

## SELECTIVE LEVEL METER

### ML422B/C

### 50Hz to 30MHz



The ML422B and the ML422C are selective level meters. The ML422B is designed for use with Bell System FDM hierarchy, while the ML422C is for use with a CCITT system. Each instrument covers an extremely wide frequency range, from 50 Hz to 30 MHz. These remarkable instruments offer highly accurate measurement of signal levels, and they have the frequency accuracy and stability needed to manufacture and maintain FDM systems, from voice frequencies up to 3600 channels. The ML422B or ML422C can also function as a wideband level meter, psophometer, or voice band analyzer.

#### Features

- **Highly accurate level measurement**  
Measures levels to an accuracy of  $\pm 0.1$  dB ( $23^{\circ}\text{C} \pm 5^{\circ}$ ). Automatic level calibration ensures the accuracy needed for manufacture, installation and maintenance of FDM transmission lines and equipment.
- **Measurement of transmission impairment**  
Fast troubleshooting of voice channel problems.
- **48 kHz group filter**  
Easy testing of data transmission systems.
- **Intrinsic distortion below -70 dB**  
Measures low noise levels under conditions of high interference.
- **True RMS value detection and 3.1 kHz bandwidth**  
Measures psophometric weighted channel noise, without conversion, using the weighted 3.1 kHz BW.
- **Built-in microprocessor for simple operation**  
Controls are simple, yet extensive: Autoranging, relative level measurement, hot tone search, direct frequency selection with 10-key pad, fine tuning dial, fixed interval frequency shifts with STEP key, and memory capacity for up to 20 different frequencies.
- **GP-IB compatibility for automatic measurement**  
All functions except power switch and demodulator volume can be controlled through GP-IB (IEEE-standard 488-1978).

#### Specifications

Frequency range	50 Hz to 30 MHz (BW 20 Hz, WIDEBAND) 10 kHz to 30 MHz (BW 3.1 kHz) 36 kHz to 30 MHz (BW 48 kHz) 2 kHz to 2 MHz ( $75\ \Omega$ , $124\ \Omega$ , $150\ \Omega$ BALANCED INPUT) 50 Hz to 120 kHz ( $600\ \Omega$ BALANCED INPUT)
Frequency display	LED, 8 digits (minimum step: 1 Hz)
Reference frequency stability	$\leq 5 \times 10^{-7}/0^{\circ} \sim 45^{\circ}\text{C}$ , $\leq 1 \times 10^{-6}/\text{year}$ (aging rate)
Level measuring range	-120 to +30 dBm (BW 20 Hz, $\geq 200$ Hz) -100 to +30 dBm (BW 3.1 kHz) -80 to +30 dBm (BW 48 kHz) -60 to +30 dBm (WIDEBAND)
Noise floor	$\leq -115$ dBm (BW 3.1 kHz, $75\ \Omega$ UNBALANCED, full scale $\leq -30$ dBm)

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# VOLTMETER, POWER METERS AND LEVEL METERS

Level measuring accuracy (1) 75Ω unbalanced	20dB scale range, AFC (ON), SCALE (AUTO)																																													
	<ul style="list-style-type: none"> <li>• Selective <table border="1"> <thead> <tr> <th>Temperature</th> <th>23°C ±5°</th> <th colspan="3">0° to 45°C</th> </tr> <tr> <th>Frequency range</th> <td>10kHz to 13MHz</td> <td>50Hz to 200Hz</td> <td>200Hz to 13MHz</td> <td>13MHz to 30MHz</td> </tr> </thead> <tbody> <tr> <td>Level range</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>0 to +20dBm</td> <td>±0.15dB</td> <td rowspan="2">±0.2dB</td> <td rowspan="2">±0.15dB</td> <td rowspan="2">±0.2dB</td> </tr> <tr> <td>-80 to 0dBm</td> <td>±0.1dB</td> </tr> <tr> <td>-100 to -80dBm</td> <td>±0.3dB</td> <td>±1dB</td> <td>±0.5dB</td> <td>±0.5dB</td> </tr> <tr> <td>-110 to -100dBm</td> <td>±1dB</td> <td>—</td> <td>±1.5dB</td> <td>±1.5dB</td> </tr> </tbody> </table> </li> <li>• Wideband <table border="1"> <thead> <tr> <th>Frequency range</th> <th>200Hz to 13MHz</th> <th>13MHz to 30MHz</th> </tr> </thead> <tbody> <tr> <td>Level range</td> <td></td> <td></td> </tr> <tr> <td>-50 to +20dBm</td> <td>±0.3dB</td> <td>±0.5dB</td> </tr> <tr> <td>-60 to -50dBm</td> <td>±0.4dB</td> <td>±0.6dB</td> </tr> </tbody> </table> </li> </ul>			Temperature	23°C ±5°	0° to 45°C			Frequency range	10kHz to 13MHz	50Hz to 200Hz	200Hz to 13MHz	13MHz to 30MHz	Level range					0 to +20dBm	±0.15dB	±0.2dB	±0.15dB	±0.2dB	-80 to 0dBm	±0.1dB	-100 to -80dBm	±0.3dB	±1dB	±0.5dB	±0.5dB	-110 to -100dBm	±1dB	—	±1.5dB	±1.5dB	Frequency range	200Hz to 13MHz	13MHz to 30MHz	Level range			-50 to +20dBm	±0.3dB	±0.5dB	-60 to -50dBm	±0.4dB
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(2) Balanced	Add ±0.1dB to the above accuracy																																													
Level display	LED 5 digits, resolution: 0.01dB (20dB scale range) 0.1dB (100dB scale range) Units: dBm, dB (0.775V), dB (X-R, relative to REF (R))																																													
Input impedance	(1) Unbalanced input (75Ω) TERMINATED: Return loss ≥35dB (50Hz to 20MHz) ≥25dB (20MHz to 30MHz) HIGH: 10kΩ ±10% shunted by ≤80pF (2) Balanced input TERMINATED: Return loss ≥30dB CMRR ≥30dB HIGH: 75Ω, 124Ω, 150Ω.* <sup>1</sup> Typically 2kΩ at 2MHz 600Ω. Typically 15kΩ at 120kHz																																													
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Intrinsic distortion attenuation	Input level below 10dBm: Single tone, 2nd and 3rd order respectively ≥70dB (1kHz to 12MHz)																																													
IF rejection	≥70dB (56.6MHz, refer to full scale value) ≥80dB (other frequencies)																																													
Image rejection	≥80dB																																													
Phase jitter	Compatible with CCITT Rec. 0.91 and BSP 41009 (1) Input signal frequency range: 1kHz to 30MHz (2) Input signal level range: -60dBm to +10dBm (3) Frequency response: 20Hz to 300Hz (4) Measuring accuracy: ±10% +0.5° p-p (5) Residual phase jitter: ≤0.5° p-p																																													
Weighted noise and notch filter	Weighting filter is compatible with CCITT Rec. P.53 (ML422C) or BSP 41009 C-message (ML422B) response. In selective mode, weighted noise and notch filter are superimposed on the 3.1kHz channel filter response. In wideband mode, unit can be used as a normal psophometer. Notch filter gives more than 50dB rejection of tone signal of 1010Hz ±15Hz.																																													
Impulse noise	Compatible with CCITT Rec. 0.71 or BSP 41009 Time period: 1 to 99 minutes Threshold level setting: 1dB step (≥-80dBm) Dead time: 125 msec. ±25 msec. (ML422C) 143 msec. ±25 msec. (ML422B) Maximum count: 999																																													
Signal search	Automatic search for unknown signals or "hot" tones on transmission systems. Threshold level range: -100dBm to 0dBm (BW 3.1kHz) Threshold level accuracy: ±2dB (scale 20dB) Dynamic range: ≥50dB																																													

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Remote control	Compatible with IEEE Standard 488-1978. Optional adapting connector for IEC 625-1 is available. Interface functions: SH1, AH1, T5, L3, SR1, RL1, PP0, DC1, DT0, C0.
Demodulator	Lower sideband (LSB), upper sideband (USB) Demodulated output frequency: 300Hz to 3400Hz (BW 3.1kHz) Demodulated output level: typically 0dBm to 600Ω (at 0dB meter indication) Output connector: suitable for SP-110
Output for recorder	Approximately 2V at 0dB meter indication Internal resistance: approx. 10kΩ Output connector: BNC female
Tracking output	Frequency range: 800Hz to 30MHz Output level: 0dBm (to 75Ω unbalanced) (Tracking output cannot be used during internal calibration)
External frequency reference input	The internal reference oscillator can be synchronized with an external signal. Frequency: 1, 2, 5, 10MHz Frequency accuracy: $\pm 1 \times 10^{-6}$ Level: 1 to 5Vp-p
Input connector	Unbalanced: BNC female Balanced: 3-pole CF connector*2
Power	$\leq 145VA$
Ambient temperature, rated range of use	0° to 45°C
Dimensions and weight	177H, 426W, 450D mm, $\leq 20$ kg
Accessories supplied	One coaxial cables: 1 m

\*1 Balanced input impedances are as follows.

ML422B: 75Ω, 124Ω, 135Ω, 600Ω  
ML422C: 75Ω, 135Ω, 150Ω, 600Ω

\*2 3-pole CF connector can be replaced by I-214 type. (Option 12)

## Specifications of ML422B/C options

- 12:** Modification of input connector (ML422C only)  
Balanced input connectors are modified to I-214 type
- 31:** Modification of selective bandwidth  
400Hz BW is installed instead of 48kHz BW  
3dB bandwidth: 400Hz  $\pm$  10%  
60dB bandwidth:  $\leq \pm 2$ kHz  
Frequency range is 10kHz to 30MHz.  
Level range is -100dB to +30dBm
- 42:** Modification of FDM channel plan (ML422C only)  
Bell System plan MMX2 is installed instead of CCITT Rec. G332, plan 1A, G343 plan 1, and G334 plan 1
- 43:** Modification of FDM channel plan  
CCITT Rec. G332 plan 2 is installed instead of standard plan.

## Optional accessories

- GP-IB Bus Cable (1 m or 2 m in length)
- Connector: ICC-1 (IEC-IB → GP-IB)  
ICC-2 (GP-IB → IEC-IB)
- Rack Flange Kit
- Front Handle Kit
- Front Cover
- Portable Test Rack
- Carrying Case
- MA45A High-Impedance Probe



Rack flange kit