

**Building a Radiometer**

**INTRODUCTION**
In this lab you will construct a simple radiometer and evaluate its baseline functionality. The radiometer will be based on a planar-diffused silicon (Si) photodiode. Do not dismantle this radiometer for it will be used throughout the quarter.

**MATERIALS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity/Description</th>
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<tbody>
<tr>
<td>Breadboard (circuit board)</td>
<td>Silicon (Si) Photodiode detector</td>
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<tr>
<td>Wire</td>
<td>BNC cable</td>
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<tr>
<td>Resistors</td>
<td>(2) 9 volt batteries</td>
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<tr>
<td>Digital Multimeter (DMM)</td>
<td>741 operational amplifier</td>
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<tr>
<td>2 battery connectors</td>
<td>5 position DIP switch</td>
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**CONSTRUCTING THE RADIOMETER**

1. First measure the resistance of your resistors (2 or 3 trials would be nice) and voltage of the batteries to be used. The resistor values will become crucial in future experiments.
2. Construct the Si radiometer on your bread board in a zero-bias mode, as illustrated below.
3. Your photodiode is connected via a BNC cable. Note the pin-out connections (see diagram below).

HINTS
- Understand the layout of the breadboard.
- Assemble a “bi-polar” supply and power-up the op-amp. Establish a place on the breadboard for “ground”.
- Understand how the DIP switch works
- Assemble the feedback resistor network
- Connect the input and output wires to the op-amp
- Your radiometer output signal should vary with incident illumination.
- IMPORTANT: Be sure to disconnect your batteries when not using the radiometer. The circuit will constantly draw current if you leave them connected. Low battery voltage will ultimately lead to low dynamic range for your device.
- IMPORTANT: Do not “over-handle” the op-amp. The device is susceptible to electrostatic discharge. This means the charge in your body could “short-circuit” the device rendering it useless.

NOTE: There is no formal write-up for this lab. We will perform a more in-depth analysis of your radiometer in subsequent labs.