Network Analyzers

300 kHz to 3.8 GHz/300 kHz to 8 GHz

R3765G/3767G Series

(Photo is R3767CG)

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Network Analyzers

The R3765G/67G-series network analyzers are vector network analyzers that incorporate a new RF circuit analysis technique. The measuring frequency range is from 300 kHz to 3.8 GHz (R3765G)/ 300 kHz to 8 GHz (R3767G). ADVANTEST's unique high-speed signal processing technology enables a faster measurement speed. In addition to the basic model, a model with built-in bridge transmission/reflection characteristic measurement and a model with a built-in S-parameter test set for forward and reverse measurement are also available. An optional 3-port test set or 4-port test set can be added to these models. By installing additional input channels in the receive section, the multi-port models allow perfectly simultaneous measurement of two different measurement paths, revolutionizing the measurement efficiency of multi-port devices. The 8.4-inch color TFT liquid crystal display allows the waveform display can be split into four windows. An independent measurement path can be selected for each windows, thus allowing the simultaneous display of up to eight parameters in four paths. Analysis of measurement items in a wide range can be completed instantaneously. By executing 2-port full calibration, measurement speed can be increased to 0.15ms per point.
 The optional software fixture function makes measurement of normalized impedances other than 50Ω easy. This function converts the impedance in software, eliminating the need to provide hardware such as an impedance converter. Furthermore, balanced circuits can be measured and matching networks such as filters and amplifiers can be simulated using the network analyzer, making it suitable for wide range of applications.
ADVANTEST's popular BASIC controller function is incorporated in the analyzer as standard, expanding the analyzer's applications in automatic measurement.

■ **Revolutionized measurement of multi-port devices**
Thanks to additional input channels, the built-in 3-port test set model (option) can shorten measuring time. The system eliminates the need for a change-over switch and enables measurement of two different paths simultaneously. For example, the new system obtains measurement results in two sweeps for Tx and Rx measurement of a duplexer, compared with the four sweeps normally required.

■ **High-speed sweep time**
The sweep time per point has been shortened further to 0.15ms. The network analyzer also features faster register save and recall functions in addition to reduced sweep time to enhance overall throughput.

■ **Software fixture (option71/72)**
In conventional RF measurement normalized impedance has been limited only to 50Ω. A function has been added that eliminates the need for a hardware fixture to establish the system of measurement.

• Impedance conversion function

• Port conversion function (option71 only)

• Matching network function

• Balancing measurement function (option 71 only)

• Data save function (TS, CSV formats)

■ High-Speed, High-Accuracy Measurement

The R3765G/3767G series achieves a further reduction of measuring time. This series of network analyzers supports today's increasingly diverse measurement environments and significantly expands RBW setting resolution to enable optimal setting for both high-accuracy and high-speed measurement.

- 0.15ms/point in 2-port full calibration

- full calibration : 3-port and 4-port

- High-speed data transfer

- Enhanced IF RBW setting resolution at 20 kHz to 10 Hz

■ Easy Operation

Rapid increase in the performance and the number of ports in modern devices not only make using measuring equipment more complicated, but also greatly increase the number of items to be analyzed.

One of the most important features of network analyzers in the recent years is the ability to enhance the efficiency of analysis. Focusing on this requirement, the user interfaces of the R3765/67G series have been dramatically enhanced.

- Automatic calibration kit

- Ten markers per trace

- Easy-to-see limit line editor and powerful GO/NO-GO functions

■ Revolution in Multi-Port Measurement

As options, a model with a 3-port test set and a model with a 4-port test set are available in the R3765/67G series. These options not only contain the test sets, but also have an additional network analyzer receiver channel. This enables simultaneous measurement of two different paths, such as the Tx and Rx of a duplexer, without a switching time.

A 3-port full calibration function is available to enable measurement of 3-port devices more accurately. This function is useful for measuring couplers and circulators and can greatly enhance the accuracy of measurement.
displayed simultaneously also.

- Built-in 3-port test set (Option 11)

- Built-in 4-port test set (Option 14)

- Measurement of two paths simultaneously

  (When a built-in 3- or 4-port)

- 3-port and 4-port full calibration
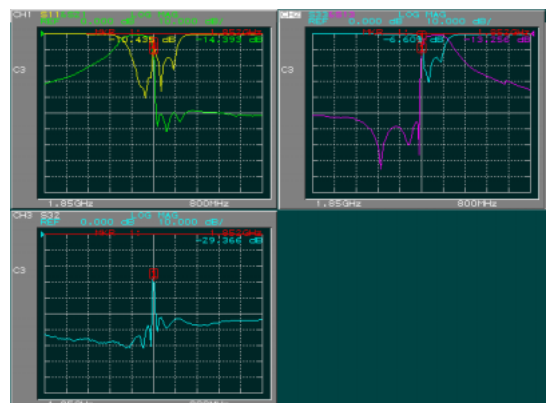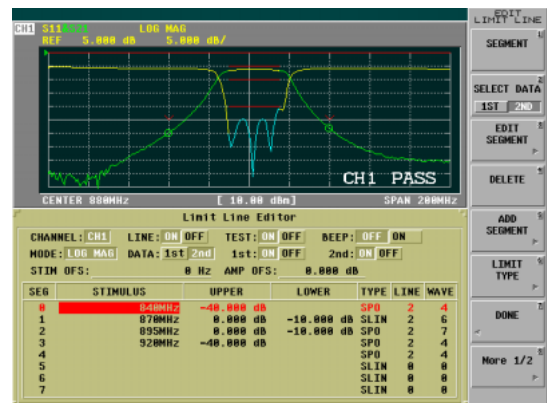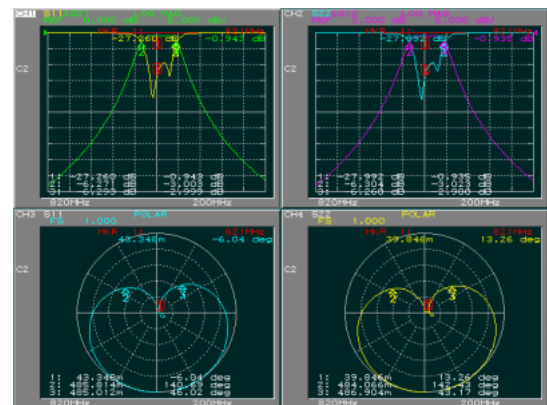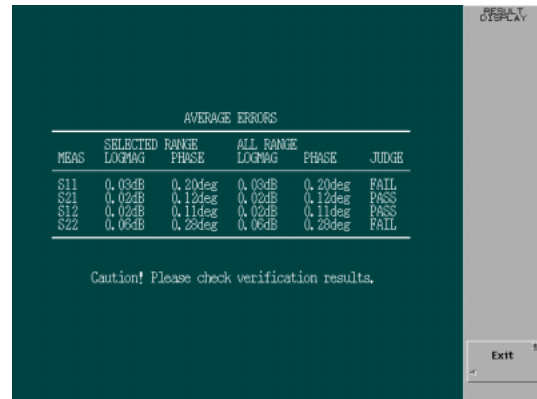
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■ Simultaneous Display and Analysis of Multi-Port Parameters

An analysis display function is mission-critical for measuring multi-port devices. The R3765/3767 series provides users with four display channels. Each channel is capable of two trace displays, allowing simultaneous display of a total of eight traces. Users can also freely select the measurement path independently for each channel. This function is particularly effective for measurement of multiple port devices.
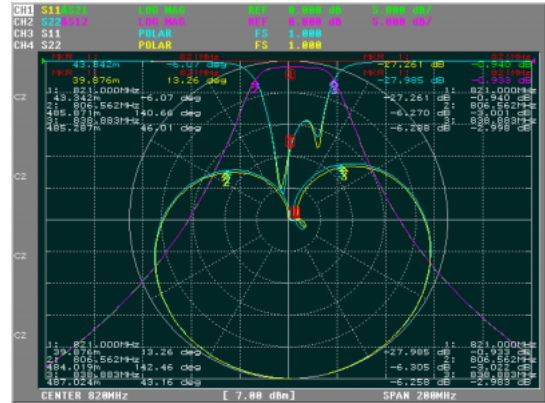
■ PC Friendly

The R3765G and R3767G feature an enhanced support for production line operating environments. The built-in BASIC controller function is provided as standard on all models. An optional LAN interface is also available. These features greatly enhance the expendability of theses next generation network analyzers.

- 3-mode floppy disk drive
- Built-in MS-DOS format BASIC controller
- Built-in programming editor
- VGA output
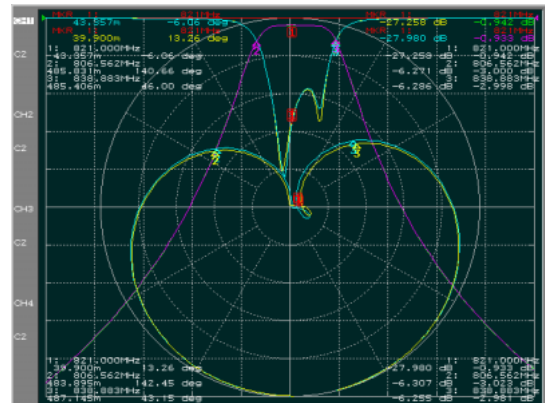
■ Time Domain (Option 70)

Time domain analysis function
Using the time domain analysis function enables multiple reflection effects to be analyzed on the time axis. Using with the GATE function, effects on phase linearity caused by a multiple reflection signal can be analyzed simultaneously.
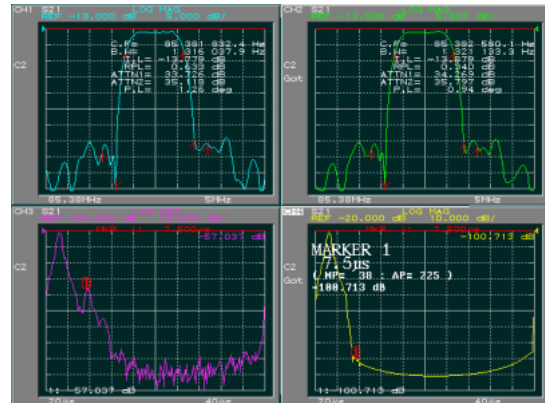
■Step Attenuator (Option 10)

This is a built-in output attenuator option for R3767XG series network analyzers. Attenuation can be set for each test port, and a successive switching operation is available thanks to an electric step attenuator.

This option is suitable for applications such as a small signal input amplifier, which lower the network analyzer's output level when measuring S21 (Gain) and raise the level when measuring S22 (output impedance). By these functions, a small signal can be input to a device.

Measurement Functions

Sweep channel	2 channels (CH1, CH2)
Display channel	4 channels (CH1, CH2, CH3, CH4)
Trace	2 traces/channel
	(A maximum of 8 traces displayed simultaneously)
Measurement parameter	R3765CG, R3767CG : S11, S21, S12, S22
	Option 11, 13 : S11, S22, S33, S12, S21, S31, S13, S23, S32
	Option 14 : S11, S21, S31, S41, S22, S12, S32, S42, S33, S13, S23, S43, S44, S14, S24, S34
Measurement format	R3765BG, R3767BG : TRANSMISSION, REFLECTION
Rectangular coordinates	R3765AG, R3767AG : A/R, B/R
	Can be converted into impedance (Z) and admittance (Y) by the parameter conversion function.
Smith chart	
Polar coordinates	Amplitude (linear/logarithm), phase, group delay, VSWR, complex numbers (real part/imaginary part). Marker readout values: Linear/log amplitude, phase, complex numbers (real part/imaginary part). R+jX, G+jB Marker readout values: Linear/log amplitude, phase, complex numbers (real part/imaginary part).

Receiver Characteristics

Resolution bandwidth	20 kHz to 10 Hz (variable in 1, 1.5, 2, 3, 4, 5 and 7 steps)
Stability	
Trace noise	0.003dBrms (300kHz to 2.6GHz, RBW 3kHz, typical value)
	0.006dBrms (2.6 to 3.8GHz, RBW 3kHz, typical value)
	0.012dBrms (3.8 to 8.0GHz, RBW 3kHz, typical value)
Temperature stability	0.01dB/˚C (300kHz to 2.6GHz, typical value)
	0.02dB/˚C (2.6 to 8.0GHz, typical value)
Stability over time	0.005dB/week (typical value)
Amplitude characteristics	
Amplitude resolution	0.001dB
Frequency characteristics	±1.0dB (23˚C ± 5˚C)
Dynamic accuracy	Maximum input to -20 dB input used as a reference
	0.20dB (0 to -10dB, 300kHz to 3.8GHz)
	0.40dB (0 to -10dB, 3.8GHz to 8.0GHz)
	0.05dB (-10 to -50dB)
	0.10dB (-50 to -60dB)
	0.40dB (-60 to -70dB)
	1.00dB (-70 to -90dB)
Phase characteristics	
Phase resolution	0.01˚
Frequency characteristics	± 5˚ (23˚C ± 5˚C)
Dynamic accuracy	Maximum input to -20 dB input used as a reference
	2.0˚ (0 to -10dB, 300kHz to 3.8GHz)
	4.0˚ (0 to -10dB, 3.8GHz to 8.0GHz)
	0.3˚ (-10 to -50dB)
	0.4˚ (-50 to -60dB)
	1.5˚ (-60 to -70dB)
	4.0˚ (-70 to -80dB)
	8.0˚ (-80 to -90dB)
Group delay characteristics	Can be calculated through the following expression based on phase characteristic: $\Delta\phi/(360 \times \Delta f)$ $\Delta\phi$: Phase difference Δf : Frequency difference (aperture frequency)
Group delay time resolution	1pS
Aperture frequency	Can be set between [100/(measurement points - 1)] × 2 to 50% of set frequency range
Accuracy	Phase accuracy/(360 x aperture frequency (Hz))

Signal Source Characteristics

Frequency	R3765AG/BG/CG		R3767AG/BG/CG	
Range	300kHz to 3.8GHz		300kHz to 8.0GHz	
Set resolution	1Hz			
Measurement resolution	± 0.01ppm			
Accuracy	± 10ppm (23 ± 5˚C)			
Temperature stability	± 7.5ppm (0 to 55˚C, typical value)			
System parameter drift over time	± 3ppm (year, typical value)			

Output Power	R3765CG/67CG	R3765BG/67BG	R3765AG/67AG
Range	+10 to -10dBm	+7 to -13dBm	+17 to -3dBm
	Option 12, 13 R3765CG +4 to -16dBm R3765BG +9 to -11dBm		
Resolution	0.01dB		
Accuracy	R3765CG/ R3767CG ± 0.5dB (50MHz, 0dBm, 23˚C ± 5˚C) Option 11, 14 is specified in Test Port 1		
	Option 12, 13 R3765CG ±0.5dB (50MHz, -6dBm, 23˚C ±5˚C) Option 13 is specified in Test Port 1		
	Option 12 R3765BG ±0.5dB (50MHz, -1dBm, 23˚C ±5˚C)		
	R3765BG/ R3767BG ± 0.5dB (50MHz, -3dBm, 23˚C ± 5˚C)		
	R3765AG/ R3767AG ± 0.5dB (50MHz, 7dBm, 23˚C ± 5˚C)		
Flatness	2.0dBp-p (23˚C ± 5˚C) Option 11, 13, 14 is specified in Test Port 1		
Linearity	R3765CG/ R3767CG	300kHz to 15MHz ± 0.4dB (-5 to +5dBm, 0dBm reference 23˚C ± 5˚C) ± 0.8dB (-10 to +10dBm, 0dBm reference 23˚C ± 5˚C) 15MHz to 8GHz ± 0.2dB (-5 to +5dBm, 0dBm reference 23˚C ± 5˚C) ± 0.4dB (-10 to +10dBm, 0dBm reference 23˚C ± 5˚C) Option 12, 13 300kHz to 15MHz ±0.4dB (-11 to -1dBm, -6dBm reference, 23˚C ±5˚C) ±0.8dB (-16 to +4dBm, -6dBm reference, 23˚C ±5˚C) 15MHz to 3.8GHz ±0.2dB (-11 to -1dBm, -6dBm reference, 23˚C ±5˚C) ±0.4dB (-16 to +4dBm, -6dBm reference, 23˚C ±5˚C) Option 14 300kHz to 15MHz ±0.4dB (-5 to +5dBm, 0dBm reference, 23˚C ±5˚C) ±0.8dB (-10 to +8dBm, 0dBm reference, 23˚C ±5˚C) 15MHz to 8GHz ±0.2dB (-5 to +5dBm, 0dBm reference, 23˚C ±5˚C) ±0.4dB (-10 to +8dBm, 0dBm reference, 23˚C ±5˚C)	
	R3765BG/ R3767BG	300kHz to 15MHz ± 0.4dB (-8 to +2dBm, -3dBm reference 23˚C ± 5˚C) ± 0.8dB (-13 to +7dBm, -3dBm reference 23˚C ± 5˚C) 15MHz to 8GHz ± 0.2dB (-8 to +2dBm, -3dBm reference 23˚C ± 5˚C) ± 0.4dB (-13 to +7dBm, -3dBm reference 23˚C ± 5˚C)	
	R3765AG/ R3767AG	300kHz to 15MHz ± 0.4dB (+2 to +12dBm, 7dBm reference 23˚C ± 5˚C) ± 0.8dB (-3 to +17dBm, 7dBm reference 23˚C ± 5˚C) 15MHz to 8GHz ± 0.2dB (-5 tp +5dBm, 7dBm reference 23˚C ± 5˚C) ± 0.4dB (-10 to +10dBm, 7dBm reference 23˚C ± 5˚C)	

Signal purity		
Harmonic distortion	20dBc	(23˚C ± 5˚C at maximum output)
Non-harmonic spurious	30dBc	(23˚C ± 5˚C at maximum output/offset > 1MHz)
Phase noise	85dBc/Hz	(300kHz to 40MHz, 23˚C ± 5˚C/offset > 1MHz)
(10kHz Off)	85dBc/Hz + 20Log (f/40MHz)	
		(40MHz to 8GHz, 23˚C ± 5˚C)

Sweep function	
Sweep type	Linear sweep, log sweep, program sweep and power sweep
Sweep time	0.15ms/point
Measurement point	3, 5, 11, 21, 51, 101, 201, 301, 401, 601, 801, or 1201 points
Sweep trigger	Continuous, single, hold or external trigger can be selected

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Test Port Characteristics

Load matching	16dB (300kHz to 40MHz)
(23˚C ± 5˚C)	18dB (40MHz to 2.6GHz,)
	16dB (2.6GHz to 3.8GHz)
Source matching	14dB (3.8GHz to 8.0GHz)
(23˚C ± 5˚C)	R3765BG/CG and R3767BG/CG only
	14dB (300kHz to 40MHz)
	16dB (40MHz to 2.6GHz)
	15dB (2.6 to 3.8GHz)
Directivity	12dB (3.8 to 8.0GHz)
(23˚C ± 5˚C)	R3765BG/CG and R3767BG/CG only
	28dB (300kHz to 40MHz)
	30dB (40MHz to 2.6GHz)
	26dB (2.6 to 3.8GHz)
	22dB (3.8 to 8.0GHz)
Crosstalk	90dB (300kHz to 40MHz)
	100dB (40MHz to 2.6GHz)
	90dB (2.6 to 3.8GHz)
	80dB (3.8 to 5.0GHz)
	70dB (5.0 to 8.0GHz)
	Option 14
	90dB (300kHz to 40MHz)
	95dB (40 MHz to 2.6GHz)
	85dB (2.6GHz to 3.8GHz)
	75dB (3.8GHz to 5.0GHz)
	65dB (5.0GHz to 8.0GHz)
Maximum input level	0dBm (R3765AG/BG, R3767AG/BG)
	+12dBm (R3765CG, R3767CG)
Noise level	From maximum input level
	At RBW 3 kHz -85dB (300kHz to 40MHz)
	-90dB (40MHz to 3.8GHz)
	-80dB (3.8 to 8.0GHz)
	At RBW 300 Hz -95dB (300kHz to 40MHz)
	-100dB (40MHz to 3.8GHz)
	-90dB (3.8 to 8.0GHz)
	Option 14
	At RBW 3kHz -85dB (300kHz to 40MHz)
	-85dB (40MHz to 3.8GHz)
	-75dB (3.8 to 8.0GHz)
Maximum port bias	R3765CG and R3767CG only
	± 30Vdc, 0.5A
Input burning level	+21dBm, 30Vdc
Test port connector	Type N connector (female)

Other Functions

Display unit	
Display unit	8.4-inch TFT color LCD
Backlight	Brightness half-time 40,000h (typical value)
Error correction	Normalize, normalize and isolation, 1-port calibration
	2-port calibration (R3765CG and R3767CG only)
	3-port calibration (Option 11 only)
	4-port calibration (Option 14 only)
Marker function	Averaging, smoothing
	Electrical length correction, phase offset correction
Limit line function	10 multi markers
	Δ marker function, search function, marker → function
Save/recall function	A maximum of 31 segments can be set
	PASS/FAIL display function, beep tone function
	Register type: Data saved in up to 20 registers
Controller function	File format : Data saved on a floppy disk or
FDD function	in built-in memory (8 MB)
	BASIC programming function (program size 2 MB)
	Conforms to 8 MS-DOS FAT format
	Accommodates 3 modes (DD 720 kB, HD 1.2 MB/1.4 MB)

Connection with External Equipment

External display signal	15-pin D-SUB connector (VGA)
GPIB	Conforms to IEEE 488.1 and IEEE 488.2
Parallel ports	TTL level
	Output ports (8 bits × 2 ports)
	Input/output ports (4 bits × 2 ports)
Serial port	Serial I/O ports for accessories
Printer port	Conforms to IEEE 1284-1994
Keyboard	Conforms to IBM PC-AT
External reference	1MHz, 2MHz, 5MHz, 10MHz (±10ppm)
frequency input	0 dBm (50Ω) or higher
Probe power	±12V±0.5V, 300mA

General Specifications

Operating environment	
When FDD is used	Temperature range +5 to +40˚C
	Relative humidity 80% or less (without condensation)
When FDD is used	Temperature range 0 to +50˚C
	Relative humidity 80% or less (without condensation)
Storage environment	-20 to +60˚C
Power supply	AC100 to 120V, 50/60Hz
	AC220 to 240V, 50/60Hz
	(AC 100V and AC 200V by automatic switching)
Dimensions	Approx. 424 (width) × 220 (height) × 400 (depth) mm
Weight	Approx. 18.5kg or less
Power consumption	250VA or less
Accessories	Operation manual, programming manual, power cable and fuses

R3765G/3767G Selection Guide

Model	Type	OPT10	OPT11	OPT14	OPT12	OPT70	OPT71	OPT72
R3765AG	3.8GHz basic model	○				○		
R3765BG	3.8GHz model with built-in bridge	○			○	○		
R3765CG	3.8GHz model with built-in S parameters	○	○	○	○	○	○	○
R3767AG	8GHz basic model	○				○		
R3767BG	8GHz model with built-in bridge	○				○		
R3767CG	8GHz model with built-in S parameters	○	○	○		○	○	○

*OPT11, OPT12, OPT14 Should not be selected at the same time.

Option Guide

*1	OPT10	Output attenuator (electronic type)
	OPT11	Built-in 3-port test set
*1	OPT14	Built-in 4-port test set
*1,2	OPT12/13	75Ω impedance
	OPT70	Time domain (software)
	OPT71	Software fixture (balance)
	OPT72	Software fixture (single)

[1] When using these options together, some specifications of the R3765G/3767G series
may be changed. For details, consult an ADVANTEST sales office.

[2] OPT12 : R3765/BG/CG only

OPT13 : R3765/BG/CG+OPT11 only