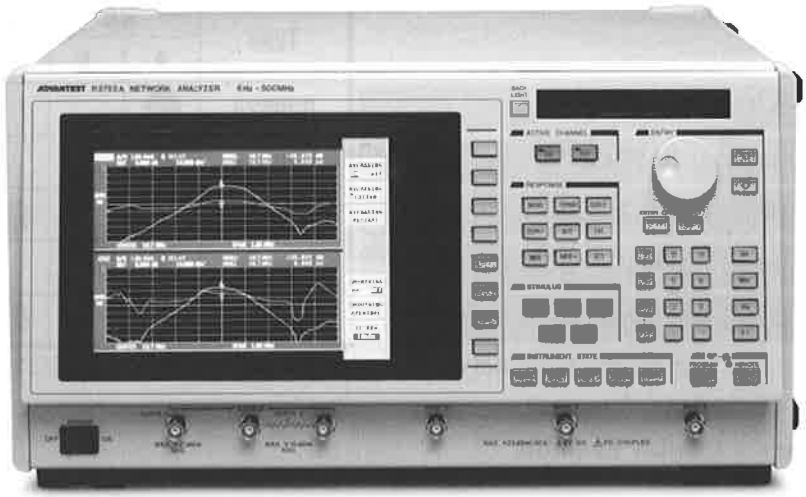
Network Analyzers

A Choice of the Optimum Network Analyzer For the Application

R3752H/3753H Series

- **R3752H Series For System Use**
  R3753H Series For Standalone Use
- **Measurement Frequencies From 5 Hz to 500 MHz**
- **0.1 ms/Point Sweep Time**
- **Simultaneous 2-Channel 4-Trace Measurement of Two Devices**
- **Wide Dynamic Range of 115 dB**
- **Programmed Sweep, High-Speed Level Sweep Function**



R3752H/3753H Series
Network Analyzers

The R3752H/3753H Series is a new vector network analyzers, developed so that each one is the 'optimum tool for the application' The Series is highly reliable and enables high throughput. High-speed 2-channel 4-trace measurements of 0.1ms/point with a resolution bandwidth of 10 kHz can be done over a wide 115 dB dynamic range, and measurement of two devices simultaneously is possible. New functions have been added to the conventional frequency sweep function. These include a programmed sweep function which allows free variation of resolution bandwidth or output level at any point during the sweep. There is also a high-speed level sweep function made possible through a new semiconductor switch in the output section which is ideal for drive level performance tests of crystal vibrators.
The R3752H Series analyzer is designed for system use, made compact and ultra light weight, at only 12 kg. The R3753H Series analyzer is for use as independent units. They have been designed for easy viewing and operation with TFT color LCD displays that allow easy data comparison and pattern recognition when viewing measurement results or doing analysis.
Both the R3752H and R3753H Series come in three types with either one, two or three input channels so that the best model can be selected for the application.

■ Sweep Time of 0.1 ms/Point

Total throughput is an important factor in systems which measure electronic circuit parts such as ceramic or crystal resonators and filters. Sweep time has
the greatest effect on throughput performance and the R3752H/3753H Series has a sweep time of 0.1 ms/point (10 kHz resolution bandwidth) for high-speed measurement. Blanking time, the time between the end of one sweep and the beginning of the next has been brought down to 5 ms (typical value).

Improved H Series Performance Items

- Manually selectable display colors (256 colors)
- Expanded BASIC programming memory capacity (1MB)
- Expanded save register capacity (2MB)
- Improved BASIC processing speed
- Limit line function as standard

■ 2-Channel, 4-Trace Simultaneous Measurement of Two Devices

The R3752AH and R3753AH have three input channels (A, B and R) which greatly reduce measurement by allowing measurement of two devices simultaneously.

■ 115 dB Wide Dynamic Range Measuring

Though compact and lightweight, the R3752H/3753H Series realize a dynamic range of 115 dB which is effective when making ripple evaluations of the pass bands or spurious checks of the block bands of monolithic crystal filters (MCFs) or similar filters.

■ Programmed Sweep Function (Standard) Allows RBW or Output Level Variations in Mid-Sweep

The programmed sweep function not only allows setting of the sweep frequency but also enables changes to be made in resolution bandwidth or output level in mid-sweep.

■ High-Speed Level Sweep Function Enables Device Level Testing

The R3752H/3753H Series uses a semiconductor switch in the output section, allowing high-speed output level switching, which is difficult with conventional mechanical switches that have limited mechanical life spans.

R3752AH/3752BH/3752EH (System-Use Type)

The R3752H Series is a system-use network analyzers that achieve low cost while maintaining the basic functions required, high throughput and highly accurate measurement. The units employ a green fluorescent display and are compact and lightweight (12 kg). They come with a signal output terminal for external display when doing waveform observation and can be connected to an external VGA or IBM-PC compatible monitor. Either one (R3752EH), two (R3752BH) or three input channels (R3752AH) can be selected, as best fits the application.

■ Ideal For Integration Into a System

When used with automated equipment, normal data processing is done by a personal computer and the R3752H Series displays only the minimal data necessary for cost and space reductions.

▲ Construction of an automatic measurement system by use together with a test handler

▲ R3752A

■ Input Can Be Done By a Bar Code Reader, Convenient For Factory Automation

When testing electronic components or other devices, the set measurement conditions must be changed every time the device to be tested is changed. By connecting a bar code reader human input errors can be eliminated and settings can be changed easily.

▲ Bar code input

■ High-Speed GO/NO-GO Decision Function

After a device is measured, display can only be made from the test results which satisfy the goals. GO/NO-GO decisions against preset limit values can be displayed quickly and in an easy-to-read format.

▲ GO/NO-GO testing of a crystal oscillator

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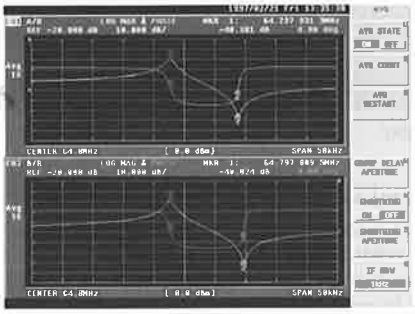
R3753AH/3753BH/3753EH (Standalone-Use Type)

The R3753H Series is a all-around network analyzers for use in the research or development laboratory or in the production line. The Series uses TFT color LCD displays for ease in distinguishing different sets of data. As with the R3752H Series, three models are available with either one (R3753EH), two (R3753EH), two (R3753BH) or three (R3753AH) input channels.

■ Simultaneous Measurement of Two Devices Improves Throughput

The R3753AH (with 3 input channels) can make up to four traces in a single sweep. With the same type of electronic component connected to the A and B input channels, both components can be measured simultaneously in a single sweep with parameters such as amplitude/phase or amplitude/group delay divided into two traces each.



▲ 2-channel, 4-trace display

■ Wide Dynamic Range of 115 dB

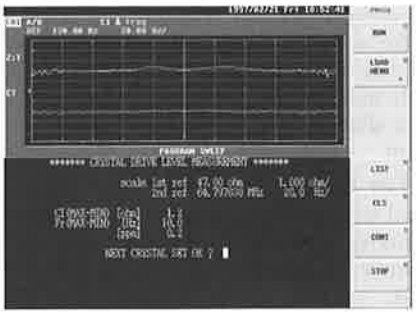
Both the R3752H and R3753H Series use an auto attenuator on the input which works depending on the input level, providing measurements in a dynamic range of 115 dB (with 1 kHz RBW).

■ Limit Line Function

Quick evaluation of characteristics is critical during manual inspection of a device. The limit line function with its quick and accurate evaluation is ideal in such situations.

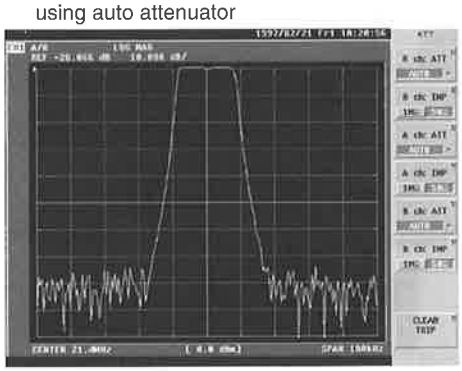
■ High-Speed Level Variation Measurements

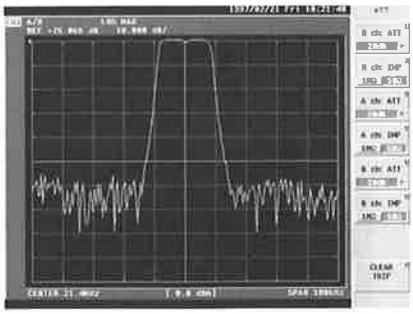
A wide range of levels, from -43 dBm to +21 dBm can be swept at high speed, which is ideal for device level testing of components such as resonators. A highly reliable semiconductor switch is used for the level variations.



▲ CI measurement by level sweep

▼ Amplitude measurement of a crystal filter, using auto attenuator





▲ With attenuator fixed at 20 dB

Specifications

Measuring Functions

Measuring channels: 2 channels (4 trace display)
Measurement parameters:
A/R, B/R, A/B, R, A, B (R3752AH, R3753AH)
A/R, R, A (R3752BH, R3753BH)
A (R3752EH, R3753EH)
Measuring format:
R3752H Series
Log/linear amplitude, phase, group delay, real and imaginary parts of complex parameters
|Z|, R, X (during impedance conversion measurement)
|Y|, G, B (during admittance conversion measurement)
Phase extension display
R3753H Series
Orthogonal display:
Log/linear amplitude, phase, group delay, real and imaginary parts of complex parameters
|Z|, R, X (during impedance conversion measurement)
|Y|, G, B (during admittance conversion measurement)
Phase extension display
Smith chart: Marker readout for log/linear amplitude, phase, group delay, real and imaginary parts, R + jX, G + jB
Polar coordinate display: Marker readout for log/linear amplitude, phase, group delay, real and imaginary parts
Signal Source

Frequency characteristics

Range: 5 Hz to 500 MHz
Resolution: 0.1 Hz
Stability: ±5 x 10^{-6}/day (25 ± 5°C)
Accuracy: ±20 ppm (25 ± 5°C)

Output characteristics

Range: +21 dBm to -63 dBm (output port 1)
Resolution: 0.1 dB
Accuracy: 0.5 dB (0 dBm, 50 MHz, 25 ± 5°C)
Linearity (25 ± 5°C, 50 MHz):
+21 dB to -35 dB ±0.5 dB
–35 dB to -63 dB ±1.5 dB
Flatness (25 ± 5°C,10 dBm output):

5 Hz to 100 kHz	±4.0 dB
100 kHz to 1 MHz	±2.0 dB
1 MHz to 300 MHz	±1.5 dB
300 MHz to 500 MHz	±2.0 dB

Impedance: 50 Ω nominal
(Output port 1) return loss 13 dB min. (0 dBm, typ.)

Signal purity

Harmonic distortion: ≤ -20 dBc
Non-harmonic spurious: ≤ -30 dBc or -70 dBm, whichever is larger
Phase noise: ≤ -75 dBc/Hz (at 10 kHz offset)

Sweep characteristics

Sweep parameters: Frequency, signal level
Range:
Frequency sweep same as frequency characteristic
Level sweep +21 dBm to -43 dBm
Range settings: Start/stop or center/span
Sweep types: Linear frequency sweep, sweep by user-specified segment and level sweep
Sweep time: 0.1 ms/point (RBW 10 kHz)
Measurement points: 3, 6, 11, 21, 51, 101, 201, 301, 401, 601, 801, 1201
Sweep trigger: Continuous, single or external
Sweep modes:
Dual sweep Two channels are swept in the same frequency range.
Alternate sweep Two channels are swept using two different types of sweep in different frequency ranges.

Output format

Output: Single, dual (R3752AH/BH, R3753AH/BH)
Single (R3752EH, R3753EH)
Connector: BNC (female), 50 Ω
Power splitter (output port 2): (R3752AH/BH and R3753AH/BH only)
Insertion loss 6 dB
Amplitude tracking < 100 MHz 0.1 dB (typ.)
Phase tracking ≥ 100 MHz 0.2 dB (typ.) 1°
Reception

Input characteristics

Input channels: 3 channels (R3752AH, R3753AH)
2 channels (R3752BH, R3753BH)
1 channel (R3752EH, R3753EH)
Frequency range: 5 Hz to 500 MHz
Impedance: 50 Ω nominal, 1 MΩ/20 pF
Return loss:

	ATT 0 dB	ATT 20 dB
<300 MHz	>20 dB	>23 dB
≥300 MHz	>15 dB	>20 dB

Maximum input level:

Input impedance	ATT 0 dB	ATT 20 dB
50 Ω	-20 dBm	0 dBm
1 MΩ	22.4 mV	224 mV

Destructive input level: 50 Ω +23 dB, 0 VDC 1 MΩ ±3 V
Noise level: (ATT AUTO, 25 ± 5°C)

RBW / FREQ	10 kHz	3 kHz	1 kHz	300 Hz	100 Hz
5 Hz to 500 kHz	min. f 200 kHz -100 dBm	min. f 60 kHz -105 dBm	min. f 20 kHz -110 dBm	min. f 6 kHz -115 dBm	min. f 2 kHz -115 dBm
500 kHz to 300 MHz	-105 dBm	-110 dBm	-115 dBm	-115 dBm	-115 dBm
300 MHz to 500 MHz	-105 dBm	-110 dBm	-110 dBm	-110 dBm	-110 dBm

Resolution bandwidth (RBW): 10 kHz to 3 Hz (variable in 1, 3 steps)
Input crosstalk: (R3752AH/BH, R3753AH/BH)
10 kHz to 500 kHz 120 dB
500 kHz to 300 MHz 115 dB
300 MHz to 500 MHz 110 dB
Signal source crosstalk: (output level +15 dBm, ATT 0 dB)
5 Hz to 100 kHz 105 dB
100 kHz to 300 MHz 110 dB
300 MHz to 500 MHz 105 dB
Input connector: BNC (female), 50 Ω
Automatic offset compensation:
Normalize function ; Eliminates frequency characteristic of measuring system
Electric length compensation ; Equivalent electric length or group delay time is added to measured phase and group delay time
Range: +10 sec. to -10 sec.

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Amplitude characteristics

Relative Measuring (R3752AH/BH, R3753AH/BH Only)
Measurement range: 0 ± 120 dB (RBW 1 kHz)
Display resolution : 0.001 dB(/div.)
Accuracy: ±0.5 dB (50 MHz, 25 ± 5°C, max. input level)
Frequency response: (25 ± 5°C)

50 Ω input	5 Hz to 100 MHz	1 dBp-p
	100 MHz to 300 MHz	2 dBp-p
	300 MHz to 500 MHz	3 dBp-p
1 MΩ input	5 Hz to 1 kHz	5 dBp-p
	1 kHz to 100 MHz	1.5 dBp-p

Dynamic accuracy:

0 dBm to -10 dBm	±0.10 dB
-10 dBm to -60 dBm	±0.05 dB
-60 dBm to -70 dBm	±0.10 dB
-70 dBm to -80 dBm	±0.30 dB
-80 dBm to -90 dBm	±0.90 dB

Absolute Measuring
Measurement range:

0 dBm to -120 dBm	ATT AUTO
0 dBm to -100 dBm	ATT 20 dB
-20 dBm to -120 dBm	ATT 0 dB
(1 kHz RBW)	

Display resolution : 0.001 dB(/div.)
Accuracy: ±0.5 dB (50 MHz, 25 ± 5°C, max. input level)
Frequency response: (25 ± 5°C)

50 Ω input	5 Hz to 10 kHz	4 dBp-p
	10 kHz to 300 MHz	2 dBp-p
	300 MHz to 500 MHz	3 dBp-p
1 MΩ input	5 Hz to 1 kHz	10 dBp-p
	1 kHz to 100 MHz	1.5 dBp-p

Dynamic accuracy: (R3752EH, R3753EH only)

0 dBm to -10 dBm	±0.4 dB
-10 dBm to -60 dBm	±0.1 dB
-60 dBm to -70 dBm	±0.2 dB
-70 dBm to -80 dBm	±0.6 dB

Phase characteristics

Relative Measuring (R3752AH/BH, R3753AH/BH Only)
Measurement range: ±180° (more than ±180° can be displayed continuously with the display extension function)
Frequency response: (at 25 ± 5°C, same attenuation amount)

50 Ω input	5 Hz to 100 MHz	5° p-p
	100 MHz to 300 MHz	10° p-p
	300 MHz to 500 MHz	20° p-p
1 MΩ input	5 Hz to 1 kHz	20° p-p
	1 kHz to 100 MHz	10° p-p

Dynamic accuracy: (25 ± 5°C, 3 Hz RBW, f ≤ 1 kHz, ATT = 20 dB)

0 dBm to -10 dBm	±1.0°
-10 dBm to -50 dBm	±0.3°
-50 dBm to -60 dBm	±0.5°
-60 dBm to -70 dBm	±1.0°
-70 dBm to -80 dBm	±3.0°
-80 dBm to -90 dBm	±8.0°

Absolute Measuring (R3752EH, R3753EH Only)
Measurement range: ±180° (more than ±180° can be displayed continuously with the display extension function)
Dynamic accuracy: (25 ± 5°C, 3 Hz RBW, ≥1 kHz, ATT = 20 dB)

0 dBm to -10 dBm	±3.0°
-10 dBm to -50 dBm	±1.5°
-50 dBm to -60 dBm	±2.0°
-60 dBm to -70 dBm	±2.4°
-70 dBm to -80 dBm	±3.6°

Delay characteristics

Range: Calculated by the following equation

$$\tau = \frac{\Delta\phi}{360 \times \Delta f}$$

$\Delta\phi$: phase
Δf : aperture frequency (Hz)

Measurement range: 1 ps to 250 s
Group delay time resolution: 1 ps
Aperture frequency: 0.01% to 50%
Accuracy: $\dfrac{\text{Phase accuracy}}{360 \times \text{aperture frequency (Hz)}}$

Display

R3752H Series
Display: Green fluorescent screen
Resolution: 256 × 64 dots
Display mode: Character display, 32 x 8 characters
R3753H Series
Display: 7.8 inch TFT color LCD display
Resolution: 640 × 480 dots
Display modes: Orthogonal log/linear coordinates, polar coordinates, Smith chart (impedance/admittance display)
Display format: Single channel, 2-channel (overlapping display, separate display)
Display of measurement conditions: Start/stop, center/span, scale/DIV, reference level, marker values, software key functions, warning message
Reference line position: From top (100%) to bottom (0%) of the vertical axis scale
Auto scale: Reference value and scale are set so that all traces being measured can be displayed on the screen in optimum form.
Luminance: Backlight can be turned on or off

Other Functions

Marker functions (R3753H Series only)
Marker display: Marker readout can be changed to display values which adapt to each measurement format.
Multi markers: 10 markers can be set independently on each channel.
Delta markers: Any of 10 can be specified as the reference marker and the delta value of two moved markers can be measured.
Marker coupling: The markers of each channel can be set coupled or independently.
Analysis of any freely specified section: Marker search can be performed in a section specified by Δ markers.
MKR search: MAX search, MIN search
Marker track: Search is done with every sweep

Target search: Calculation and phase 0° frequency value can be done for items at the X dB DOWN point such as bandwidth, center frequency and Q.
MKR→: MKR→reference value, MKR → START, MKR → STOP, MKR → CENTER
Limit line function

Error compensation functions

Normalize: Frequency response (amplitude and phase) is corrected during transmission measurement.
1-port calibration: Errors due to bridge directionality, frequency response and source match during reflection measurement are compensated. Short, open and load are required for error compensation.
Trans full calibration: High accuracy measurement more than transmission mormalige is possible
Data averaging: Data (vector values) are averaged for every sweep. The number of averaging times can be set to any value between 2 and 999.

Programming functions

Basic controller function: Using this function (provided standard), the network analyzer can control itself and another measuring device with a GPIB interface function by means of a program.
Built-in arithmetic functions: Using the built-in arithmetic functions, measured data can be analyzed at high speed.
Floppy disk drive: Standard MS-DOS format
Storage capacity: DD720K bytes,
HD1.2M bytes, 1.44M bytes

Connections with external devices

Signal output for external display: 15 pin, D-SUB connector (VGA)
GPIB data output and remote control: Conforms to IEEE-488
Parallel I/O output: TTL level, 8 bit output (2 port)
4 bit input/output (2 port)
Serial port: RS232 standard
Keyboard: IBM PC-AT standard
External reference frequency input: Frequencies of 1, 2, 5 or 10 MHz, >0 dBm can be input

General Specifications

Operating conditions:
When FDD is used Temperature rang : +5 to +40°C,
Humidity range : 80% or less (without condensation)
When FDD is not used Temperature range : 0 to +50°C,
Humidity range : 80% or less (without condensation)
Storage conditions: -20 to +60°C
Power requirements: 100 to 120 VAC, 220 to 240 VAC, 48 to 66Hz
Automatics switching between 100VAC and 220 VAC lines.
Power consumption: 300 VA max.
Dimensions: R3752 Series: Approx. 424 (W) × 132 (H) × 400 (D) mm
R3753 Series: Approx. 424 (W) × 200 (H) × 400 (D) mm
Weight: R3752H Series: 12 kg max.
R3753H Series: 14 kg max.

Accessories

A0264 L Angle Rail Set

● R3752/R3753 Series Comparison Chart

	R3752H Series			R3753H Series		
	R3752AH	**R3752BH**	**R3752EH**	**R3753AH**	**R3753BH**	**R3753EH**
Type	System use			Independent use		
Sweep time	0.1 ms/point (with 10 kHz RBW)					
Display format	Fluorescent display			7.8 inch TFT color LCD display		
Output signal	Single, dual	Single, dual	Single	Single, dual	Single, dual	Single
Number of input channels	3 (R, A, B)	2 (R, A)	1 (A)	3 (R, A, B)	2 (R, A)	1 (A)
Frequency range	5 Hz to 500 MHz	5 Hz to 500 MHz	5 Hz to 500 MHz	5 Hz to 500 MHz	5 Hz to 500 MHz	5 Hz to 500 MHz
Resolution	100 mHz	100 mHz	100 mHz	100 mHz	100 mHz	100 mHz
Connection with S parameter test set	Not possible	Not possible	Not possible	Possible	Not possible	Not possible
Output level	21 dBm	21 dBm	21 dBm	21 dBm	21 dBm	21 dBm
Dynamic range (AUTO)	115 dB	115 dB	115 dB	115 dB	115 dB	115 dB
Dynamic accuracy	0.05 dB/0.3°	0.05 dB/0.3°	0.1 dB/1.5°	0.05 dB/0.3°	0.05 dB/0.3°	0.1 dB/1.5°
Resolution	0.001 dB/0.01°	0.001 dB/0.01°	0.001 dB/0.01°	0.001 dB/0.01°	0.001 dB/0.01°	0.001 dB/0.01°