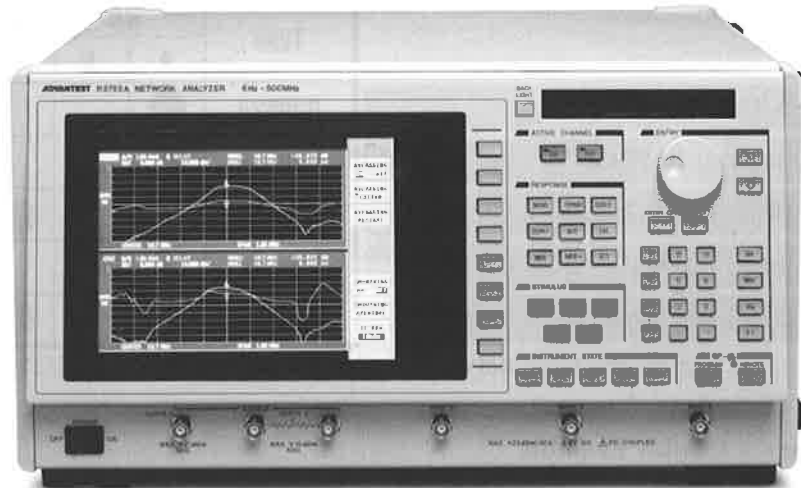


# Network Analyzers

*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.

## R3752H/3753H Series

### 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



### 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:**  $\pm 5 \times 10^{-6}$ /day ( $25 \pm 5^\circ\text{C}$ )

**Accuracy:**  $\pm 20$  ppm ( $25 \pm 5^\circ\text{C}$ )

#### Output characteristics

**Range:** +21 dBm to -63 dBm (output port 1)

**Resolution:** 0.1 dB

**Accuracy:** 0.5 dB (0 dBm, 50 MHz,  $25 \pm 5^\circ\text{C}$ )

**Linearity ( $25 \pm 5^\circ\text{C}$ , 50 MHz):**

+21 dB to -35 dB  $\pm 0.5$  dB

-35 dB to -63 dB  $\pm 1.5$  dB

**Flatness ( $25 \pm 5^\circ\text{C}$ , 10 dBm output):**

5 Hz to 100 kHz  $\pm 4.0$  dB

100 kHz to 1 MHz  $\pm 2.0$  dB

1 MHz to 300 MHz  $\pm 1.5$  dB

300 MHz to 500 MHz  $\pm 2.0$  dB

**Impedance:** 50  $\Omega$  nominal

(Output port 1) return loss 13 dB min. (0 dBm, typ.)

#### Signal purity

**Harmonic distortion:**  $\leq -20$  dBc

**Non-harmonic spurious:**  $\leq -30$  dBc or -70 dBm, whichever is larger

**Phase noise:**  $\leq -75$  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  $\Omega$

**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**  $\geq 100$  MHz 0.2 dB (typ.)  $1^\circ$

**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  $\Omega$  nominal, 1 M $\Omega$ /20 pF

**Return loss:**

	ATT 0 dB	ATT 20 dB
$< 300$ MHz	$> 20$ dB	$> 23$ dB
$\geq 300$ MHz	$> 15$ dB	$> 20$ dB

#### Maximum input level:

Input impedance	ATT 0 dB	ATT 20 dB
50 $\Omega$	-20 dBm	0 dBm
1 M $\Omega$	22.4 mV	224 mV

**Destructive input level:** 50  $\Omega$  +23 dB, 0 VDC 1 M $\Omega$   $\pm 3$  V

**Noise level:** (ATT AUTO,  $25 \pm 5^\circ\text{C}$ )

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

**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.

# Network Analyzers

A Choice of the Optimum Network Analyzer For the Application

## R3752H/3753H Series

### 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

$$\tau = \frac{\Delta\phi}{360 \times \Delta f} \quad \begin{array}{l} \Delta\phi : \text{phase} \\ \Delta f : \text{aperture frequency (Hz)} \end{array}$$

**Measurement range:** 1 ps to 250 s

**Group delay time resolution:** 1 ps

**Aperture frequency:** 0.01% to 50%

**Accuracy:**  $\frac{\text{Phase accuracy}}{360 \times \text{aperture frequency (Hz)}}$

### Display

**R3752H Series**

**Display:** Green fluorescent screen

**Resolution:** 256 × 64 dots

**Display mode:** Character display, 32 × 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

## R3752H/3753H Series

**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 normalige 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°	0.003 dB/0.01°	0.001 dB/0.01°	0.001 dB/0.01°	0.001 dB/0.01°