The Model 5402 is a low noise current input preamplifier designed for use whenever the signal source is a current source - for example, an electron multiplier, ion collector, photo multiplier, or photodiode, or when measuring sample impedances. The gain (transimpedance) is switch selectable with six settings enabling the amplifier, on its most sensitive range, to detect fractions of a picoamp without noise degradation.

The unit has a bandwidth of 100 kHz on its highest gain (1 GV/A) and greater than 4 MHz on its lowest gain (10 kV/A), while still maintaining low input current noise ranging from 25 fA /√Hz on the 1 GV/A range to 5 pA /√Hz on the 10 kV/A range. The gain setting is changed by simply pressing a push-button, with the present setting being indicated by an LED. The setting is retained when the power switch is turned off and restored when it is turned on again.

Switch selectable output filters allow AC or DC output coupling, and three choices of low pass filtering which can reduce overall noise, especially when working at high gains if the full bandwidth is not required.

The Model 5402 is powered by two internal lithium-ion rechargeable batteries which allow operation for up to 48 hours on a single charge. This method of powering delivers the lowest possible noise as well as allowing isolated operation, preventing problems which might be caused by ground loops.

A plug-in line power supply, model PS0112, is included which is capable of recharging the batteries in one model 5402; recharge time is a maximum of three hours.
Specifications

Input
Mode
Coupling
Connector
Maximum safe input voltage
Input Bias Current
Input Referred Voltage Noise
Input Referred Current Noise

Output Filters

- **Output Coupling (high-pass)**
  - When set to DC, amplifier is DC coupled.
  - When set to AC, low-frequency cut off is 0.1 Hz.

- **Output Filter (low-pass)**
  - Low pass Butterworth filter with 18 dB/octave roll-off filter reduces overall noise, especially when working at high gains, if full bandwidth is not required.

Gain & Frequency Response

- **Gain**
  - Switch selectable (6 settings) to 1 G, 100 M, 10 M, 1 M, 100 K, 10 K V/A

- **Accuracy**
  - ± 0.5 dB

- **Flatness in pass-band**
  - ± 0.5 dB

- **Frequency Response**
  - See Table A-1

Gain & Frequency Response

<table>
<thead>
<tr>
<th>Gain</th>
<th>Bandwidth (–3dB) with $C_i = 10 \text{ pF}$</th>
<th>Bandwidth (–3dB) with $C_i = 1 \text{ nF}$</th>
<th>Input Referred Current Noise (typical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 K</td>
<td>&gt; 5 MHz</td>
<td>&gt; 500 kHz</td>
<td>5 pA/√Hz</td>
</tr>
<tr>
<td>100 K</td>
<td>&gt; 2 MHz</td>
<td>&gt; 200 kHz</td>
<td>1 pA/√Hz</td>
</tr>
<tr>
<td>1 M</td>
<td>&gt; 800 kHz</td>
<td>&gt; 100 kHz</td>
<td>500 fA/√Hz</td>
</tr>
<tr>
<td>10 M</td>
<td>&gt; 450 kHz</td>
<td>&gt; 80 kHz</td>
<td>100 fA/√Hz</td>
</tr>
<tr>
<td>100 M</td>
<td>&gt; 250 kHz</td>
<td>&gt; 25 kHz</td>
<td>50 fA/√Hz</td>
</tr>
<tr>
<td>1 G</td>
<td>&gt; 100 kHz</td>
<td>&gt; 20 kHz</td>
<td>25 fA/√Hz</td>
</tr>
</tbody>
</table>

Table A-1 Typical Frequency Response

Output

- **Impedance**
  - 50 Ω

- **Connector**
  - BNC jack

- **Max voltage swing**
  - > 5 V pk-pk

- **Polarity**
  - Current flowing into the input produces a positive output voltage

- **Protection**
  - Output is short-circuit protected

Power

- **Internal**
  - Rechargeable lithium ion batteries provide up to 48 hours of use.
  - Batteries recharge automatically when DC power is connected.
  - Recharge time is max of 3 hours

- **External**
  - 9 V DC @ 350 mA max

  - Connector
    - 1.3 mm DC power socket, inner pin positive, outer barrel negative

General

- **Dimensions**
  - Excluding connectors
    - 3½" w x 1¼" d x 2¾" high
    - (85 mm x 31 mm x 71 mm)
  - Including connectors
    - 4½" w x 1¼" d x 2¾" high
    - (114 mm x 31 mm x 71 mm)

- **Weight**
  - 7.5 oz. (210 g) excluding optional power supply

- **Operating Temperature**
  - 5° to 40°C

- **Storage Temperature**
  - -25° to 70°C

Ordering Information

Model 5402
Low noise current amplifier complete with line power supply (PS0112) and user manual

© Copyright 2018 AMETEK, Inc. All Rights Reserved
Specifications subject to change