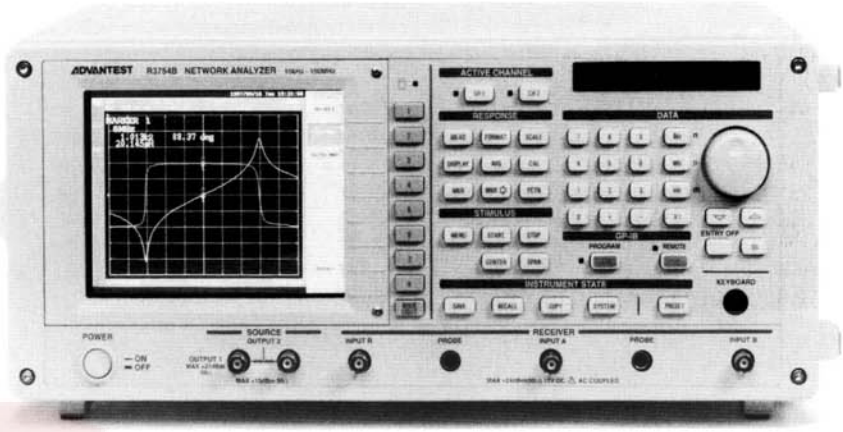
Network Analyzers

10 kHz to 150 MHz

R3754 Series



(Photo is R3754B)

R3754 Series
Network Analyzers

All mobile communications terminals must have a compact design, which means compact, lightweight electronic components. Designed to deliver solid performance and fast measurement, the R3754 series network analyzers are vector network analyzers that offer faster, more accurate measurement of those components. In fact, they open up a whole new measurement environment for electronic components.

■ Sweep speed of 0.05ms/point

The total throughput is the single most important quality of measurement systems for ceramic oscillators and filters, crystal oscillators and filters, etc. The R3754 series models increase the total throughput by reducing the sweep time to half the speed of conventional models (in-house comparison).

■ Two-device simultaneous measurement by 2-channel 4-trace capability

Selection of the 2-channel input option allows 3-channel (R, A, B) input, enabling simultaneous measurement of two devices without incurring extra time.

■ High dynamic range measurement at 127dB (typical)

Checking the attenuation of conventional filters and other components requires a narrower IF bandwidth, which slows down the speed of measurement. The 127 dB (typical) dynamic range of this series enables faster and more accurate measurement.

■ Two models to suit the application

Low cost is an important consideration for network analyzers mounted in an automatic machine.
The R3754A network analyzer is designed to be easily incorporated in automatic machines and to improve the system. The R3754B model features a 6.5-inch color TFT liquid crystal display for easier inspection of waveforms in manual operation. Both models occupy just two-thirds of the volume of the conventional network analyzers for further space savings.

■ Programmed sweep for faster, accurate measurement

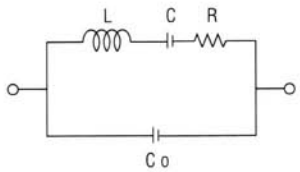
The number of sweep points, resolution bandwidth, and output level can be set randomly as needed. This increases both the speed and efficiency of measurement over a wide range of frequencies as, for instance, in the harmonic spurious evaluation of filters.

■ More variable steps of resolution bandwidth (RBW)

Measurement time and resolution bandwidth are a trade-off. The new series models feature a 3.5-fold increase in resolution bandwidth steps (in-house comparison) to enable optimum measurement for specific devices at all times.

■ Standard feature of equivalent circuit constant calculation

The new series models feature a built-in equivalent circuit constant calculation for crystal oscillators.



Model	Display	OPT.10	OPT.11	OPT.01	OPT.71
R3754A	B/W	2ch input	3ch input	Parallel IO	Drive level measurement
R3754B	Color	2ch input	3ch input	Parallel IO	Drive level measurement

*1: Either OPT.10 or OPT.11 may be selected. The 1ch input model will be chosen if neither one is specified.

Sweep Time of 0.05 ms/Point

R3754 Series

Specifications

Measurement functions

Measuring channels : 2 channels (4-trace display)
Measurement parameters : R

A/R, R, A	(option10)
A/R, B/R, A/B, R, A, B	(option11)

Measurement format
Orthogonal display : Log/linear amplitude, phase, group delay
Real/imaginary part of complex parameter
Z, R, X (impedance conversion measurement)
Y, G, B (admittance conversion measurement)
Phase extension display
Smith chart : Marker reading of log/linear amplitude, phase, real+imaginary parts, R+jX, G+jB
Polar coordinates : Marker reading of log/linear amplitude, phase, real + imaginary parts

Signal source characteristics (23 ± 5 °C)

• **Frequency characteristics**
Range : 10 kHz to 150 MHz
Accuracy : ±5 ppm
• **Output characteristics**
Range (output port 1) : +21 dBm to -43 dBm
Resolution : 0.1 dB
Accuracy : ±0.5 dB (0 dBm, 10 MHz)

Linearity	: +21 dBm to -35 dBm	±0.5 dB
(50MHz)	-35 dBm to -43 dBm	±1.5 dB
Flatness	: 10 kHz to 300 kHz	±2.0 dB
(0dBm output)	300 kHz to 150 MHz	±1.5 dB

Impedance : 50 Ω nominal
(output port 1) return loss 13 dB or higher (0 dBm output, typical)
• **Signal purity**
Harmonic spurious : ≤-15 dBc
Non-harmonic spurious : ≤-20 dBc or -60 dBm, whichever is larger
Phase noise : ≤-95 dBc/Hz (10 kHz offset)
• **Sweep characteristics**
Sweep parameter : Frequency, signal level
Range:
Frequency sweep ; Same as frequency characteristics
Level sweep; +21 dBm to -43 dBm
Range setting : Start/stop or center/span
Sweep type : Linear/log frequency sweep, level sweep, user-specified segment sweep
Sweep time : 0.05 ms max./point (RBW 15 kHz)
Measurement point: 3, 6, 11, 21, 51, 101, 201, 301, 401, 601, 801, 1201 points
Sweep trigger: Continuous, single, external
Sweep mode:
Dual sweep; Simultaneous; 2-channel sweep over the same frequency range
Alternate sweep; 2-channel sweep at different sweep types and frequency ranges

• **Output type**
Output: Single
Single, dual : Option 10, 11
Connector : BNC (female), 50 Ω
Power splitter (output port 2) : Option 10, 11
Insertion loss : 6 dB

Amplitude tracking	< 100 MHz 0.1 dB (typical)
	≥ 100 MHz 0.2 dB (typical)
Equivalent output SWR	< 100 MHz 1.2 (typical)
	≥ 100 MHz 1.4 (typical)

Receiver characteristics (23±5 °C)

• **Input characteristics**
Input channel : 1ch
2ch : option10
3ch : option11
Frequency range : 10 kHz to 150 MHz
Impedance : 50 Ω nominal
Return loss : ATT 0 dB 20 dB or higher
ATT 25 dB 25 dB or higher
Max. input level: ATT 25 dB gain 0 dB +5 dBm
ATT 0 dB gain 0 dB -20 dBm
ATT 0 dB gain 16 dB -36 dBm
Input destructive level : +24 dBm, ±3 VDC
Average noise level (ATT 0 dB, gain 16 dB)

RBW10 kHz	200 kHz to 500 kHz	-102 dBm
	500 kHz to 150 MHz	-112 dBm
RBW3 kHz	60 kHz to 500 kHz	-107 dBm
	500 kHz to 150 MHz	-117 dBm
RBW1 kHz	20 kHz to 500 kHz	-112 dBm
	500 kHz to 150 MHz	-112 dBm
RBW300 kHz	10 kHz to 500 kHz	-117 dBm
	500 kHz to 150 MHz	-127 dBm

Resolution bandwidth (RBW): 15 kHz to 3 Hz (1, 1.5, 2, 3, 4, 5, 7 steps)

Input crosstalk	: 10 kHz to 500 kHz	105 dB
	500 kHz to 150 MHz	120 dB
Signal source crosstalk	: 10 kHz to 500 kHz	105 dB
	500 kHz to 150 MHz	120 dB

Input connector: BNC (female), 50Ω
• **Auto offset correction**
Normalize : Eliminates frequency characteristics of the measurement system.
Electrical length correction : Equivalent length of group delay time can be added to the measured phase and group delay time.
Range: -3×10^8 m to $+3\times10^8$ m
or +10 sec to -10 sec

Sweep Time of 0.05 ms/Point

R3754 Series

Specifications

• Amplitude characteristics (absolute measurement)

Measurement range (RBW 1 kHz):

ATT	AUTO	gain 0 dB	+5 dBm to -115 dBm
ATT	25 dB	gain 0 dB	+5 dBm to -90 dBm
ATT	0 dB	gain 0 dB	-20 dBm to -115 dBm
ATT	0 dB	gain 16 dB	-36 dBm to -122 dBm

Display resolution : 0.001 dB/div

Accuracy : ±0.5 dB (50MHz, max. input level)

Frequency response (at 0 dBm input) :

10 kHz to 1 MHz	4 dBp-p
1 MHz to 150 MHz	3.5 dBp-p

Dynamic accuracy (ATT 25 dB gain 0 dB, 100 kHz or higher):

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

• Amplitude characteristics (relative measurement) : Option10, 11

Measurement range (ATT 25 dB gain 0 dB, 100 kHz or higher):

ATT	AUTO	gain 0 dB	±120 dB
ATT	20 dB	gain 0 dB	±95 dB
ATT	0 dB	gain 0 dB	±95 dB
ATT	0 dB	gain 16 dB	±86 dB

Display resolution (/div) : 0.001 dB/div

Accuracy : ±0.5 dB (50 MHz, max. input level)

Frequency response (at 0 dBm input):

10 kHz to 1 MHz	3 dBp-p
1 MHz to 150 MHz	2 dBp-p

Dynamic accuracy (ATT 25 dB gain 0 dB, 100 kHz or higher):

0 dBm to -10 dBm	±0.1 dB
-10 dBm to -60 dBm	±0.05 dB
-60 dBm to -70 dBm	±0.1 dB
-70 dBm to -80 dBm	±0.3 dB
-70 dBm to -80 dBm	±0.9 dB

• Phase characteristics (absolute measurement)

Measurement range: ±180° (±180° or more can be displayed continuously by using a display extension function)

Resolution : 0.01°

Dynamic accuracy : (ATT 25 dB gain 0 dB, 100 kHz or higher):

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°

• Phase characteristics (relative measurement) : Option10, 11

Measurement range: ±180° (±180° or more can be displayed continuously by using a display extension function)

Resolution : 0.01°

Frequency accuracy (at 0dB input) :

10 kHz to 1 MHz	20° p-p
1 MHz to 150 MHz	15° p-p

Dynamic accuracy : (ATT 25 dB gain 0 dB, 100 kHz or higher):

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

• Delay characteristics

Range: Calculated as follows

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

$\Delta \phi$ = Phase
Δf = Aperture frequency (Hz)

Measurement range : 1ps to 250s

Group delay time resolution : 1ps

Aperture frequency: Corresponds to Δf and can be set randomly

$$\frac{100}{\text{Measurement points - 1}} \times 2 \text{ to approximately 100\% of}$$

$$\frac{100}{\text{Measurement points - 1}} \times 2 \text{ of the frequency span at resolution.}$$

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

• Error correction functions

Normalize : Correction of frequency response (amplitude, phase) during transmission measurement.

1-port calibration : Error correction by bridge directivity during reflection measurement, frequency response, and source matching. Error correction requires short, open, and load calibration tools.

Data averaging : Data (vector) averaging per sweep at any frequency between 2 and 999.

Transmission full calibration : High accuracy measurement by transmission normalization during transmission measurement. Error correction requires short and load calibration tools.

Connection to external equipment

• Input characteristics

Signal output for external display: 15-pin, D-sub connector (VGA)

GPIB data output and remote control: IEEE488 compliant

Printer port : 25-pin, D-sub

Serial port : RS232 (9-pin, D-sub)

Keyboard : IBM PC-AT

External reference frequency input: Possible input frequencies 1, 2, 5, 10MHz±10ppm 0dBm (50Ω) or higher

Parallel I/O output : TTL level, 8-bit output (2 ports)
4-bit input/output (2 ports) Option01

Probe power : ±12V Option10, 11

External trigger signal input : BNC connector (female)

*Phase characteristic absolute measurement function is not guaranteed if the measuring range is set crossing "32.5 MHz".
But this function is guaranteed when used in the measuring range of 10 kHz to 32.5 MHz or of 32.5 MHz to 150 MHz.

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Sweep Time of 0.05 ms/Point

R3754 Series

Specifications

Display

Display : R3754A 5-inch STN B/W LCD
R3754B 6.5-inch TFT color LCD
Resolution : 640 × 480 dots
Display mode : Orthogonal log/linear coordinates, polar coordinates, Smith chart (impedance/admittance displays)
Display format : 1 ch
2 ch (overlay, separate)
Measurement condition display : Start/stop, center/span, scale/div, reference level, marker value, soft key/function warning message
Reference line position : Top (100%) to bottom (0%) of vertical axis memory
Auto scale : Reference value and scale are set to ensure appropriate display of tracing.
Brightness : R3754A without brightness control
R3754B with brightness control and backlight ON/OFF
Contrast : R3754A with contrast control
MKR search : MAX search, MIN search
Marker tracking : Searched per sweep

Other functions

• **Marker**
Marker display : Marker reading can be displayed in the selected format value.
Multiple marker : Up to 10 markers can be set independently per channel.
Delta marker : Each of the 10 markers can be used as a reference marker for measuring the delta from the moved marker.
Marker coupling : Markers on different channels can be coupled or left independent.
Area analysis : Markers within the area specified by Δ markers can be searched for analysis.
MKR search : MAX search, MIN search, NEXT search
Marker tracking : Searched per sweep
Target search : Calculation of bandwidth, center frequency, Q, etc., of the XdB-down point ; search for 0° phase frequency and ±X° frequency width.
MKR → : MKR → Reference, MKR → START, MKR → STOP, MKR → CENTER
Limit line : Limit line can be set for up to 31 segments for evaluation per segment.
Direct analysis : Resonator analysis, etc.
• **Instrument state**
Save register : Set conditions and CAL data can be saved in internal memory with a back-up.
Data save/recall : Various data can be stored in the standard floppy disk.
• **Programming**
BASIC controller : The standard built-in controller allows programmed control of the analyzer and other measuring instruments having GPIB interface capability.
Built-in functions : High speed analysis of measurement data
FDD : MS-DOS format
recording capacity DD (720KB) and HD (1.2, 1.44MB)

General specifications

Operating environment :

When FDD is used	Temperature	+5 to +40°C
	Humidity	≤ 80%RH (no condensation)
When FDD is used	Temperature	0 to +50°C
	Humidity	≤ 80%RH (no condensation)

Storing environment : -20°C to 60°C
Power supply : 100VAC to 120VAC, 220VAC to 240VAC (auto switching), 48 Hz to 66 Hz
Power consumption : 200VA max.
Dimensions : Approx. 424(W) × 177(H) × 300(D) mm
Mass : 12 kg max.