The New NanoScope V Controller:

New power and capabilities for MultiMode V, Dimension V, NanoMan V, and PicoForce

Fast, Dependable Data Capture

The new NanoScope® V controller utilizes advanced electronics, including A/D and D/A converters operating at 50MHz, to deliver reliable, high-speed data capture. This state-of-the-art controller allows researchers to record and analyze tip-sample interactions (e.g., at pull-off in force spectroscopy) that probe nanoscale events at timescales previously inaccessible to SPM.

High speed data capture is simultaneous with imaging or ramping and is independent of microscope mode.

Flexible Controller Features

The NanoScope V enables up to eight images to be simultaneously displayed in real-time (and captured for analysis)

The NanoScope V controller.

with unprecedented signal-to-noise ratio. The controller incorporates three independent lock-in amplifiers and provides thermal tune measurements of cantilever resonances up to 2MHz.

The controller also affords easy access to most input and output signals through front-panel BNCs. Input data into the controller from an external source (e.g., photomultiplier tube) is supported, as is user access to lock-in amplifiers and to signals to/from a microscope (e.g., XYZ sensors, amplitude, phase).

Highest Pixel Density

Up to 5000 x 5000 pixel images, improve "time to results" by reducing the need to capture several images at lower pixel densities; and eliminating the requirement for offset adjustments to correlate information from multiple images. The high pixel density also allows observation of large structures and small features in the same image.

Outstanding Software Functionality

The new controller's NanoScript open-architecture option provides an expansive set of SPM control functions for custom experiments and nanoscale research (e.g., nanomanipulation in X,Y, Z; automated scanning; nanolithography with different tip-sample interactions).

These functions can also be called from any programming client of Microsoft's Component Object Model (COM), including LabView, MATLAB, Visual Basic, Ruby, Python, C++/MFC, Excel®, and Word®.

EASY-AFM, Remarkable Simplicity

For the ultimate in streamlined operational simplicity, the NanoScope V controller's Easy-AFM™, ease-of-use feature, offers an intuitive, easy-to-follow graphic user interface. Easy-AFM reduces the time for initial setup (including probe, laser, and detector alignments), engaging the sample with the probe, adjusting the scanning parameters, and obtaining TappingMode™ images on most samples.

Highlights of Features and Benefits

- High-speed electronics enable recording and analyzing data (e.g., force pulling experiments) from nano-scale events at timescales previously inaccessible to SPM
- Advanced software features simplify operation for novice or infrequent users, and give experienced users more power, and more ways to extract information from data
- High pixel density images up to 5k x 5k massively improve productivity
- Up to 8 simultaneous channels in real-time-scanning and offline-visualization/analysis enable correlating information about unprecedented number of sample properties
- Open architecture provides new options to design and run customized experiments, including with third-party software
- Differential signals and adjustable gains improve signal-to-noise ratio
- Closed-loop XYZ scanner compatibility utilizes the latest in scanner design and functionality
- Expandable modular design is forward-looking towards supporting additional functions in future
- Customizable signal access using software-controlled signal routing expands options for experimentation

Hardware

Electronics

High speed and expanded AC capabilites

- Two high-speed (50MHz)14-bit ADCs sample and digitize the probe signal (+/-2V)

- Two high-speed (50MHz) 16-bit DACs provide sinusoids (+/-10V), plus 16-bit offset bias superposed (+/-10V, adjustable up to 500kHz)

- Nine mid-speed (500kHz) 18-bit ADCs (+/-12V) enable multiple digital feedback loops to operate at 2µs speed, allowing faster scanning and data capture with fast actuators.

- Two independent high-speed lock-ins (1KHz – 5MHz) and one mid speed lock-in (0.1Hz – 50KHz) allow sampling and determining amplitude and phase of up to three independent signals, or analyzing higher harmonics of a signal (0.5KHz – 2.1MHz or 5Hz – 21KHz lock-in bandwidths)
  - Three independent reference signals available (2 at up to 5MHz, 1 at up to 50KHz)

User-accessible hardware input/output

- Three mid-speed ADCs, two high-speed ADCs

- Two digital inputs, two digital outputs (TTL compatible)

- Two high-speed and three mid-speed 16-bit DACs (+/-10V)

Hardware options

- "Pico Angler" hand-held module for tactile interface and feedback in force spectroscopy

- Signal Access Module for "MultiMode® V"

Software

- Exceptional Force Spectroscopy control and analysis
  - "Point and Shoot": precisely located force or tunneling spectroscopy at any XY coordinate in an image, with a single click of the mouse
  - Force Volume imaging up to 256 x 256 x 256 data-points per image

- Open architecture using easy to use Applications Programming Interface (API) and Component Object Model (COM)

- High-speed data capture commensurate with high-speed electronics

- Easy-AFM, the "Expert System" graphic user interface, easy-to-follow for new or infrequent SPM users to set up (including probe, laser, and detector alignments); engage the sample with the probe in air; adjust the scanning parameters; and obtain high- quality, useful TappingMode images on most samples with minimal user intervention

- Expanded, enhanced image capture, visualization, and analysis
  - Flexible combinations of sample-per-line and lines-per-frame imaging (e.g., 512 x 512, 8192 x 3200, 16384 x 1600, 5000 x 5000)
  - Up to 8 channels of data can be simultaneously collected
  - Two- and three-dimensional image display options with 24 color tables
  - Full suite of image analysis at high pixel densities
  - Continuous data capture from successive scans of the same area
  - Automatic data capture for calibration

- Integrated graphic user interface for
  - Thermal tuning of AFM cantilevers with fundamental resonance frequencies up to 2MHz (e.g., for spring constant measurements)
  - Controlling lock-in hardware
  - Controlling cantilever Q
  - Adjusting scan rate, size, and offset (calibrations remain unchanged)
  - Disabling scanning along the slow scan axis
  - Adjusting gain, set point, drive frequency/amplitude/phase
  - Selecting AFM and STM feedback modes
  - Applying bias voltages to tip and/or sample
  - Adjusting Z drive voltage range (11V to 440V) commensurate with desired vertical resolution
  - Selecting gains for most input signals
  - Selecting and setting parameters for multiple auxiliary input channels
  - Correcting for XY linearity

- Optional: Nanomanipulation, NanoScript, TRmode

Software Utilities

- ASCII, jpeg, BMP export

- Printing images, spectroscopy curves, cantilever tune plots, image analysis windows

Other Specifications

Computer	Premium computer system *(call for current specifications)*
Space/footprint requirement	20" x 30" footprint, 10" height clearance
Power requirement	520W peak power consumption
Weight	46 pounds

Note: Performance specifications are typical and subject to change without notice.

Solutions for a nanoscale world.™