

Model 181

Current Preamplifier



FEATURES

- ◆ Low input impedance
- ◆ Low noise
- ◆ Single-ended virtual ground input
- ◆ Adjustable sensitivity
- ◆ DC to 200 kHz frequency response
- ◆ Detector bias control

APPLICATIONS

- ◆ Photodiode amplification
- ◆ Photomultiplier amplification
- ◆ Ion collector amplification
- ◆ Electron multiplier amplification

DESCRIPTION

The model 181 is a current-to-voltage preamplifier of low noise and low input impedance designed to amplify the extremely low currents encountered in such areas as photometry and semiconductor research. In photometric applications the low input noise allows the use of photodetectors with dark currents as low as 10^{-14} A/ $\sqrt{\text{Hz}}$, while the wide frequency range permits high modulation frequencies to avoid $1/f$ noise and power-line pick-up.

The unit has a high dynamic range, allowing small AC currents to be amplified without overload in the presence of quiescent (DC) detector currents up to ten times the current to voltage converter setting. In semiconductor applications its low input impedance permits the actual bias voltage applied to the device under test to be measured without having to correct for the effects of back bias.

Six switch-selectable sensitivity settings from 10^{-4} A/V to 10^{-9} A/V are available and the instrument has a usable frequency range from DC to 200 kHz. A signal monitor connector is provided on the rear panel and there is an overload indicator light on the front panel.

Bias Control

A bias control (accessible through an opening in the bottom of the unit) allows the application of a detector bias voltage at the input connector in the range 0 V to -5 V, with a nominal source impedance of $10^{-5}/S$, where S is the selected sensitivity. For example, if the sensitivity is set to 10^{-7} A/V then the source impedance will be $10^{-5}/10^{-7}$, or 100 Ω . In some cases it may prove convenient to use this bias control to cancel the effect of DC bias accompanying the input signal.

DC Zero Control

A second control, also accessible through an opening in the bottom of the unit, allows the internal electronics to be DC zeroed.

Power

The unit can be powered from an external low voltage, a lock-in amplifier via a suitable power cable, or the models PS0055 or PS0056 remote line power supply modules.

Preamplifiers

Specifications

General

DC coupled current to voltage amplifier with adjustable sensitivity and a maximum frequency response extending from DC to 200 kHz. Adjustable negative detector bias. Single-ended virtual ground input and single-ended AC coupled output via BNC connectors.

Powered from external DC power supplies.

Input

Sensitivity 10^{-4} A/V to 10^{-9} A/V in six ranges

Overload Indicator Indicates that instantaneous (DC plus peak AC) current has exceeded amplifier capability - see table below

Frequency Response see table and Figure 1

| Gain A/V | Max DC Input Current | Frequency Response |
|-----------|----------------------|--------------------|
| 10^{-4} | 1 mA | DC to 200 kHz |
| 10^{-5} | 100 μ A | 200 kHz |
| 10^{-6} | 10 μ A | 100 kHz |
| 10^{-7} | 1 μ A | 50 kHz |
| 10^{-8} | 100 nA | 10 kHz |
| 10^{-9} | 10 nA | 1 kHz |

Input Impedance See Figure 2

Noise Current See Figure 3

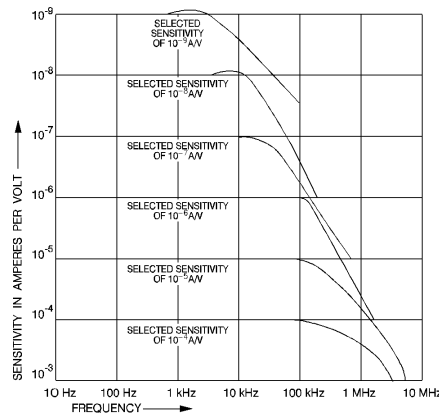


Figure 1, Frequency Response vs. Sensitivity

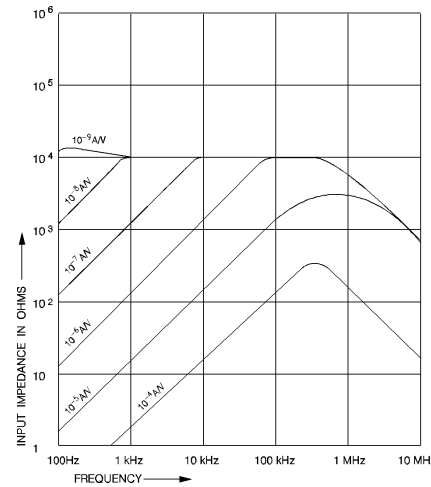


Figure 2, Input Impedance vs. Sensitivity

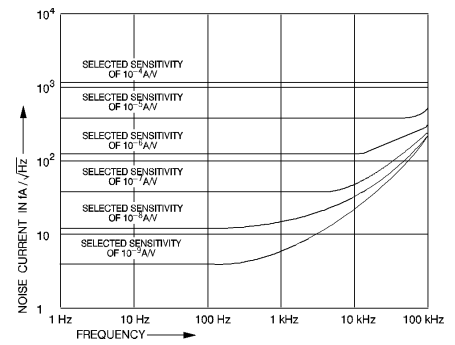


Figure 3, Noise Current vs. Frequency and Sensitivity

Outputs

Monitor Output 600 Ω rear-panel BNC connector permits monitoring of the input signal

Main Output Level 6.5 V rms maximum

Impedance 1 k Ω nominal

Output Attenuator Provides optional 1:10 attenuation of output voltage

Power ± 15 V or ± 24 V at 30 mA

General

Dimensions (excluding connectors) 4.5" wide x 6.6" deep x 2.7" high (114 mm wide x 168 mm deep x 69 mm high)

Weight 1.2lbs (500 g)

ACCESSORIES FOR MODEL 181

Remote Line Power Supply for Model 181 (110 V) Model PS0055



Remote Line Power Supply for Model 181 (220 V) Model PS0056



Power Cable Model C0099
To power model 181 from models 124A, 5101, 5203 or 5204



Power Cable Model C0145
to power model 181 from models 5102, 5104, 5109, 5110(A), 5205, 5206, 5207, 5208, 5209, 5210, 5302, 7220(BFP), 7225(BFP), 7260, 7265, 7280(BFP) or 7310