

## NETWORK ANALYZER MS4630B 10 Hz to 300 MHz



*For Fast Evaluation of IF Filters and Resonators*



The MS4630B is suitable for electronics production lines demanding fast and accurate device measurements. It is particularly well suited to accurate, high-speed evaluation of IF filter resonance and group delay characteristics, as well as evaluating the impedance characteristics of resonators in AV equipment and personal computers. A fast sweep speed of 150  $\mu$ s/measurement point is achieved using a high-speed synthesizer and digital signal processing (DSP) technologies. The post-processing data analysis functions have been strengthened with improved data-processing macros that have greatly increased the total production throughput. In comparison to the earlier MS3401A/B and MS3606B network analyzers, the sweep speed is three times faster and the group delay measurement accuracy and stability have been improved by more than 10 times. In addition, the dynamic range has been improved to 120 dB (RBW: 1 kHz) while the weight of the analyzer has been dramatically reduced. The GPIB and PTA processing speed are 30 to 50% faster than the MS4630A. In addition, the sweep conditions can be set more easily by the addition of the list sweep function.

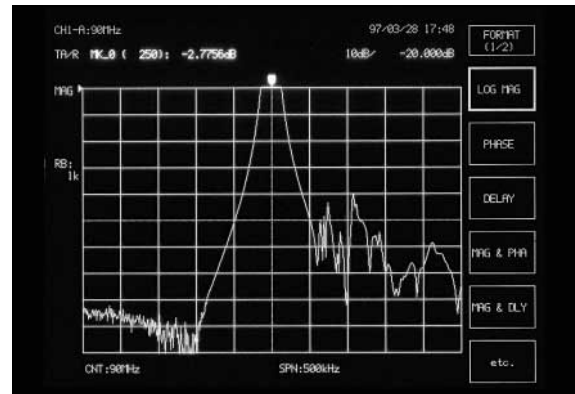
### Features

- High-speed evaluation of IF filters, resonators, etc.
- Greatly increased production/inspection capacity

### Performance and functions

#### • High dynamic range

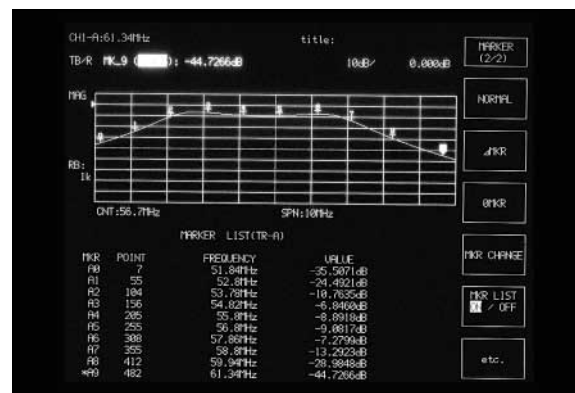
The high dynamic range of 120 dB (RBW: 1 kHz) permits fast and accurate out-of-band measurement of filter.



**Filter out-of-band attenuation measurement**

#### • Multi-marker function

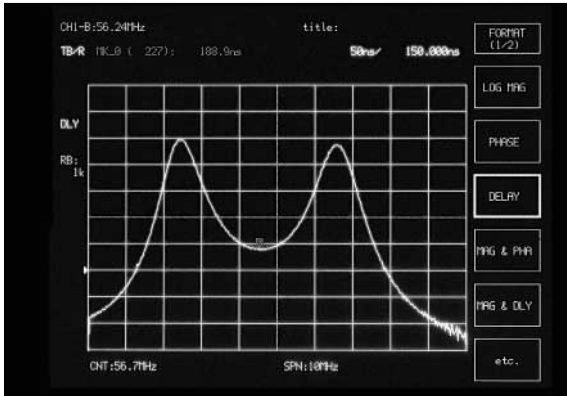
Up to 10 markers can be set independently for each channel. The marker list function can be used to display all tabular data and waveform information simultaneously at each marker.



**Multi-markers**

• **High-accuracy group delay measurement**

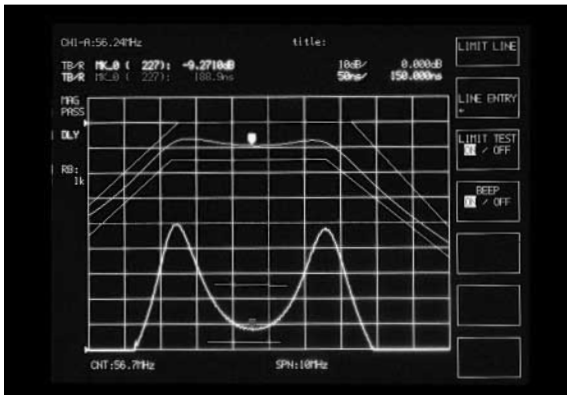
The group delay characteristics can be measured with a high degree of accuracy at a resolution of 1/10,000 of the measurement range.



Group delay characteristics

• **Limit test function**

Device pass/fail evaluation can be performed in real-time using the single and segmented limit test functions.

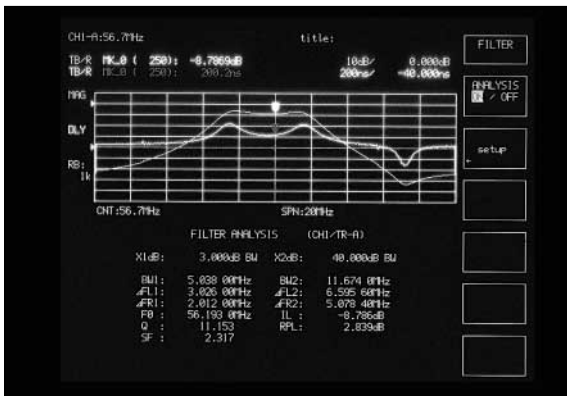


Filter pass/fail evaluation using limit test

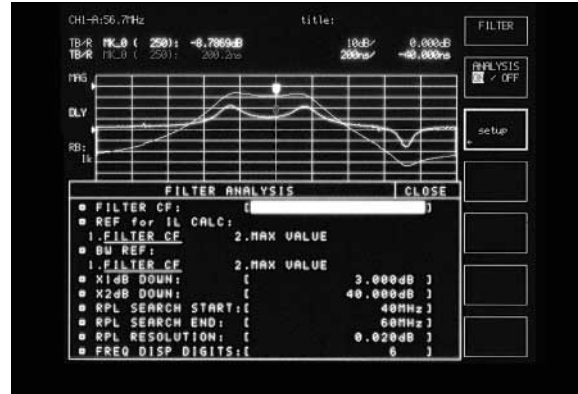
• **Filter measurement**

**Filter analysis functions**

Filter characteristics such as 3 dB bandwidth, center frequency ( $f_0$ ), in-band ripple, out-of-band attenuation, etc., are digitally processed and analyzed at high speed. User can easily enter or change default values using filter set up menu.



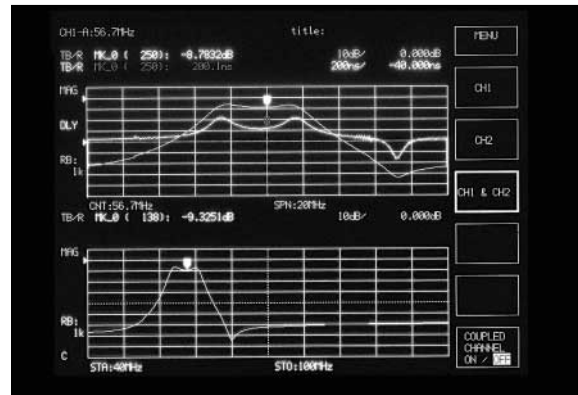
Measurement using filter functions



Set up menu for filter functions

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

Previously, spurious detection and passband measurement required switching of the measurement setup. The MS4630B alternate sweeping function permits simultaneous display of the measured passband and spurious band data. The very short switching time greatly improves the measurement efficiency.

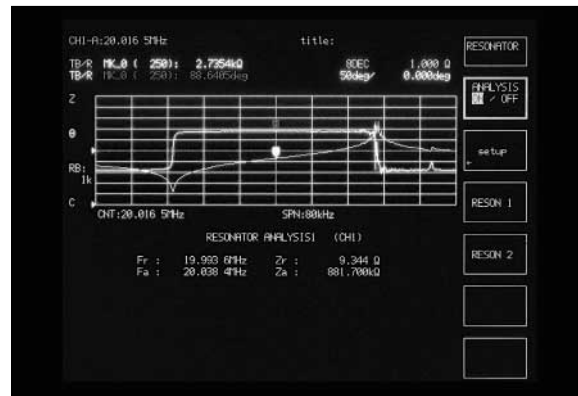


Spurious measurement using alternate sweeping

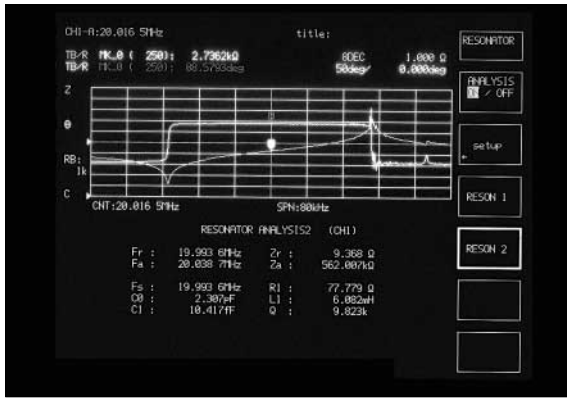
• **Resonator measurement**

**High-speed measurement of resonator characteristics**

The MS4630B has a number of dedicated waveform analysis functions to improve the evaluation efficiency of resonators. Resonator 1 analyzes the resonance frequency ( $F_r$ ) and the resonance impedance ( $Z_r$ ). Resonator 2 is able to measure resonator equivalence in addition to the parameters for Resonator 1.



Resonator 1 measurement



Resonator 2 measurement

## 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: $\leq \pm 2 \times 10^{-9}$ /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 (when combined with MA4605A: 75 Ω, 1 MΩ) 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 (when combined with MA4605A: 75 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 border="1"> <thead> <tr> <th>Level relative to IRG</th> <th>80 kHz to 100 MHz</th> <th>10 kHz to 300 MHz</th> </tr> </thead> <tbody> <tr> <td>0 to -10 dB</td> <td><math>\pm 0.30</math> dB</td> <td><math>\pm 0.30</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> </tbody> </table>	Level relative to IRG	80 kHz to 100 MHz	10 kHz to 300 MHz	0 to -10 dB	$\pm 0.30$ dB	$\pm 0.30$ 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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Phase measurement	Measurement range: $\pm 180^\circ$ Measurement resolution: $0.001^\circ$ Display scale: $0.01^\circ$ to $50^\circ$ /div (1-2-5 sequence) Dynamic accuracy																					
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Group delay measurement	DRG: $\Delta\theta/(360 \times \Delta F) \times \Delta\theta$ : phase measurement range; $\Delta F$ : frequency span x smoothing aperture (%); smoothing aperture: 20% to $\left(\frac{2}{\text{number measurement points}}\right) \times 100\%$ Measurement resolution: $2.78 \times 10^{-5} \Delta F$ Display scale: 1 ps/div to 50 ms/div Dynamic accuracy: Phase measurement accuracy/(360 x aperture frequency)																					
Calibration, correction	Calibration types: Frequency response, 1 port, 1 path-2 port, frequency response/isolation calibration, $\pi$ -NET calibration Calibration data interpolation: Measurement frequency, when number of measurement points changed, based on calibration data before change, new calibration data interpolation calculation possible (except at log frequency measurement and 1001 measurement points) Normalize: X-S Electrical length calibration Range: 0 to $\pm 999999.9999999$ m, Resolution: 100 nm Phase offset range: $\pm 180^\circ$																					
Sweeping	Frequency sweep: LIN (CENTER/SPAN, START/STOP), LOG (START/STOP) Level sweep: LIN (START/STOP/STEP) List sweep: Frequency, level, RBW, the individual setting in the waiting time Number of measurement points: 11, 21, 51, 101, 251, 501, 1001 Break point: Anywhere between 1 and 1001 Sweep time: 150 $\mu$ 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)																					
Display	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/ $\theta$ , Q, Z/Q, POLAR, VSWR, IMPD (Z $\angle\theta$ , Rs + Ls/Cs, Q/D, R + jx), ADMT (Y $\angle\theta$ , Rp + Lp/Cp, Q/D, G + jB) Display: 640 x 480 dots, 16.5 cm color LCD																					
Markers	Marker functions: NORMAL MKR, $\Delta$ MKR, 0 MKR, MKR $\rightarrow$ MAX, MKR $\rightarrow$ MIN, MKR $\rightarrow$ CF, $\Delta$ $\rightarrow$ SPAN, MKR $\rightarrow$ +PEAK, MKR $\rightarrow$ -PEAK, MKR TRACK + PEAK, MKR TRACK-PEAK, MKR CHANGE, MKR OFFSET Setting: Set marker position to frequency or point Multi-marker: Max. 10 markers 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)																					
Trace data calculation	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 $\rightarrow$ ST, MT = MT-ST, MT = ST Limit line: Single or segment (10) limit line, pass/fail evaluation against limit line																					
Measurement parameters auto-setting	Receive bandwidth and sweep time: Receive bandwidth set automatically for set sweep time Automatically set to give minimum sweep time at set receive bandwidth																					
Auxiliary media	Saving/recalling data: Measurement parameters, measured data, calibration data, PTA application programs saved/recalled to/from FD and PMC Function memory FD: 100 functions max. PMC: 100 functions max. (depends on PMC capacity) Drive and capacity 3.5 inch FDD: 1 Capacity: 720 KB (2DD), 1.44 MB (2HD), MS-DOS format (bmt, text file) Option 01: PMC (32 to 512 KB)																					
Printing	Printing is available using video plotter, printer and FD (bitmap format).																					

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Back-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/A1: 1998 (Class A) EN61000-3-2: 1995/A2: 1998 (Class A) EN61326: 1997/A1: 1998 (Annex A)
LVD	EN61010-1: 1993/A2: 1995 (Installation Category II, Pollution degree 2)

## Ordering information

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

Model/Order No.	Name
MS4630B	<b>Main frame</b> Network Analyzer
	<b>Standard accessories</b>
	Power cord, 2.6 m: 1 pc
F0013	Fuse, 5 A: 2 pcs
W1534AE	MS4630B operation manual (main frame): 1 copy
W1535AE	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: $\leq \pm 2 \times 10^{-8}$ /day)
MS4630B-14	3 branch output (for 3 channel receiver)
	<b>Optional accessories</b>
62BF50	Reflection Bridge
62B50	Reflection Bridge
62BF75	Reflection Bridge
62B75	Reflection Bridge
MA2201A	Reflection Bridge
MA2203A	Reflection Bridge
MA2301A	Reflection Bridge
MA2302A	Reflection Bridge
MA2303A	Reflection Bridge
MA2204A	Impedance Probe
MA2403A	Impedance Probe
MA414A	Impedance Measurement Kit (for MA2403A)
MA1506A	$\pi$ Network (DC to 125 MHz, for resonator measurement)
MA4605A	Impedance Adapter (for MS4630B, 10 Hz to 300 MHz, 50/75 $\Omega$ , unbalanced)
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 Key Board (JIS type)
MC3306A	PTA Key Board (ASCII type)
B0329C	Front cover (1MW4U)
B0333C	Rack mount kit
B0334C	Carrying case (hard type)
	<b>Optional instruments</b>
ME010 series	Test Fixture (PIN, SMD, tip-inductor, etc.)