signal generation tool**
- **Bluetooth signal generation tool**
- **Multi-carrier and clipping signal generation tool**
  (Creating multi-carrier waveforms by combining data from multiple waveforms is supported, as is clipping.)

Applicable environment: The waveform generator software runs on an external PC.
[PC system requirements]
OS: Microsoft® Windows® 2000, Microsoft Windows XP
PC: 1.6 GHz Pentium® 4 or higher recommended
Main Memory: 256 MB or more recommended
Display: Super VGA (800 x 600) or higher-resolution monitor with 256 colors



IEEE802.11a signal generation tool



EVDO signal generation tool

Differential IQ Input Fixture and Variety of I/O Interfaces

R14603 Differential IQ Input Fixture

The R3671 and R3681 are equipped with the R14603 differential IQ input fixture, which is a signal converter for differential IQ signal measurement. The R14603 converts high-impedance differential baseband IQ signals to 50 Ω single-end IQ signals. Power and control signals to the R14603 are supplied from the R3671/3681 through an attached cable.

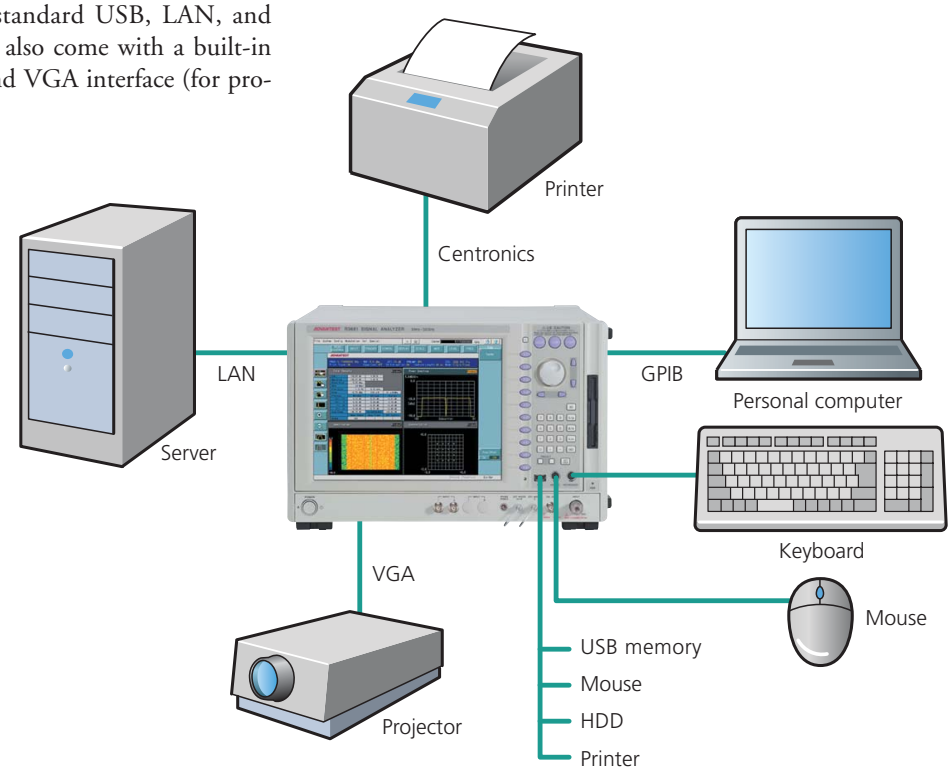
To use the R14603, the optional R3671/3681 modulation analysis software is required.

The high-impedance differential IQ signal converter circuit, which is independent from the R3671/3681 signal analyzer, can be placed close to the target device. The high-impedance signal line between a DUT and the measuring device can thus be shortened, and this reduces adverse effects on modulation precision by stray capacitance on the signal line and differences in line length.

- **Flat Input Frequency Characteristics**
  Flat input frequency characteristics: 0.1 dBp-p (typical)
  (DC to 10 MHz): ≤0.3 dBp-p (maximum)
  Input capacitance: 22 pF (typical)
- **Input Modes Available for Different Types of Measurements**
  IQ input: Switchable between Balanced and Unbalanced
  Input coupling: Switchable between DC and AC
  Input impedance: Switchable between 50 Ω (only for DC coupling) and 100 kΩ
- **3-Step Input Amplitude Range Switch and DC Biasing**
  Input range: 0.25 Vp-p, 0.5 Vp-p, and 1.0 Vp-p (for Balanced input)
  0.5 Vp-p, 1.0 Vp-p, 2.0 Vp-p (for Unbalanced input)
  DC biasing: ±2.5 V, 50 mV steps

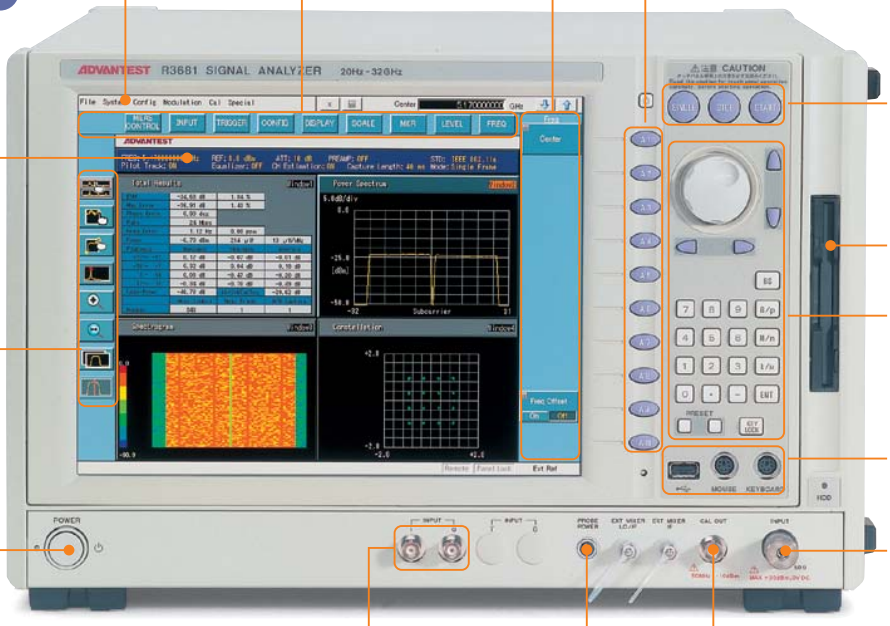
Variety of Interfaces

The R3671 and 3681 come with standard USB, LAN, and GPIB control interfaces. The units also come with a built-in Centronics interface (for printers) and VGA interface (for projectors).



Adopting a Large TFT Display

FRONT PANEL



Software menu bar
Displays a software menu for various functions.

Menu bar
Displays the analyzer's system operation menu.

Function bar
Displays the buttons for basic functions.

Application keys
Used to select from a side menu on the display.

Large 12-inch TFT display
- Touch screen for quick operation
- Large screen for increased work efficiency
- Comparative analysis capabilities on multi-screens
- Indicator function for low-speed sweep position check, and more

Measurement toolbar
Displays the icon buttons for useful measurement functions.

Power switch
Turns the analyzer on and off.
Setting this switch to Off shuts the OS down and turns off the analyzer.

Program keys
Used for measurement control. SINGLE, STOP, and START

Floppy disk drive

Data knob and numerical keypad
Used to enter numeric values and units.

I/O connector block
- USB connector
- Mouse connector
- Keyboard connector

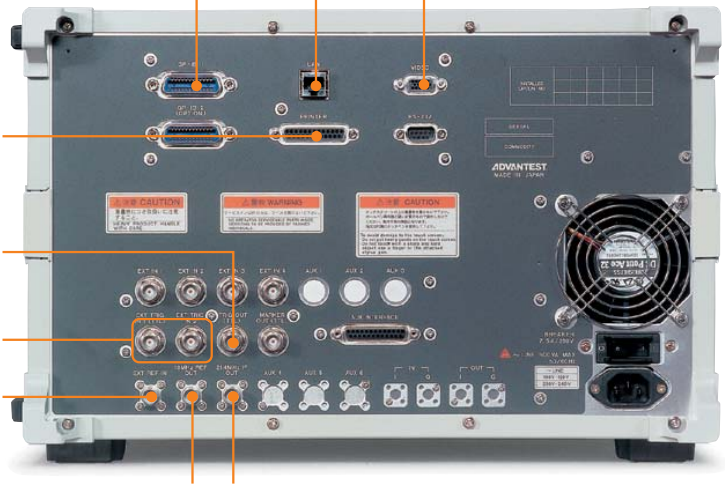
Input connector
Used to input RF signals.

I/Q Input connectors
Used to connect baseband I/Q signals.

CAL OUT connector
Used to calibrate.

Probe connector
Used for the probe power connection (±15 V output)

REAR PANEL



GPIB (conforming to IEEE488.2)

LAN (10Base-T, TCP/IP)

VIDEO (VGA specifications)

PRINTER (conforming to IEEE1284-1994)

TRIG OUT (TTL)

EXT TRIG IN 1 (TTL)
EXT TRIG IN 2
(0 to 5 V, DC coupled)

EXT REF IN

10 MHz REF OUT

21.4 MHz IF OUT

Specifications

Frequency

Frequency Range

Spectrum analysis mode

R3671: 20 Hz to 13 GHz

Frequency range	Frequency Band	Harmonic mixing mode (N)
20 Hz to 3.5 GHz	0	1 –
3.4 to 7.5 GHz	1	1 –
7.4 to 13 GHz	2	2 –

Bands 1 to 2 use a built-in YIG tuning preselector

R3681: 20 Hz to 32 GHz

Frequency range	Frequency Band	Harmonic mixing mode (N)
20 Hz to 3.5 GHz	0	1 –
3.4 to 7.5 GHz	1	1 –
7.4 to 15.4 GHz	2	2 –
15.2 to 32 GHz	3	4 –

Bands 1 to 3 use a built-in YIG tuning preselector

Modulation analysis mode: (Enabled when the modulation analysis option is specified)
20 MHz to 6 GHz

Frequency range	Frequency Band	Harmonic mixing mode (N)
20 MHz to 3.5 GHz	0	1 –
3.5 to 6 GHz	1M	1 –

Band 1M bypasses the built-in YIG tuning preselector

Built-in preamplifier (Band 0 only): 100 kHz to 3.5 GHz, 20 dB gain (typical)

Input coupling: DC

Internal frequency reference stability
- **Aging rate:** ±5 x 10^{-8}/day, ±5 x 10^{-7}/year
- **Temperature stability:** ±1 x 10^{-7} (at 5 to 40°C, with frequency at 25°C as reference)
- **Warm-up (nominal):** ±5 x 10^{-7}/minute
- **Reference frequency error:** ±(Time elapsed from the latest factory calibration x Aging rate + Temperature stability)

Marker frequency counter (S/N >50 dB)
- **Accuracy:** ±(Marker frequency x Reference frequency error + Residual FM)
- **Resolution:** 0.01 Hz

Frequency reading accuracy: (Resolution bandwidth 1 Hz to 3 MHz)
±(Frequency reading x Reference frequency error + Span x Span accuracy + Resolution bandwidth x 0.1 + Residual FM)

Frequency stability
- **Residual FM:** (with internal reference frequency source) ≤(3 Hz x Np-p)/100 ms

Frequency span
- **Range**
  - **R3671:** 20 Hz to 13 GHz, 0 Hz (zero span)
  - **R3681:** 20 Hz to 32 GHz, 0 Hz (zero span)
- **Accuracy:** ±1% (200 Hz ≤Span)
  ±1 x N% (20 Hz ≤Span <200 Hz)

Signal purity: (with internal reference frequency source, Frequency 800 MHz, and temperature range: 20 to 30°C)
- 100 Hz offset: <–87 dBc/Hz
- 1 kHz offset: <–110 dBc/Hz
- 10 kHz offset: <–120 dBc/Hz
- 100 kHz offset: <–120 dBc/Hz
- 1 MHz offset: <–140 dBc/Hz
- 10 MHz offset: <–155 dBc/Hz (nominal)

Resolution bandwidth (RBW)
- **Range:** 1 Hz to 10 MHz (sequences 1, 2, 3, and 5)
- **Accuracy:** ±3%: Resolution bandwidth 1 Hz to 500 kHz
  ±7%: Resolution bandwidth 1 to 3 MHz
  ±12%: Resolution bandwidth 5 MHz
  ±20%: Resolution bandwidth 10 MHz
- **Selectivity (60 dB/3 dB):** <6: 1 (5: 1, typ.)

Video bandwidth (VBW)
- **Range:** 1 Hz to 10 MHz (sequences 1, 2, 3, and 5)

Sweep

Sweep time setting range
- **Zero span:** 1 µs to 6000 s
- **Span > 0 Hz:** 10 ms to 2000 s

Sweep time accuracy: ±2%

Sweep mode: Continuous and single

Trigger function
- **Trigger source:** Free-run, Video, IF, Line, Ext 1 (TTL level), and Ext 2 (0 to 5 V, Resolution: 20 mV)
- **Trigger delay setting range:** 10 ns to 1 s
- **Resolution:** 10 ns

Amplitude

Amplitude measurement range
- **Preamplifier off:** +30 dBm to Average display noise level
- **Preamplifier on (Band 0 only):** +20 dBm to Average display noise level

Maximum safety input level
- **Average continuous power**
  - **Preamplifier off:** +30 dBm (at input ATT. ≥10 dB)
  - **Preamplifier on:** +13 dBm (at input ATT. ≥10 dB)
- **DC voltage:** 0 V (No DC applied to signals)

Input ATT. range: 0 to 75 dB by 5 dB steps

Scale display range: 10 div., fixed
- **Log scale:** 0.1 to 1 dB/div. by 0.1 dB steps
  1 to 20 dB/div. by 1 dB steps
- **Linear scale:** 10%/div. of reference level

Scale unit : dBm, dBmV, dBµV, dBµVemf, dBpW, W, V

Reference level setting range
- **Preamplifier off**
  - **Log scale:** –170 to +60 dBm by 0.01 dB steps
  - **Linear scale:** 707.1 pV to 223.6 V by Approx. 1% steps
- **Preamplifier on**
  - **Log scale:** –170 to +30 dBm, 0.01 dB steps
  - **Linear scale:** 707.1 pV to 7.071 V by Approx. 1% steps

Trace: 4 maximum

Detector modes: Normal, positive peak, negative peak, sample, RMS, video average, and voltage average

Amplitude accuracy

Calibration signal (50 MHz)
- Amplitude: –10 dBm
- Accuracy: ±0.2 dB (temperature range: 20 to 30°C)
  ±0.3 dB (temperature range: 5 to 40°C)

Frequency response (After automatic calibration, where reference frequency: 50 MHz; input ATT.: 10 dB; pre-selector: peak-adjusted; and temperature range: 20 to 30°C)

Spectrum analysis mode

Preamplifier off:	50 MHz to 2.5 GHz:	<±0.4 dB
	20 Hz to 3.5 GHz:	<±1.0 dB
	3.5 to 7.5 GHz:	<±1.5 dB
	7.5 to 13 GHz:	<±2.0 dB
R3681 only:	13 to 15.4 GHz:	<±2.0 dB
	15.4 to 32 GHz:	<±2.5 dB
Preamplifier on:	50 MHz to 2.5 GHz:	<±1.0 dB
	100 kHz to 3.5 GHz:	<±2.0 dB

Input ATT. switching error: (At input ATT. 5 to 50 dB, with ATT. 10 dB as reference)

	20 Hz to 8 GHz:	<±1.0 dB
	8 to 12 GHz:	<±1.3 dB
	12 to 13 GHz:	<±1.4 dB
R3681 only:	13 to 20 GHz:	<±1.4 dB
	20 to 26.5 GHz:	<±1.8 dB
	26.5 to 32 GHz:	<±2.1 dB

Scale display error: (Mixer level: –20 dBm as reference, mixer level range: –10 to –50 dBm, and temperature range: 20 to 30°C) <±0.13 dB

Resolution bandwidth switching uncertainty: (RBW 100 kHz as reference, after automatic calibration with and 10 dB/div. or less)
<±0.05 dB: Resolution bandwidth 1 Hz to 3 MHz
<±0.3 dB: Resolution bandwidth 5 MHz, 10 MHz

Total level accuracy: (After automatic calibration, mixer level: –10 to –50 dBm, preamplifier: off; input ATT.: 10 dB; RBW: 100 kHz; and temperature range: 20 to 30°C)
<±(0.2 dB + Frequency response + Scale display error)

Dynamic range

Average display noise level

Spectrum analysis mode (Input terminated, input ATT.: 0 dB; RBW: 1 Hz; VBW: 1Hz, detector: sample; average: 20 times or more; AVG mode: Video; and temperature range: 20 to 30°C. For a temperature range of 5 to 40°C, 2 dB is added.)

Preamplifier off:	100 Hz:	<–96 dBm
	1 kHz:	<–119 dBm
	10 kHz:	<–129 dBm
	100 kHz:	<–130 dBm
	1 MHz:	<–140 dBm
	10 MHz to 1 GHz:	<–156 dBm (typical: –158 dBm)
	1 to 2 GHz:	<–154 dBm (typical: –156 dBm)
	2 to 2.5 GHz:	<–152 dBm (typical: –154 dBm)
	2.5 to 3 GHz:	<–150 dBm (typical: –152 dBm)
	3 to 3.5 GHz:	<–148 dBm (typical: –150 dBm)
	3.5 to 13 GHz:	<–146 dBm (typical: –149 dBm)
R3681 only:	13 to 15.4 GHz:	<–146 dBm (typical: –149 dBm)
	15.4 to 26.5 GHz:	<–141 dBm (typical: –144 dBm)
	26.5 to 32 GHz:	<–140 dBm (typical: –143 dBm)
Preamplifier on:	100 kHz:	<–136 dBm
	1 MHz:	<–146 dBm
	10 MHz to 1 GHz:	<–162 dBm (typical: –168 dBm)
	1 to 2.5 GHz:	<–160 dBm (typical: –166 dBm)
	2.5 to 3 GHz:	<–158 dBm (typical: –164 dBm)
	3 to 3.5 GHz:	<–156 dBm (typical: –162 dBm)

1 dB gain compression: (Separation: Resolution bandwidth x 15, 50 kHz min.)

	10 to 200 MHz: >+2 dBm (typical: +5 dBm)
	200 MHz to 3.5 GHz: >+7 dBm (typical: +10 dBm)
	3.5 to 7.5 GHz: >–5 dBm (typical: –2 dBm)
	7.5 to 13 GHz: >–3 dBm (typical: 0 dBm)
R3681 only:	13 to 32 GHz: >–3 dBm (typical: 0 dBm)

2nd order harmonic distortion:
10 MHz to 1.75 GHz:
<–60 dBc (mixer level: –20 dBm)
>1.75 GHz: <–90 dBc (mixer level: –10 dBm)

3rd order intercept point (TOI): (Mixer level: –20 dBm, separation: 25 kHz)

	10 to 200 MHz: >+12 dBm (typical: +16 dBm)
	200 to 500 MHz: >+16 dBm (typical: +20 dBm)
	500 MHz to 1 GHz: >+20 dBm (typical: +24 dBm)
	1 to 2 GHz: >+21 dBm (typical: +25 dBm)
	2 to 3.5 GHz: >+22 dBm (typical: +26 dBm)
	3.5 to 7.5 GHz: >+5 dBm (typical: +10 dBm)
	7.5 to 13 GHz: >+8 dBm (typical: +12 dBm)
R3681 only:	13 to 32 GHz: >+8 dBm (typical: +12 dBm)

Image/multiple/out-band spurious

Spectrum analysis mode

R3671:	10 MHz to 13 GHz: <–70 dBc
R3681:	13 MHz to 15.4 GHz: <–70 dBc
	15.4 to 26.5 GHz: <–65 dBc
	26.5 to 32.0 GHz: <–60 dBc

Residual spurious (Spectrum analysis mode, no input, input terminated, input ATT.: 0 dB)

Preamplifier on:	1 MHz to 3.5 GHz: <–95 dBm
Preamplifier off	
R3671:	1 MHz to 13 GHz: <–90 dBm
R3681:	1 MHz to 32 GHz: <–90 dBm

Input/Output

RF input
- Connector:
  - R3671: N type (female), front panel
  - R3681: K type (male), front panel
- Impedance: 50 Ω (nominal)
- VSWR: (Input ATT.: ≥10 dB, at the specified frequency)
  <1.5: 1 (<3.5 GHz) (nominal)
  <2.0: 1 (>3.5 GHz) (nominal)

Calibration signal output
- Connector: BNC (female), front panel
- Impedance: 50 Ω (nominal)
- Frequency: 50 MHz

Probe power source
- Connector: 4-pin connector, front panel
- Output voltage and current: ±15 V, 150 mA (nominal)

I/Q input
- Connector: BNC (female), front panel
- Impedance: 50 Ω (nominal), AC/DC coupling
- Maximum input amplitude: 1.0 Vp-p (DC ±0.5 V or less)

External trigger input 1
- Connector: BNC (female), rear panel
- Impedance: 10 kΩ (nominal), DC coupling
- Trigger level: TTL level

External trigger input 2
- Connector: BNC (female), rear panel
- Impedance: 10 kΩ (nominal), DC coupling
- Trigger level: 0 to 5 V

Trigger output
- Connector: BNC (female), rear panel
- Amplitude: TTL level

Frequency reference input
- Connector: BNC (female), rear panel
- Impedance: 50 Ω (nominal)
- Frequency: 5 to 20 MHz
- Amplitude: 0 dBm ±5 dB

10 MHz frequency reference output	
Connector:	BNC (female), rear panel
Impedance:	50 Ω (nominal)
Frequency:	10 MHz
Amplitude:	0 dBm ±5 dB
21.4 MHz IF output	
Connector:	BNC (female), rear panel
Impedance:	50 Ω (nominal)
Frequency:	21.4 MHz
Amplitude:	Mixer level: +2 dB (typical at 50 MHz)
I/O	
Keyboard:	PS/2 101/106 keyboard, front panel
Mouse:	PS/2 mouse, front panel
USB:	Front panel
GPIB:	Conforming to IEEE-488.2, rear panel
LAN port:	10 Base-T, supporting TCP/IP, rear panel
Printer port:	Conforming to IEEE-1284-1994, rear panel
Signal for external indicator:	15-pin D-subconnector (VGA), rear panel

Notice: RS232 and EXT IN 1 to 4 connectors are not available.

General specifications

Operating environment range:	Ambient temperature: +5 to +40°C Relative humidity: 80% or less (No condensation)
Storage environment range:	Ambient temperature: –20 to +60°C Relative humidity: 80% or less (No condensation)
AC power input:	100 to 120 VAC, 50 Hz/60 Hz 220 to 240 VAC, 50 Hz/60 Hz (automatic switching between 100 VAC and 220 VAC)
Power consumption:	500 VA or less Approx. 220 VA (excluding options)
Dimensions:	Approx. 424 (W) x 266 (H) x 530 (D) mm
Mass:	32 kg or less (excluding options)

Options

OPT.22 High-stability frequency reference source

Reference frequency stability	
Aging rate:	±3 x 10^{-10}/ day, ±2 x 10^{-8}/ year
Temperature stability:	±5 x 10^{-9} (5 to 40°C, with frequency at 25°C as reference)
Warm-up (nominal):	(At 25°C, the frequency at 24 hours after power is turned on is used as a reference) ±1 x 10^{-8}/30 minutes ±5 x 10^{-9}/60 minutes
Reference frequency error:	±(Time elapsed from the latest factory calibration x Aging rate + Temperature stability)

OPT.71 2-ch arbitrary waveform generator (AWG) module
OPT.72 3 GHz (R3671)/6 GHz (R3681) digital modulation signal generator module

Arbitrary waveform generator module

Waveform resolution	
DAC resolution:	14 bits
Number of channels/Waveform memory size	
Number of channels:	2
Maximum memory size:	64M samples/channel
Number of waveforms storable:	Up to 4 waveforms
Waveform amplitude	
AC waveform amplitude:	1 Vp-p (Fix Gain Path mode) 2 Vp-p (Variable Gain Path mode)
Amplitude variable range:	0.2 to 2 Vp-p (Variable Gain Path mode)
Amplitude setting resolution:	5 mV
DC offset	
Variable range:	±0.75 V
Setting resolution:	5 mV
Residual DC offset:	<±0.5 mV (Fix Gain Path mode)*1) <±1.0 mV (Variable Gain Path mode)*1)
Sampling frequency	
Frequency setting range:	12.5 to 200 MHz
Frequency setting resolution:	10 µHz
Amplitude/Phase difference	
Phase difference between channels:	<2 ns
Level error between channels*2):	<0.2% (Fix Gain Path mode) <1.0% (Variable Gain Path mode)
Baseband filter:	2.5 MHz/50 MHz/Through (Low Path Filter: Tchebyscheff)
Distortion characteristics*3)*4)	
SFDR:	<–67 dBc (Fix Gain Path mode)*5) <–61 dBc (Variable Gain Path mode)*6)
Start trigger	
Type:	Continuous/Single/Target
Source:	Internal/External
Trigger polarity:	Positive/Negative
Marker	
Mode:	Memory marker/Sequence marker
Marker polarity:	Positive/Negative
Number of markers:	2 (one of two markers internally connected to SA)
BER counter	
PRBS:	PN7, 9, 11, 15, 19, 20, 23, ALL-0, and ALL-1
Number of channels:	1
Clock rate:	<60 MHz
External input signal:	data, clock, clock gate, and reset
Data polarity:	Positive/Negative
Clock polarity:	Rising/Falling
Input/Output	
I/Q output:	SMA (female), rear panel, 50 Ω (nominal)
Marker output:	BNC (female), rear panel, 180 Ω (nominal) TTL LEVEL
BER data input:	BNC (female), rear panel, 5 kΩ (nominal) TTL level or LVTTL level
BER clock input:	BNC (female), rear panel, 5 kΩ (nominal) TTL level or LVTTL level
BER clock gate input:	BNC (female), rear panel, 5 kΩ (nominal) TTL level or LVTTL level
BER reset input:	BNC (female), rear panel, 5 kΩ (nominal) TTL level or LVTTL level

Please be sure to read the product manual thoroughly before using the products.
Specifications may change without notification.

RF signal generator module (only in OPT.72)

Frequency	
Range:	R3671: 50 MHz to 3 GHz R3681: 50 MHz to 6 GHz
Resolution:	0.1 Hz
Accuracy:	Depends on accuracy of reference source
Output level	
Range:	+13 to –100 dBm (modulation OFF) +10 to –100 dBm (modulation ON)
Attenuator hold	
Level variable range:	>10 dBp-p
Resolution:	0.01 dB
Accuracy*7):	<±1.4 dB (+13 to –15 dBm, modulation OFF), ±1.0 dB (2 Sigma) <±1.8 dB (–15 to –100 dBm, modulation OFF), ±1.2 dB (2 Sigma) <±1.4 dB (+10 to –15 dBm, modulation ON), ±1.0 dB (2 Sigma) <±2.3 dB (–15 to –100 dBm, modulation ON), ±1.6 dB (2 Sigma)
ALC Hold ADJ accuracy:	<±0.25 dB (relative to ALC ON)
Output impedance:	50 Ω (nominal), front panel N (female)
SWR*8):	<1.7: ≤3 GHz
R3681 only:	<2.0: ≤6 GHz
Maximum reverse input power:	1 W
Signal purity	
SSB phase noise (20 kHz offset)	
R3671/3681:	<–115 dBc/Hz (50 MHz ≤ f ≤ 500 MHz) <–123 dBc/Hz (500 MHz < f ≤ 2 GHz) <–118 dBc/Hz (2 GHz < f ≤ 3 GHz)
R3681:	<–118 dBc/Hz (3 GHz < f ≤ 4 GHz) <–115 dBc/Hz (4 GHz < f ≤ 6 GHz)
Broadband noise:	<–132 dBc/Hz (for 2 GHz 0 dBm output)
Harmonic component:	<–30 dBc (for +10 dBm output)
Non-harmonic component:	<–65 dBc (for 0 dBm output)
Modulation*7) *9)	
Modulation accuracy*10):	EVM < 4% rms
Origin offset:	<–15 dBc
ACLR*11):	<–53 dBc (basic) <–60 dBc (OPT.73 ACLR mode)
External IQ input	
Input level:	$\sqrt{I^2 + Q^2}$ = 0.5 Vrms
Impedance:	50 Ω (nominal), rear panel SMA (female)

**1: After calibration*
**2: fout = 1 kHz after calibration*
**3: Sampling clock = 200 MHz*
**4: fout = 5 MHz, sine wave*
**5: Output level = 1 Vp-p*
**6: Output level = 2 Vp-p*
**7: Temperature range: 25 ±5°C*
**8: Output level: –10 dBm or less*
**9: 3GPP, IEEE802.11a/b/g, 0 dBm output*
**10: Carrier-Shift 2.5 MHz (3GPP)*
**11: 3GPP DL Test Model 1 64DPCH, 2110 to 2170 MHz*

OPT.73 3GPP multi-carrier generator option

Maximum number of carriers:	4
Test models that can be generated:	Test Model 1 (64DPCH/32DPCH/16DPCH) Test Model 2 Test Model 3 (32DPCH/16DPCH) Test Model 4 Test Model 5 (8HS-PDSCH+30DPCH) Test Model 5 (4HS-PDSCH+14DPCH) Test Model 5 (2HS-PDSCH+6DPCH)
Scrambling code:	0, 16, 32, 48
Slot timing:	0, 1/5, 2/5, 3/5 slot
Waveform generation mode:	ACLR mode, EVM mode

OPT.74 Pulse modulator

ON/OFF ratio:	>60 dB
Rise and fall times (10 to 90%):	<0.5 µsec
Input/Output	
External modulation input (RAMP IN)	
Connector:	BNC (female), rear panel
Input level:	TTL level (negative logic)
Marker 1 output (MARKER1 OUT)	
Connector:	BNC (female), rear panel
Output level:	TTL level

Ordering information

Accessories

Power cable:	A01402	1
Input cable (50 Ω):	A01261-30	1
N – BNC adapter (R3671) :	JUG-201A/U	1
K (f)–K (f) adapter (R3681):	5A-SFF40 (A)	1
SMA (f) – SMA (f) adapter (R3681):	HRM-501	1
SMA (m) – BNC (m) adapter (R3681):	HRM-517 (09)	1
Stylus pen:	ST-PEN	1

Options

Wideband demodulator:	OPT.11	
High-stability frequency reference source:	OPT.22	
3GPP modulation analysis software:	OPT.50	
cdma2000 1xEV-DV modulation analysis software:	OPT.52	
cdma2000 1xEV-DO modulation analysis software:	OPT.54	
GSM (EDGE) modulation analysis software:	OPT.56	
Bluetooth modulation analysis software:	OPT.57	
IEEE802.11b/g modulation analysis software:	OPT.59	
WiBro modulation analysis software:	OPT.60	
Single-carrier general-purpose modulation analysis software:	OPT.64	
OFDM (IEEE802.11a) modulation analysis software:	OPT.68	
2-ch arbitrary waveform generator (AWG) module:	OPT.71	
SMA (male) - BNC (female) adapter:	HRM-517(09)	2
3 GHz/6 GHz digital modulation signal generator module:	OPT.72	
SMA (male) - BNC (female) adapter:	HRM-517(09)	2
N (male) - BNC (female) adapter:	JUG-201/U	1
Input cable:	A01413	1
3GPP multi-carrier generator:	OPT.73	
Pulse modulator:	OPT.74	
C/N measurement software:	OPT.80	
AMP measurement software:	OPT.83	
Differential IQ input fixture:	R14603	
BNC cable:	A01261-60	2
USB cable:	A112008	1
Probe power cable:	A01294-0800	1
W-LAN 11.a technical adaptability test software		
IEEE802.11a:	PR36810101-FD	
TELEC (IEEE802.11a frequency band):	PR36810102-FD	
FCC (IEEE802.11a frequency band):	PR36810103-FD	
W-LAN 11.b/g technical adaptability test software		
IEEE802.11b/g:	PR36810104-FD	
TELEC (IEEE802.11b/g frequency band):	PR36810105-FD	
FCC (IEEE802.11b/g frequency band):	PR36810106-FD	

Accessories (optional)

Rack-mount set B:	A02724	EIA standard
	A02725	JIS standard
Panel extension cable (3 m):	A112003	

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