

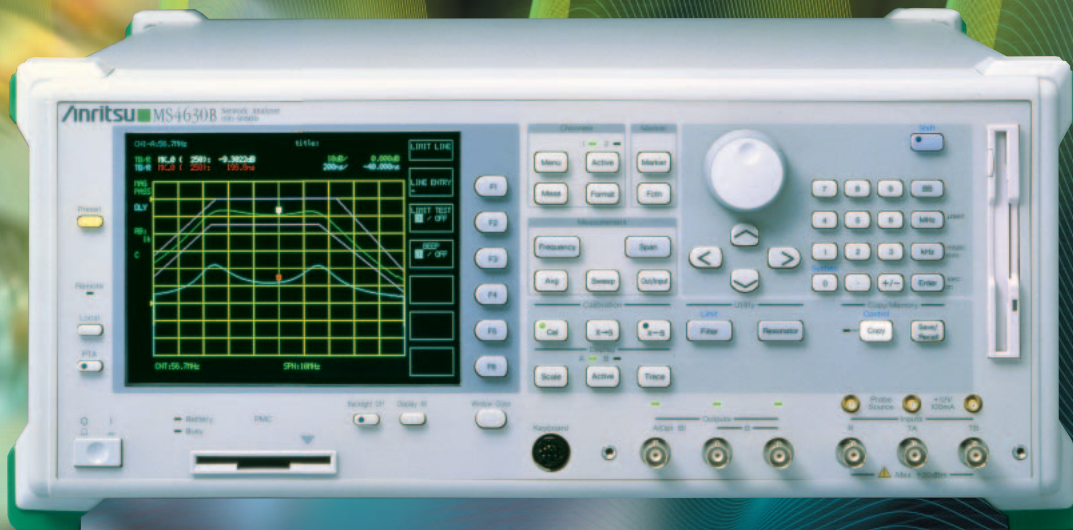
Product Brochure

Anritsu

# MS4630B

Network Analyzer

10 Hz to 300 MHz





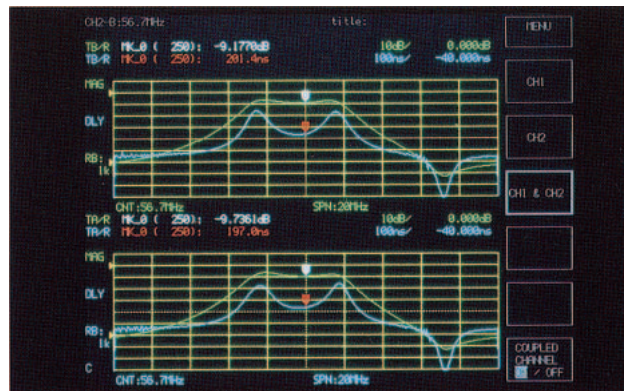
# Maximum Production/Inspection Capacity

The MS4630B is targeted at production lines demanding fast and accurate measurements of electronic devices. It is perfect for accurate high-speed evaluation of IF filter resonance and group delay characteristics, as well as for evaluating the impedance characteristics of resonators in AV equipment and personal computers.

High-speed synthesizer and DSP technologies offer speeds of 150  $\mu$ s per measurement point and post-processing data analysis functions have been strengthened by improved macros for greatly increased total production throughput.

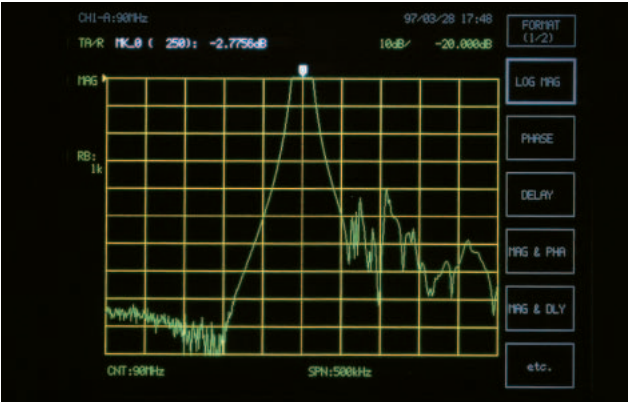
The dynamic range has been improved to 120 dB (RBW: 1 kHz).

In addition, sweep conditions are easily set by adding the optional List Sweep function or by using PTA software. Weight has been dramatically cut, too.



High dynamic range

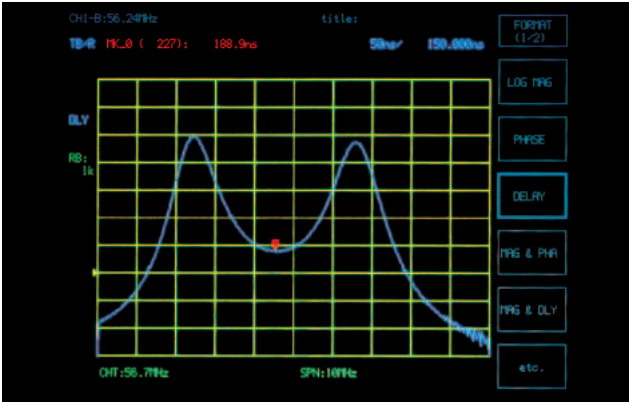
The high dynamic range of 120 dB (RBW: 1 kHz) supports fast and accurate out-of-band measurement of filters.



Filter out-of-band attenuation measurement

High-accuracy group delay measurement

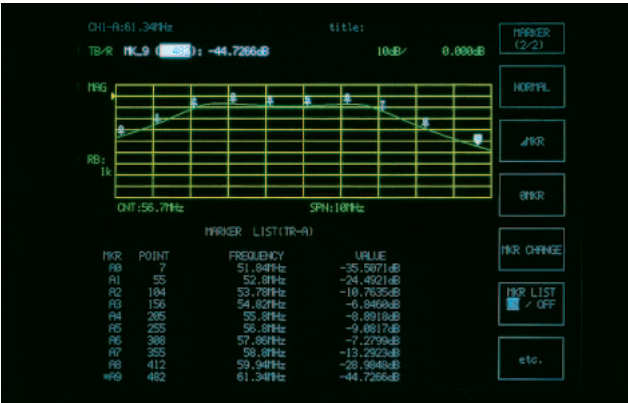
Group delay characteristics can be measured with high accuracy at a resolution of 1/10,000 of the measurement range.



Group delay characteristics

Multi-markers

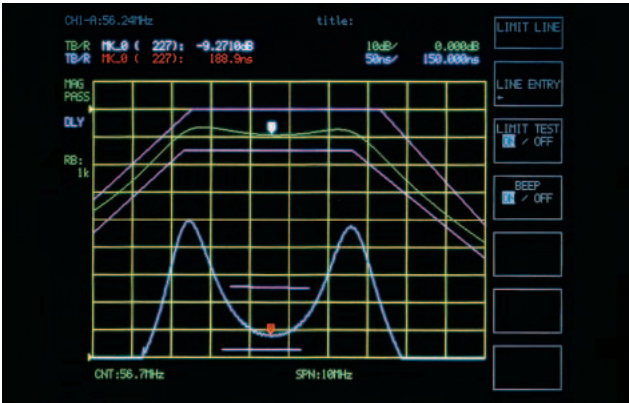
Up to 10 independent markers can be set for each channel. The marker list function displays all data at each marker as tables and waveforms simultaneously.



Multi-markers

Limit tests

Devices are pass/fail evaluated in real time using the single and segmented limit test functions.



Filter pass/fail evaluation using limit test

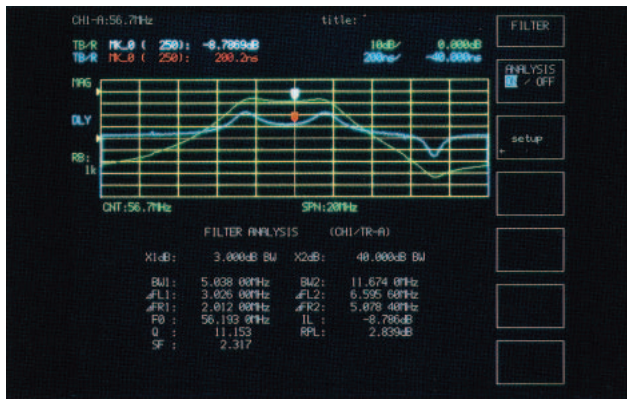


# Higher Productivity

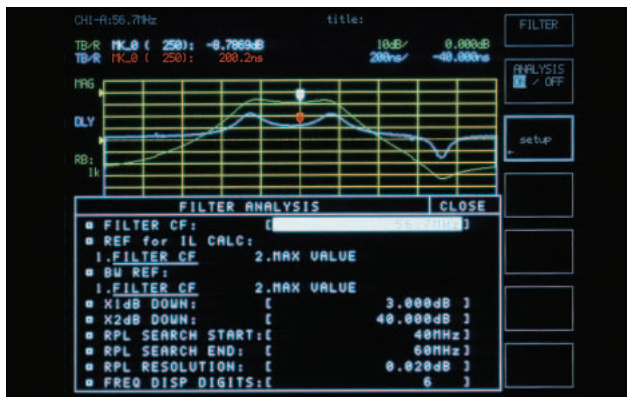
## Filters

### • Analysis functions

Filter characteristics, such as 3-dB bandwidth, center frequency (fo), in-band ripple, out-of-band attenuation, etc., are processed digitally and analyzed at high speed. Users can easily enter or change default values by using the filter analysis setup menu. The frequency, output level, waiting time and RBW can be set at each measurement point to shorten filter measurement time.



Filter analysis screen



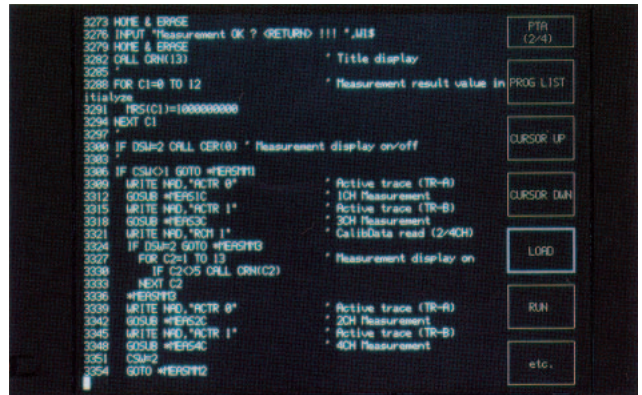
Filter analysis setup menu

### • Improved measurement performance using Personal Test Automation (PTA)

Frequency/Level Setting: The frequency and power level at Port 1 are easily controlled for efficient in-band and out-of-band measurements.

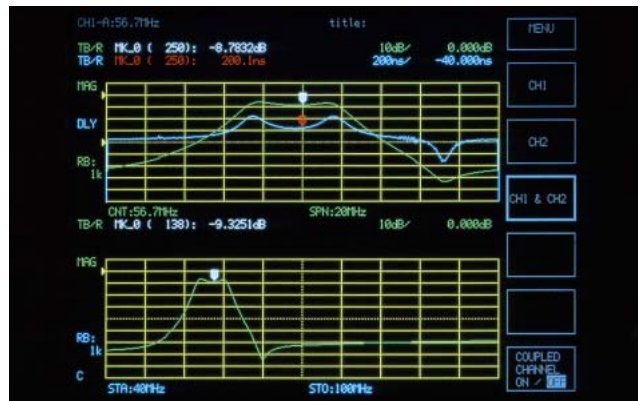
Ripple Extraction: In addition to the normal min./max. ripple, four other functions, such as the SAW filter slope ripple, are built-in.

Filter Functions: These permit complex analyses, such as multiple bandwidth and out-of-band attenuation extraction and group delay measurement.



### • Simultaneous in-band and spurious response data display

Previously, spurious detection and passband measurement required switching the measurement setup. However, the MS4630B alternate sweep function displays the measured passband and spurious data simultaneously. And the very short switching time greatly improves measurement efficiency.



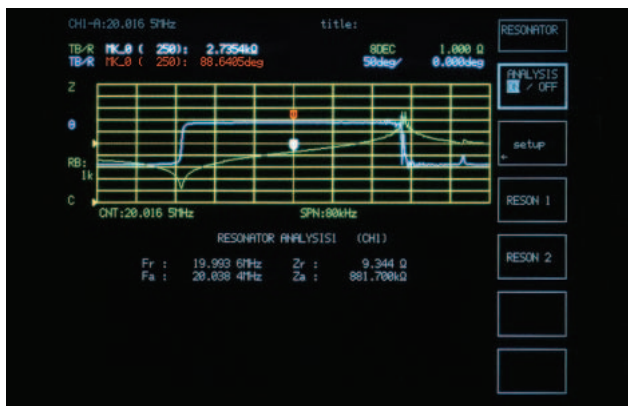
Spurious measurement using alternate sweeping

## Resonators

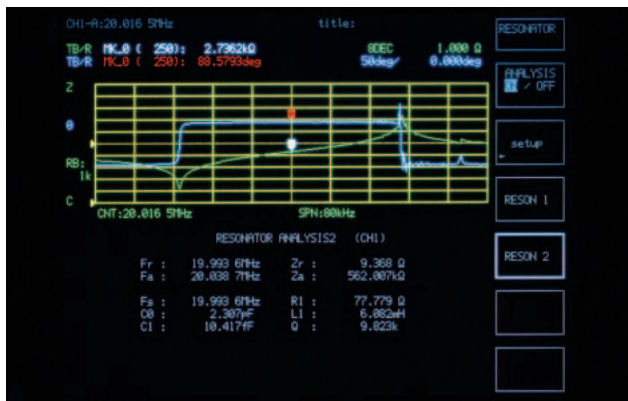
### • High-speed measurement of characteristics

The MS4630B has dedicated waveform analysis functions to improve the efficiency of resonator evaluation.

Resonator 1 analyzes the resonance frequency (Fr) and impedance (Zr) while Resonator 2 adds measurement of resonator equivalence to the Resonator 1 measurements.



Resonator 1 measurements

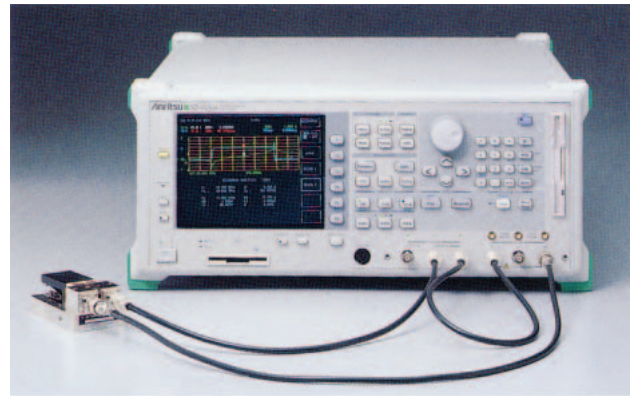


Resonator 2 measurements

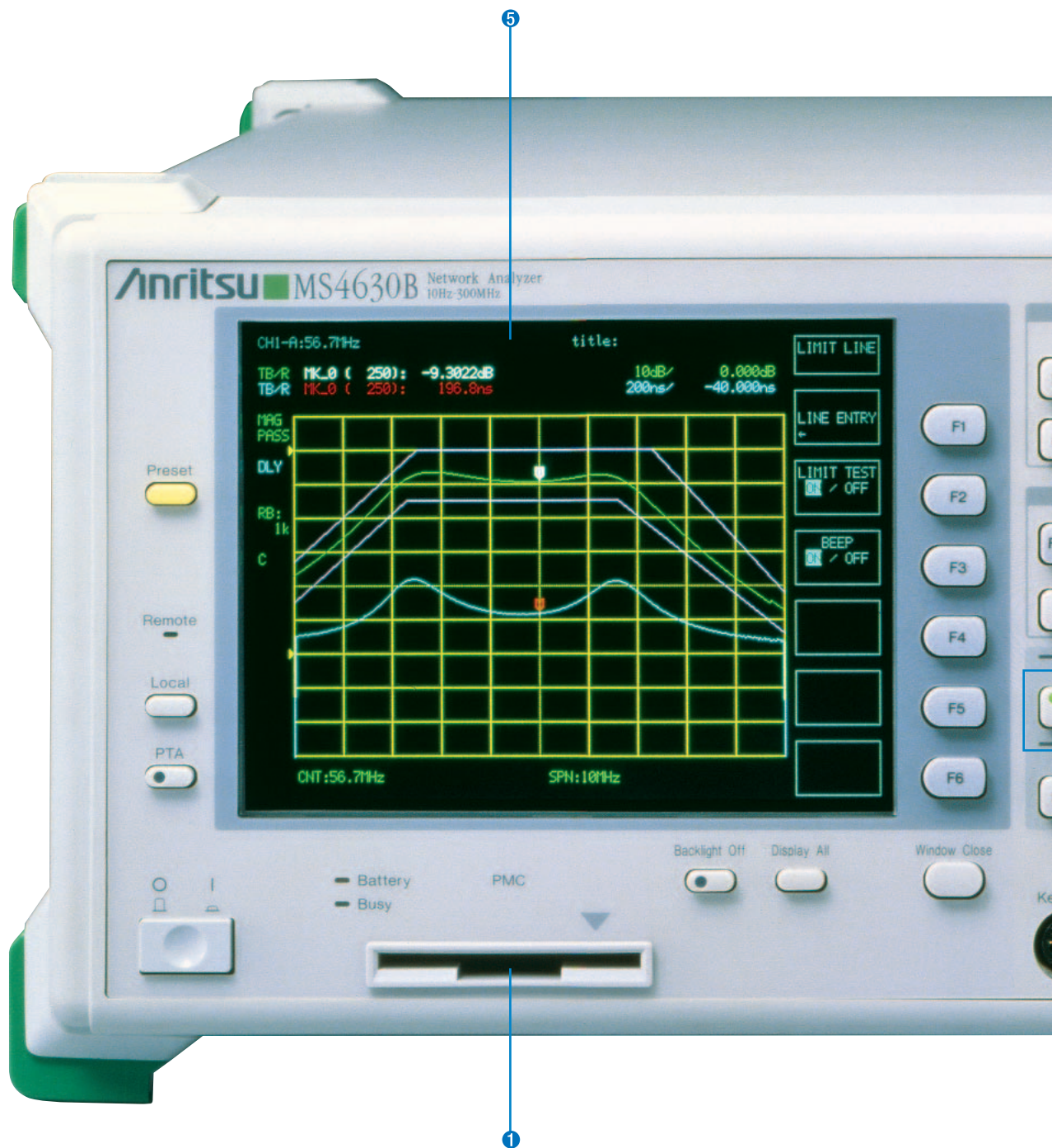
### • Measuring crystal resonators using $\pi$ -network

Crystal resonators can be tested easily by combining the MS4630B with a  $\pi$ -circuit jig like the MA1506A.

Floating admittance around the jig is eliminated using the MS4630B  $\pi$ -network calibration function and jig calibration standard, offering high-accuracy measurement.



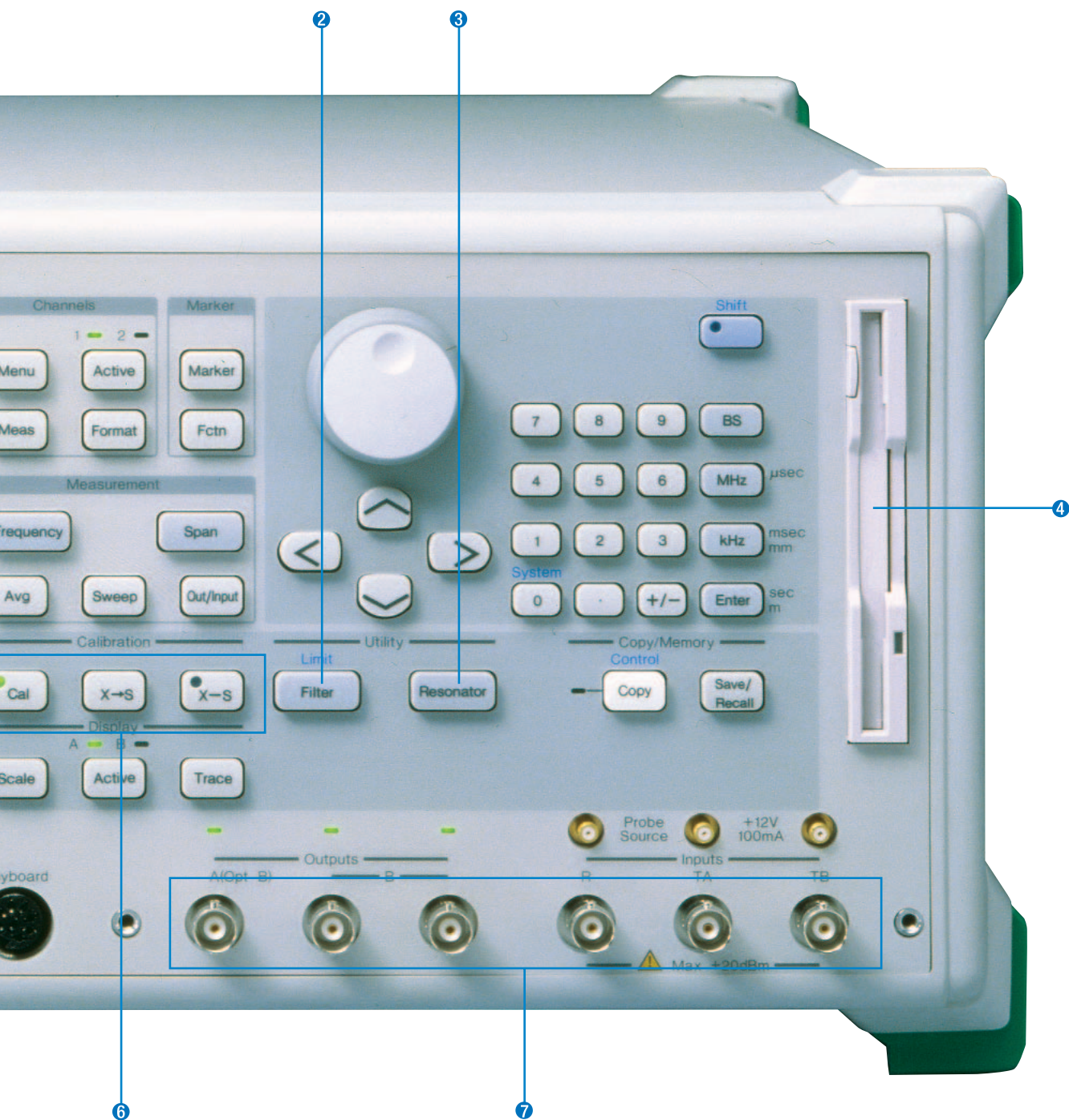
Measurement using  $\pi$ -Network



- ① PMC Slot (Option): Supports reliable Compact Flash memory cards
- ② [Filter] key: Evaluates filter characteristics, such as passband, attenuation band, IL, fo, Q, SF, etc., at single touch
- ③ [Resonator] key: Evaluates resonator characteristics (max., min., 0 Phase, equivalence constant) instantly

- ④ Floppy Disk Drive: Saves calibration data, measured data and PTA programs to 3.5" floppy disks (MS-DOS format)
- ⑤ 6.5" Color LCD
- ⑥ Calibration keys: Offer versatile calibration functions with flexible post-processing
- ⑦ Inputs/Outputs: Connectors for up to 3 channels





# Specifications

Measurement items	Transmission characteristics (ratio measurement): Amplitude, phase, group delay Reflection/impedance characteristics: Amplitude, phase (with external transducer) Level characteristics: Absolute amplitude																							
Frequency	Range: 10 Hz to 300 MHz Resolution: 0.01 Hz Accuracy (standard) Aging rate: $\leq 1 \times 10^{-6}$ /day (15 minutes after power-on) Temperature characteristics: $\leq \pm 5 \times 10^{-6}$ (0° to +50°C) Accuracy (Option 13: High-stability reference oscillator) Aging rate: $\leq \pm 2 \times 10^{-8}$ /day (24 h after power-on) Temperature characteristics: $\leq \pm 5 \times 10^{-8}$ (0° to +50°C)																							
Input	Channel No. Standard: 2 (R, TA); Option 12: 3 (R, TA, TB) Impedance: 50 Ω, 1 MΩ switchable Input range (IRG): 0/+20 dBm Max. input power AC: +20 dBm; DC $\pm 2.2$ V (50 Ω) AC: 0 dBm; DC: $\pm 20$ V (1 MΩ) Connector: BNC-J Probe source: +12 $\pm 1$ V, 100 mA (with protective circuit for shorts)																							
Average noise level	$\leq -120$ dBm (RBW: 1 kHz, 1 to 300 MHz), $\leq -110$ dBm (RBW: 1 kHz, 80 kHz to 1 MHz)																							
Crosstalk	Between channels: $\geq 120$ dB (80 kHz to 300 MHz), $\geq 110$ dB (up to 80 kHz) Between transmitter and receiver: $\geq 125$ dB																							
Resolution bandwidth	3, 10, 30, 100, 500 Hz, 1, 2, 3, 4, 5, 10, 20 kHz and automatic setting																							
Output	Output level range Output A: 0 to +21 dBm; Option 10: -70 to +21 dBm Output B: -6 to +15 dBm (-9.5 to +11.5 dB when Option 14 added); Option 10: -76 to +15 dBm (-79.5 to +11.5 dB when Option 14 added) Output resolution: 0.01 dB Output level accuracy: $\leq \pm 1.0$ dB (frequency: 100 MHz, Output A: +10 dBm) Output level linearity: $\leq \pm 0.5$ dB (0 dBm reference, frequency: 100 MHz, Output A: 0 to +21 dBm) Output level deviation: $\leq \pm 1.5$ dB (output A: +10 dBm, 100 MHz reference) Step error: $\pm 0.5$ dB (Option 10) Output impedance: 50 Ω Connector: BNC-J																							
Amplitude measurement	Measurement range: $\geq 120$ dB Measurement resolution: 0.001 dB Display scale: 0.01 dB/div to 50 dB/div (1-2-5 sequence) Dynamic accuracy <table><tr><td>Level relative to IRG</td><td>80 kHz to 100 MHz</td><td>10 kHz to 300 MHz</td></tr><tr><td>0 to -10 dB</td><td><math>\pm 0.20</math> dB</td><td><math>\pm 0.20</math> dB</td></tr><tr><td>-10 to -60 dB</td><td><math>\pm 0.05</math> dB</td><td><math>\pm 0.05</math> dB</td></tr><tr><td>-60 to -70 dB</td><td><math>\pm 0.10</math> dB</td><td><math>\pm 0.30</math> dB</td></tr><tr><td>-70 to -80 dB</td><td><math>\pm 0.30</math> dB</td><td><math>\pm 1.00</math> dB</td></tr><tr><td>-80 to -90 dB</td><td><math>\pm 1.20</math> dB</td><td><math>\pm 4.00</math> dB</td></tr><tr><td>-90 to -100 dB</td><td><math>\pm 4.00</math> dB</td><td>—</td></tr></table>			Level relative to IRG	80 kHz to 100 MHz	10 kHz to 300 MHz	0 to -10 dB	$\pm 0.20$ dB	$\pm 0.20$ dB	-10 to -60 dB	$\pm 0.05$ dB	$\pm 0.05$ dB	-60 to -70 dB	$\pm 0.10$ dB	$\pm 0.30$ dB	-70 to -80 dB	$\pm 0.30$ dB	$\pm 1.00$ dB	-80 to -90 dB	$\pm 1.20$ dB	$\pm 4.00$ dB	-90 to -100 dB	$\pm 4.00$ dB	—
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-90 to -100 dB	$\pm 4.00$ dB	—																						
Phase measurement	Measurement range: $\pm 180^{\circ}$ Measurement resolution: 0.001° Display scale: 0.01° to 50°/div (1-2-5 sequence) Dynamic accuracy <table><tr><td>Level relative to IRG</td><td>80 kHz to 100 MHz</td><td>10 kHz to 300 MHz</td></tr><tr><td>0 to -10 dB</td><td><math>\pm 1.5^{\circ}</math></td><td><math>\pm 1.5^{\circ}</math></td></tr><tr><td>-10 to -60 dB</td><td><math>\pm 0.3^{\circ}</math></td><td><math>\pm 0.3^{\circ}</math></td></tr><tr><td>-60 to -70 dB</td><td><math>\pm 0.8^{\circ}</math></td><td><math>\pm 2.0^{\circ}</math></td></tr><tr><td>-70 to -80 dB</td><td><math>\pm 2.0^{\circ}</math></td><td><math>\pm 6.0^{\circ}</math></td></tr><tr><td>-80 to -90 dB</td><td><math>\pm 6.0^{\circ}</math></td><td><math>\pm 20.0^{\circ}</math></td></tr><tr><td>-90 to -100 dB</td><td><math>\pm 20.0^{\circ}</math></td><td>—</td></tr></table>			Level relative to IRG	80 kHz to 100 MHz	10 kHz to 300 MHz	0 to -10 dB	$\pm 1.5^{\circ}$	$\pm 1.5^{\circ}$	-10 to -60 dB	$\pm 0.3^{\circ}$	$\pm 0.3^{\circ}$	-60 to -70 dB	$\pm 0.8^{\circ}$	$\pm 2.0^{\circ}$	-70 to -80 dB	$\pm 2.0^{\circ}$	$\pm 6.0^{\circ}$	-80 to -90 dB	$\pm 6.0^{\circ}$	$\pm 20.0^{\circ}$	-90 to -100 dB	$\pm 20.0^{\circ}$	—
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-90 to -100 dB	$\pm 20.0^{\circ}$	—																						



Group delay measurement	<p>DRG: <math>\Delta\theta/(360 \times \Delta F)</math> *<math>\Delta\theta</math>: phase measurement range; <math>\Delta F</math>: frequency span x smoothing aperture (%);  smoothing aperture: 20% to <math>\left(\frac{2}{\text{number measurement points}}\right) \times 100\%</math>  Measurement resolution: <math>2.78 \times 10^{-6}/\Delta F</math>  Display scale: 1 ps/div to 50 ms/div  Dynamic accuracy: Phase measurement accuracy/(360 x aperture frequency)</p>
Calibration, correction	<p>Calibration types: Frequency response, 1 port, 1 path–2 port, frequency response/isolation calibration, <math>\pi</math>-network calibration  Calibration data interpolation: Measurement frequency, when number of measurement points changed, based on calibration data before change, new calibration data interpolation possible (except at log frequency measurement and 1001 measurement points)  Normalize: X–S  Electrical length calibration  Range: 0 to <math>\pm 9999999.99999999</math> m, Resolution: 100 nm  Phase offset range: <math>\pm 180^\circ</math></p>
Sweeping	<p>Frequency sweep: LIN (CENTER/SPAN, START/STOP), LOG (START/STOP)  Level sweep: LIN (START/STOP/STEP)  List sweep: Frequency, level, RBW, wait time setting  Number of measurement points: 11, 21, 51, 101, 251, 501, 1001  Break point: Between 1 and 1001  Sweep time: 150 <math>\mu</math>s/point, 38 ms/250 points full sweep (RBW: 20 kHz, normalize calibration, 1 trace)  Setting range: 1 ms to 27.5 h  Sweep functions  Sweep range: Full sweep, part sweep (between markers)  Sweep control: REPEAT/SINGLE, STOP/CONT  Sweep trigger: INT/EXT (RISE, FALL, LEVEL)</p>
Display	<p>Max. display screens: 2 channels, 4 traces  Display format: LOG MAG (M), PHASE (P), DELAY (D), M/P, M/D, LIN MAG (LIN), LIN/P, LIN/D, REAL (R), IMAG (I), R/I, Z, Z/<math>\theta</math>, Q,Z/Q, POLAR, VSWR, IMPD (<math>Z \angle \theta</math>, <math>R_s + L_s/C_s</math>, Q/D, <math>R + jx</math>), ADMT (<math>Y \angle \theta</math>, <math>R_p + L_p/C_p</math>, Q/D, <math>G + jB</math>)  Display: 640 x 480 dots, 6.5 inch color LCD</p>
Markers	<p>Marker functions: NORMAL MKR, <math>\Delta</math> MKR, 0 MKR, MKR <math>\rightarrow</math> MAX, MKR <math>\rightarrow</math> MIN, MKR <math>\rightarrow</math> CF, <math>\Delta \rightarrow</math> SPAN, MKR <math>\rightarrow</math> +PEAK, MKR <math>\rightarrow</math> –PEAK, MKR TRACK + PEAK, MKR TRACK–PEAK, MKR CHANGE, MKR OFFSET  Setting: Set marker position to frequency or point  Multi-marker: 10 markers max. for each trace  Filter function: F0, IL, passband (L, R), attenuation band (L, R), Ripple, Q, SF  Resonator function  RESON 1: Fr, Fa, Zr, Za (0 PHASE), Fm, Fn, Zm, Zn (MAX/MIN)  RESON 2: Fs, Fr, Fa, Zr, Za, Q, equivalence constant (R1, L1, C1, C0)</p>
Trace data calculation	<p>Averaging functions  Method: SUM, MAX, MIN, Count: 1 to 1000  Measurement data memory (max. 1001 points each memory in same format as display format)  Main trace (MT) memory: 2 each (XMEM) for Channel 1 and Channel 2  Calibration S memory: 2 each (SMEM) for Channel 1 and Channel 2  Image memory: 2 each (IMEM) for Channel 1 and Channel 2  Sub-trace (ST): Following calculation between MT and ST (traces calculation of same data as display format)  MT <math>\rightarrow</math> ST, MT = MT–ST, MT = ST  Limit line: Single or segment (10) limit line, pass/fail evaluation against limit line</p>
Measurement parameters auto-setting	<p>Receive bandwidth and sweep time: Receive bandwidth set automatically for set sweep time  Automatically set to give minimum sweep time at set receive bandwidth</p>
Auxiliary media	<p>Saving/recalling data:  Measurement parameters, measured data, calibration data, PTA application programs saved/recalled to/from FD, PMC and internal function memory  Function memory  FD: 100 functions max.  PMC: 100 functions max. (depends on PMC capacity)  Drive and capacity  Internal memory: 512 kB (non-volatile)  3.5 inch FDD: 1  Capacity: 720 KB (2DD), 1.44 MB (2HD), MS-DOS format (BMP, text file)  Option 01: PMC (32 to 512 KB)</p>

Printing	Video plotter, printer, and FD (bitmap format)
Rear-panel I/O	Frequency: 5/10 MHz $\pm 10$ ppm Level: $\geq 0.7$ Vp-p (AC coupling) Input impedance: 50 $\Omega$ (connector: BNC-J) Reference oscillator output Frequency: 10 MHz Level: TTL (DC coupling, connector: BNC-J) External trigger input: TTL Level (connector: BNC-J) GPIB: IEEE488.2 (24-pin Amphenol connector) I/O Port: Parallel interface for PTA (36-pin Amphenol connector) RGB Output: For external monitor (15-pin D-Sub connector) Video output: Separate (8-pin DIN) Centronics (Option 02): Parallel interface for printer (25-pin D-Sub connector) RS-232C (Option 02): Serial interface (9-pin D-Sub connector)
External control	Standard: GPIB and PTA; Option 02: RS-232C
Power	100 to 120/200 to 240 Vac ( $-15\%/+10\%$ , 250 Vac max., 100/200 V system auto-switching), 47.5 to 63 Hz, $\leq 180$ VA (max.)
Dimensions and mass	426 (W) x 177 (H) x 451 (D) mm, $\leq 15$ kg
Environmental conditions	Temperature range: 0° to +50°C (operating; FDD: +4° to +50°C), -20° to +60°C (storage)
EMC	EN61326: 1997/A2: 2001 (Class A) EN61000-3-2: 2000 (Class A) EN61326: 1997/A2: 2001 (Annex A)
LVD	EN61010-1: 2001 (Pollution Degree 2)



# Ordering Information

Please specify the model/order number, name and quantity when ordering.

Model/Order No.	Name	Remarks
MS4630B	<b>Mainframe</b> Network Analyzer	10 Hz to 300 Hz
	<b>Standard Accessories</b>	
F0013	Power Cord, 2.6 m:	1 pc
W1534AE	Fuse, 5 A:	2 pcs
W1535AE	MS4630B Operation Manual (Mainframe):	1 copy
	MS4630B Operation Manual (Remote control):	1 copy
	<b>Options</b>	
MS4630B-01	PMC Interface	
MS4630B-02	RS-232C, Centronics Interface	Printer output, external control
MS4630B-10	Output Attenuator	70 dB, mechanical type
MS4630B-12	3-channel Receiver	
MS4630B-13	High-stability Reference Oscillator	Aging rate: $\leq \pm 2 \times 10^{-8}/\text{day}$
MS4630B-14	3-branch Output	For 3-channel receiver
	<b>Optional Accessories</b>	
SC4284	Reflection Bridge	10 to 1000 MHz BNC-J, 50 $\Omega$ , unbalanced [Calibration kit: MA8603A, MA8604A (sold separately)]
SC4288	Reflection Bridge	10 to 1000 MHz BNC-P, 50 $\Omega$ , unbalanced [Calibration kit: MA8603B, MA8604B (sold separately)]
SC6267	Reflection Bridge	10 to 1000 MHz BNC-J, 75 $\Omega$ , unbalanced [Calibration kit: MP669A, MP670A (sold separately)]
SC6289	Reflection Bridge	10 to 1000 MHz BNC-P, 75 $\Omega$ , unbalanced [Calibration kit: MP669B, MP670B (sold separately)]
MA2201A	Reflection Bridge	10 Hz to 250 kHz, 600 $\Omega$ , balanced, MA214 terminal
MA2203A	Reflection Bridge	10 Hz to 250 kHz, 900 $\Omega$ , balanced, MA214 terminal
MA2301A	Reflection Bridge	2 kHz to 2 MHz, 75 $\Omega$ , balanced, MA214 terminal
MA2302A	Reflection Bridge	2 kHz to 2 MHz, 135 $\Omega$ , balanced, MA214 terminal
MA2303A	Reflection Bridge	2 kHz to 2 MHz, 150 $\Omega$ , balanced, MA214 terminal
MA2204A	Impedance Probe	30 Hz to 300 kHz, 2 $\Omega$ to 1 M $\Omega$
MA2403A	Impedance Probe	30 kHz to 30 MHz, 2 $\Omega$ to 1 M $\Omega$
MA414A	Impedance Measurement Kit	For MA2403A
MA1506A	$\pi$ -Network	1 to 125 MHz, for resonator measurement
MA8603A	50 $\Omega$ Termination	BNC-P
MA8603B	50 $\Omega$ Termination	BNC-J
MA8604A	50 $\Omega$ Open/Short	BNC-P
MA8604B	50 $\Omega$ Open/Short	BNC-J
MP669A	75 $\Omega$ Termination	BNC-P
MP669B	75 $\Omega$ Termination	BNC-J
MP670A	75 $\Omega$ Open/Short	BNC-P
MP670B	75 $\Omega$ Open/Short	BNC-J
J0127A	Coaxial Cord, 1.0 m	BNC-P • RG58A/U • BNC-P
J0127B	Coaxial Cord, 2.0 m	BNC-P • RG58A/U • BNC-P
J0127C	Coaxial Cord, 0.5 m	BNC-P • RG58A/U • BNC-P
P0005	Memory Card (32 KB)	
P0006	Memory Card (64 KB)	
P0007	Memory Card (128 KB)	
P0008	Memory Card (256 KB)	
P0009	Memory Card (512 KB)	
MC3305A	PTA Keyboard (JIS type)	
B0329C	Front Cover (1MW4U)	
B0333C	Rack Mount Kit	
B0334C	Carrying Case	Hard type



Specifications are subject to change without notice.

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