SIGNAL RECOVERY

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/√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.

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 DC to
10^{-4}	1 mA	200 kHz
10^{-5}	100 µA	200 kHz
10^{-6}	10 µA	100 kHz
10^{-7}	1 µA	50 kHz
10^{-8}	100 nA	10 kHz
10^{-9}	10 nA	1 kHz

Input Impedance	See Figure 2
Noise Current	See Figure 3

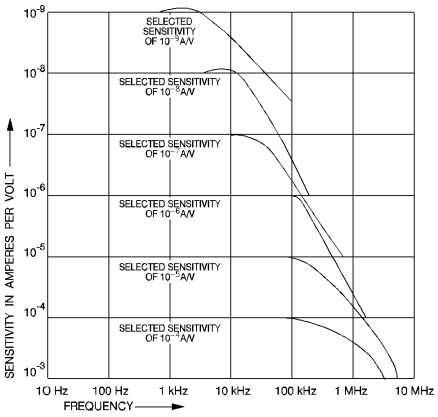

Figure 1, Frequency Response vs. Sensitivity

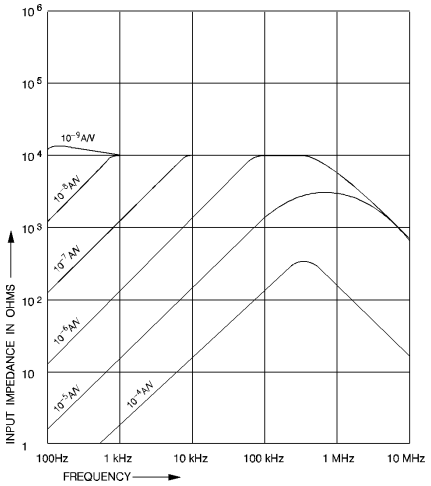

Figure 2, Input Impedance vs. Sensitivity

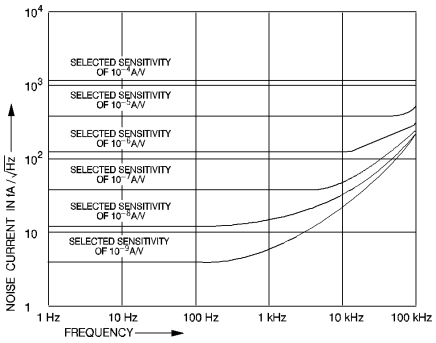

Figure 3, Noise Current vs. Frequency and Sensitivity

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 kΩ 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)