

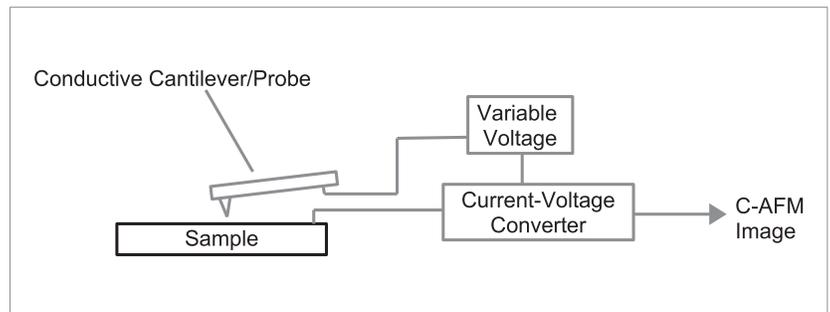
# C-AFM Conductive AFM

Model ID: CA-2011

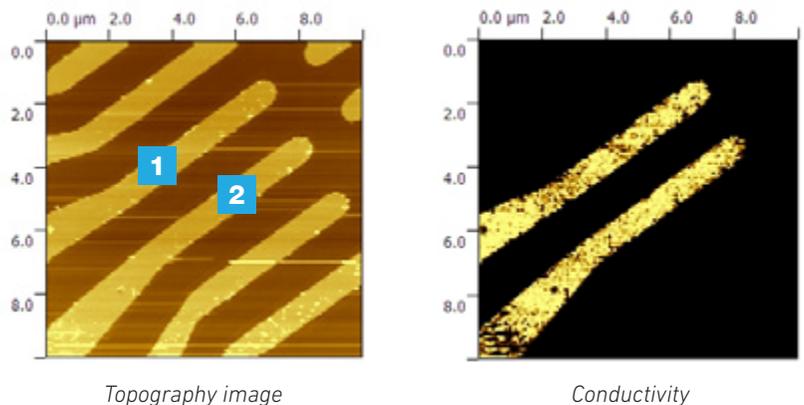
AFMWorkshop's **Conductive-AFM** (C-AFM) accessory provides surface conductivity images when used as an accessory with the TT, NP, SA, or LS-AFM.

The C-AFM creates images showing pixel-by-pixel conductivity. Conductivity is measured using any DC voltage (from -10 to +10 volts) with currents ranging from picoamps to 10 microamps.

The C-AFM measures topography and conductivity images simultaneously. This option allows measuring current-to-voltage curves at specific locations on a surface.



(Below) Images of a test pattern measured with the C-AFM option. At the right is a topography image and at the left is the conductivity image. The features labeled 1 and 2 had a conductive path to ground, and thus were visualized in the conductivity image.

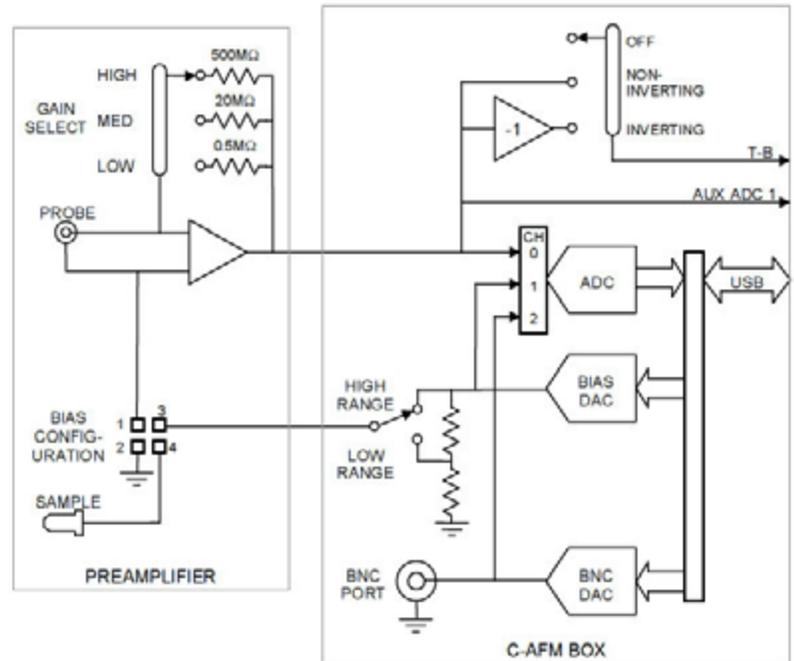


# TECHNICAL DESCRIPTIONS

At right, a block diagram depicts the functionality of the Conductive AFM circuitry.

Conductivity is measured by applying a fixed DC bias voltage between the probe and the sample, and then by measuring the resulting current.

The preamplifier is an I/V circuit, i.e. a current-to-voltage converter. It has 3 gains selected by a small slide switch on the preamplifier circuit board. These gains are designated “low”, “med” and “high”.



Multiplying the measured voltage from the C-AFM with the Scaling Factor (provided in the specifications section of this document) yields the current. Dividing the current by the applied voltage yields conductivity in mhos, or conversely, dividing the applied voltage by the measured current yields resistance in ohms.

The preamplifier circuit can be configured so that a fixed DC bias voltage is applied to the probe while the sample is held at ground, or the DC bias can be applied to the sample while the probe is held at virtual ground. In the former case, the DC bias voltage range is  $\pm 5$  volts.

# SPECIFICATIONS

## ► Probe Bias

- » Conductive Probe Model **EFM60**
- » Length **225  $\mu\text{m}$**
- » Width **30  $\mu\text{m}$**
- » Thickness **3  $\mu\text{m}$**
- » Tip Height **14-16  $\mu\text{m}$**
- » Tip Radius **< 30nm**
- » Force Constant **3N/m**
- » Resonant Frequency **70KHz**
- » Coating **Pt/Ir (Both sides)**

## ► Probes

Range	
LOW	$\pm 1\text{V}$
HIGH	$\pm 10\text{V}$

## Included with the C-AFM

- Conductive Probes
- Reference Sample
- Sample Holder with Clips
- Preamplifier/Probe Holder
- Cables
- Manual

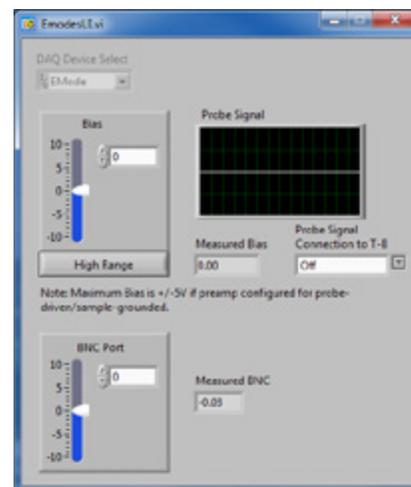
- The current-to-voltage circuit is mounted directly on the probe carrier for optimal signal to noise performance. Wires go directly from the PC board to the probe and to the sample.



- At the back of the electronic control box are connectors for a 50 pin ribbon cable, a USB cable, a cable to the preamplifier, and an extra DAC output BNC.



- Software for the C-AFM option is written in LabVIEW™. VIs for the application are available to customers who want to modify the user interface. The application allows changing the bias on the sample and monitoring the current between the probe and surface.



## ► Preamplifier Gains

Gain	Full Scale	Scaling	Transimpedance
LOW	10uA	2uA/V	0.5M $\Omega$
MED	250nA	50nA/V	20M $\Omega$
HIGH	10nA	2nA/V	500M $\Omega$