

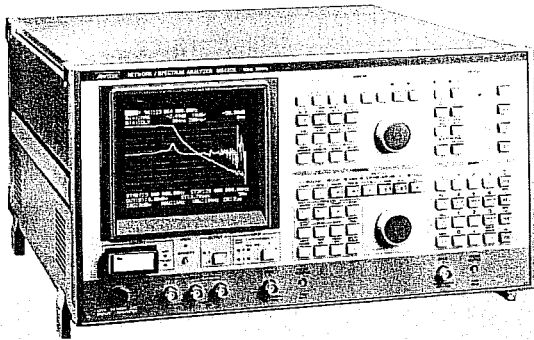
# NETWORK ANALYZERS

## NETWORK/SPECTRUM ANALYZER

### MS420B/K

10 Hz to 30 MHz

B: 75Ω  
K: 50Ω



«GP-IB»

The MS420B/K Network/Spectrum Analyzer is suitable for total evaluation of electronic devices, circuits, and elements. It can analyze magnitude, phase, delay time, levels and spectrum and frequencies of signals. The MS420B/K also has a built-in test-signal source and CRT display.

A high-performance synthesizer is used in the test-signal and local signal sources of the receiver, which gives very stable measurements and high resolution.

The following options are available for the MS420B/K

#### PTA (Personal Test Automation)

Controller used to construct a high-speed measuring system. Its programs are written in high-level language PTL (Personal Test Language) that is similar to BASIC.

#### PBMI (Plug-In Bubble Memory Interface)

8 kbyte PBM interface. A PBM can be plugged into the MS420B/K front panel and can memorize up to 6 functions or can file application programs written in PTL.

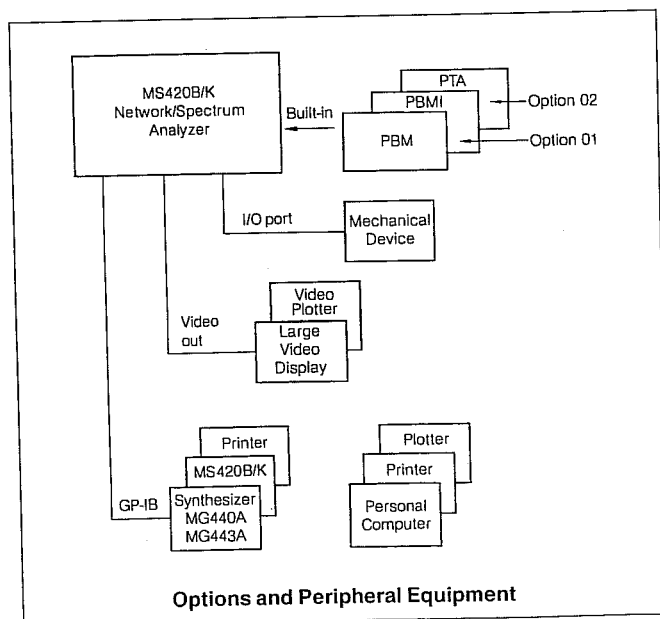
### Features

- Wide measurable level range of over 150 dB, allowing the measured device to be checked at actual operational levels
- High-performance synthesizer to enable high resolution measurements
- High-speed measurement of 2 ms/point  
This is useful for speedier mass production of parts.
- High-precision group delay measurements
- Logarithmic frequency sweep
- Level sweep for non-linearity tests; variable input levels make the instrument suitable for characteristics tests
- Built-in GP-IB interface for remote control of front-panel functions
- Video output (rear panel) allows connection of a large-scale video display or video plotter (copy speed: about 13 s)
- Level calibration by using the output of the test-signal source
- External MG440A Synthesizer or MG443B SLG can be connected to check frequency response of conversion loss at different input/output frequencies

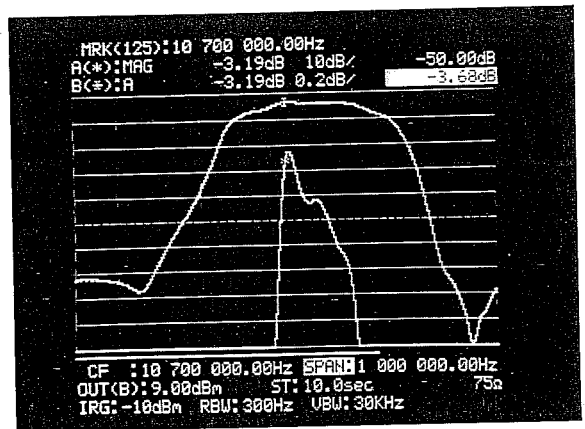
### Applications

#### • Filter adjustment

The MS420B/K can simultaneously display both the overall characteristics and passband ripple of a filter on the CRT. Therefore, passband ripple adjustment of a filter can be done while the overall frequency response is being observed.



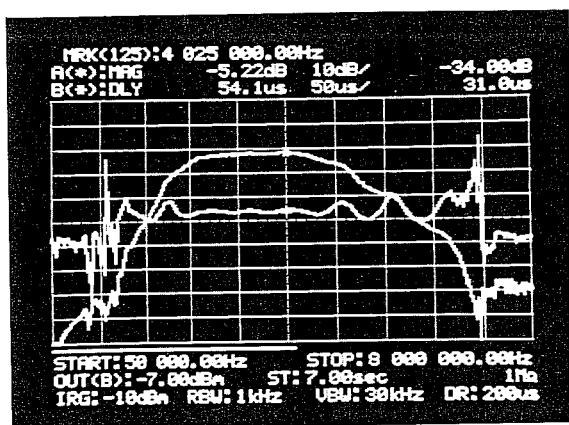
Options and Peripheral Equipment



10.7 MHz IF Filter Measurement

## • High precision delay time measurement

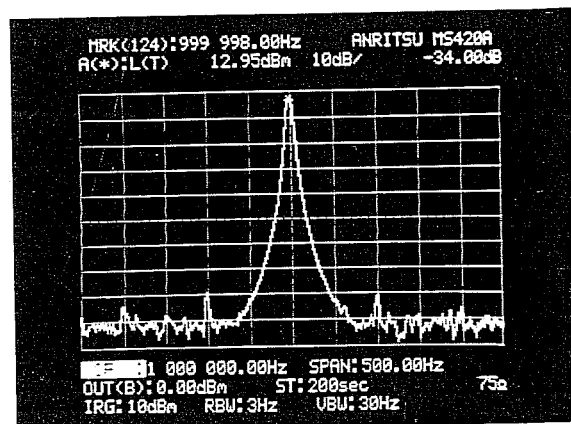
Delay time and frequency response of VTR 1H delay lines must be measured precisely. The delay time expansion function of the MS420B/K can test samples that have very feeble frequency response in comparison with the absolute delay time. At 400 kHz aperture, samples of 1  $\mu$ s delay time can be easily tested at a resolution of 1 ns. For VTR 1H delay lines, 63  $\mu$ s delay time can be tested at 10 ns resolution.



Delay Line Measurement  
 Upper trace: Amplitude  
 Lower trace: Group delay

## • High-resolution spectrum analysis

A high-performance synthesizer is built-in, so that stable analysis can be performed at a resolution bandwidth of 3 Hz. This permits accurate analysis of even a spurious signal from a power line.

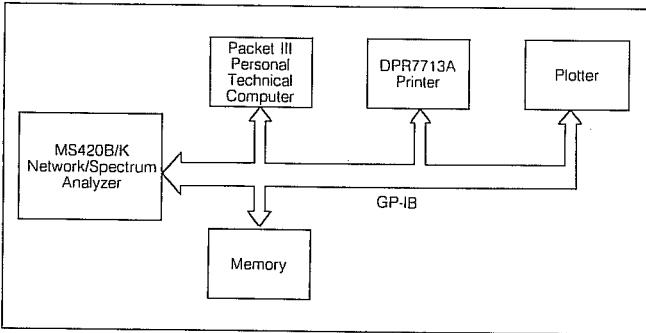


Analysis of Spurious Signal-Related to Hum

# NETWORK ANALYZERS

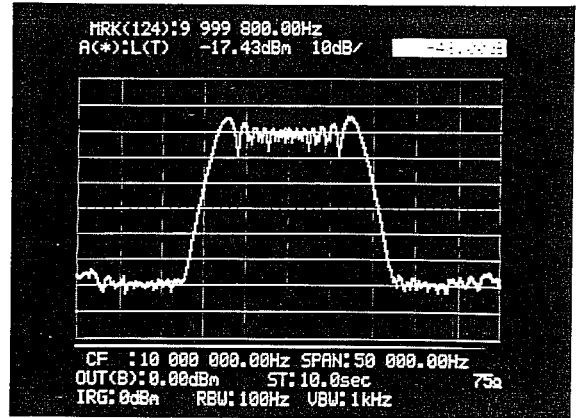
## • Connection to personal computer

The MS420B/K can be connected through the built-in GP-IB interface to a data processor, such as a personal computer, so that all the functions except the POWER switch and the INTENSITY control can be controlled externally. The interface is especially useful when a lot of data are to be processed, and when the MS420B/K is to be combined with other measuring instruments. An external memory, XY plotter, and serial printer can also be connected for recording and listing data.



## • Frequency shift measurement by MAX HOLD

The MAX HOLD function can measure frequency shift of FM signals and the degree of such shifts. The maximum value can be held easily for a spectrum with a large level change.



FM Signal Frequency Deviation Measurement

# NETWORK ANALYZERS

## MS420 □ specifications

Functions		Specifications	Network analysis	Spectrum analysis
Measuring items		Magnitude, Phase, Delay, Magnitude and Phase, Magnitude and Delay	•	
		Level (R), Level (T), Spectrum (R), Spectrum (T) R: Reference input, T: Test input, Level: Measures the level only at frequency points displayed on the CRT, Spectrum: Displays the maximum value of the signal by making a measurement with frequency steps fine enough to acquire all frequencies in full sweep bandwidth.		•
Frequency	Range	10 Hz to 30 MHz. Resolution: 0.01 H	•	•
	Reference crystal oscillator	Frequency: 10 MHz Stability: $\leq 5 \times 10^{-8}$ after 10-minute warm-up, based on the frequency after one hour warm-up $\pm 1 \times 10^{-7}$ (0° to 45°C)	•	•
Input	Channel	2 channels (R and T)	•	•
	Impedance	1 M $\Omega$ : 1 M $\Omega$ $\pm 10\%$ shunted by $\leq 70$ pF (50 pF typical) 75 $\Omega$ : (MS420B); 50 $\Omega$ : (MS420K); Return loss: $\geq 30$ dB	•	•
	Range (IRG)	-40 to +20 dBm, 10 dB steps	•	•
	Connector	BNC	•	•
Dynamic range	Image rejection	$\geq 70$ dB	•	•
	IF rejection	$\geq 70$ dB	•	•
	Internal distortion	$\leq -60$ dB at 100 Hz to 200 kHz (Resolution bandwidth: $\leq 300$ Hz) $\leq -70$ dB at 200 kHz to 15 MHz	•	•
	Average noise level	At level measurement when the input channel and impedance are T and 75/50 $\Omega$ .		
		Resolution bandwidth	Frequency	Values relative to input range
		10 Hz	100 Hz to 30 MHz	-60 dB
		10 Hz	10 kHz to 30 MHz	-90 dB
30 Hz		300 Hz to 30 MHz	-70 dB	
30 Hz		10 kHz to 30 MHz	-85 dB	
100 Hz	1 kHz to 30 MHz	-80 dB		
300 Hz	3 kHz to 30 MHz	-80 dB		
1 kHz	10 kHz to 30 MHz	-75 dB		
3 kHz	30 kHz to 30 MHz	-70 dB		
10 kHz	100 kHz to 30 MHz	-65 dB		
30 kHz	300 kHz to 30 MHz	-60 dB		
		The best data for the network analysis is 10 dB or more improvement over above values.	•	
Crosstalk	Between input R and T	$\geq 100$ dB	•	
	Between synthesizer output and input T	$\geq 120$ dB	•	•
Resolution bandwidth	3 dB bandwidth	3 Hz to 30 kHz in 1, 3 sequence. Accuracy: $\pm 20\%$ at $\geq 30$ Hz	•	•
	Selectivity	<20: 1, shape factor 60/3 dB	•	•
Video bandwidth	3 Hz to 30 kHz in 1, 3 sequence		•	•
Magnitude measurement	Range	100 dB. Resolution: 0.01 dB	•	
	Offset error	Frequency response and input range/resolution bandwidth switching errors can automatically be corrected by memorizing the calibration data (usually based on the through connection).		
	Linearity	0 to -50 dB: $\pm 0.15$ dB      -50 to -60 dB: $\pm 0.5$ dB -60 to -70 dB: $\pm 1$ dB          -70 to -80 dB: $\pm 2$ dB $\pm 1$ dB (0 to -10 dB) for resolution bandwidth 3 Hz		
Level/spectrum measurement	Range	-130 to +20 dBm. Resolution: 0.01 dB	•	•
	Offset error	Frequency response and input range errors can automatically be corrected by memorizing the standard data calibrated with the reference signal (synthesizer output)		
	Linearity	0 to -50 dB: $\pm 0.15$ dB      -50 to -60 dB: $\pm 1$ dB -60 to -70 dB: $\pm 3$ dB $\pm 1$ dB (0 to -10 dB) for resolution bandwidth 3 Hz		
Phase measurement	Range	$\pm 180^\circ$ Resolution: 0.1°	•	
	Offset error	Frequency response and input range/ resolution bandwidth switching errors can automatically be corrected by memorizing the calibration data (usually based on the through connection).		
	Level characteristic	0 to -50 dB: $\pm 1.5^\circ$ -50 to -70 dB: $\pm 3^\circ$ at resolution bandwidth 3 kHz		
Delay measurement	Range	1 $\mu$ s to 400 ms in 1, 2, 4 sequence	•	
	Resolution	Normal: 1/1000 of measurement range. Expand: 1/10000 of measurement range		
	Offset error	Frequency response can be automatically corrected by memorizing the calibration data (usually based on the through connection).		
	Level characteristic	(0.5% of full scale +0.5% of reading) at 0 to -50 dB and resolution bandwidth $\geq 10$ Hz for $\mu$ s range (1 to 30 MHz)		

Continued on next page.

# NETWORK ANALYZERS

Synthesizer output	A output	-110 to +15 dBm, Resolution: 0.01 dB	•	•
	B output	-110 to +9 dBm, Resolution: 0.01 dB (power splitter output). Both outputs terminated.		
	Level accuracy	±0.3 dB at +5 dBm		
	Impedance	75 Ω, Return loss: >30 dB (MS420B). 50 Ω, Return loss: >30 dB (MS420K)		
	Connector	BNC		
Frequency measurement		Resolution: 1 Hz. Accuracy: Reference frequency ±1 Hz		•
Sweep mode	Frequency	LIN: START/STOP, CENTER/SPAN LOG: START/STOP	•	•
	Level	START/STOP/STEP		
Sweep points		251	•	•
Sweep time (ST)		500 ms* to 24 hours/SPAN *: Depends on measurement item and measurement conditions.	•	•
Sweep range	AUTO	Automatic sweep over the full range	•	•
	MARKER	Measures only marker point or sweeps only the range between two markers		
Sweep control		RESET, STOP, REPEAT START, SINGLE START	•	•
Automatic setting		SIGNAL TRACK: Automatically ganged to maximum received signal		•
		BW, ST: COUPLED TO FREQ Resolution bandwidth, video bandwidth and sweep time are automatically set to the optimum values by ganging with span width	•	•
		BW, ST: COUPLED TO SPAN Resolution bandwidth, video bandwidth and sweep time are automatically set to the optimum value by ganging with frequency		•
Calibration	INT	Non-linearity error correction	•	•
	X→S	Offset error correction		
Calculation	X→S	Automatic correction of offset error	•	•
	A→B	Arithmetic processing between A and B memories		
	Δ	Deviation between MAIN marker and Δ marker		
	ZERO	Deviation from reference value		
Display	CRT	6.5-inch electromagnetic deflection	•	•
	Trace	Same as the measuring items (rectangular coordinates)		
	Sub-trace	Same as the measuring items (rectangular coordinates) B, A, A→B. It is not performed for Magnitude/Phase and Magnitude/Delay		
	Markers	2 (MAIN marker and Δ marker)		
	Character	Marker point data, trace condition, measurement condition		
	Function memory	3 (Trace condition, measurement condition)		
Rear panel INPUT/OUTPUT	Video output	75 Ω load, approx. 1 V p-p (BNC)	•	•
	10 MHz reference output	TTL level (BNC)		
	10 MHz reference input	TTL level (BNC)		
	X→S switching signal	Open collector (36 pins)		
	GP-IB	Compatible with IEEE-488 (24 pins)		
Remote control		GP-IB (IEEE-488, IEC625-1, 24 pins) SH1, AH1, T6, L4, SR1, RL1, PP0, DC0, DT0, C28 All functions (except power and INTENSITY) of front panel are remotely controllable	•	•
Power		AC 100 V ±10%, 50/60 Hz, <330 VA	•	•
Ambient temperature, rated range of use		0° to +45°C	•	•
Dimensions and weight		221.5H × 426W × 451D mm, ≤35 kg	•	•