For current pricing, please see our website.

# Benchtop NanoTrak™ Controller (Page 1 of 2)


BNT001/IR

## Features

- Tracking Feature Maintains Optimum Throughput Indefinitely
- Two Piezo-Actuator Output Channels Provide Closed-Loop Feedback
- InGaAS Detector, or External Inputs (FC/PC for Optical and BNC for Voltage)
- NTA009 Si Detector Available Separately
- USB Plug-and-Play Connectivity
- Full GUI Control Suite
- ActiveX® Graphical Panel Controls and Programming Interfaces
- Seamless Software Integration with Entire apt™ Family of Products

The benchtop NanoTrak™ auto-alignment controller combines an intelligent active feedback alignment control system and a two-channel piezoelectric controller into a single benchtop unit. As part of the apt™ series, this unit can be integrated with all of our apt™ controllers and drives. This system is a basic building block from which advanced alignment systems can be quickly configured. It can be fully integrated with our extensive selection of Max Series piezo-driven positioning systems.

Although used primarily for aligning optical fibers and integrated optical devices, the NanoTrak™ is ideal for automating just about any labor-intensive alignment tasks such as waveguide characterization, fiber pigtailing of active and passive devices, as well as a multitude of other R&D applications.

**Auto-Alignment**

When combined with a positioning stage outfitted with at least two piezoelectric actuators, the NanoTrak™ auto-alignment system is designed to optimize the coupling through an optical assembly. Refer to the NanoTrak™ tutorial (pages 657 – 659) for a more detailed explanation of the principle of operation of this unit.

In a typical, automated-alignment setup, it is common to align for initial first-light detection using motor control before allowing the NanoTrak™ to take over and achieve optimal alignment via piezo actuation. Many of our piezo-actuated stages can also be motorized to support this initial first alignment step (see our NanoMax™ stages starting on page 546).

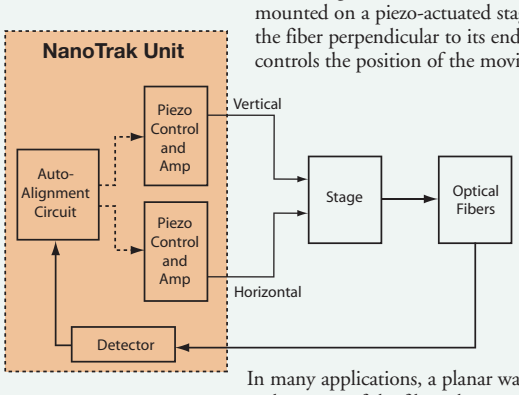
Once first-light detection is accomplished, the NanoTrak™ system begins its alignment process using advanced phase-sensitive detection and digital filtering techniques to generate correction voltages, which are then directly applied to the piezoelectric actuators in the stage.

**Highly Adaptable Operation**

There are an infinite variety of device alignment scenarios, each with potentially different optical and physical characteristics: half widths, coupled peak powers, misalignment sensitivity, and mechanical phase lags. Given the range of applications, it is important that NanoTrak™ be easily configured for a specific task.

To achieve this adaptability, NanoTrak's operation is fully configurable with many of the parameters of the system accessible through easy-to-use graphical software panels.

For example, when operating in tracking mode, the system applies a small sinusoidal dither to the piezoelectric actuators as part of the alignment process. To accommodate the specific optical characteristics of the elements in the system, the dithering amplitude and frequency can be adjusted via the Circle Diameter and Circle Frequency settings, respectively. Additionally, to deal with a potentially wide range of optical signal levels and sensitivities, the overall closed-loop gain can be adjusted via the Gain parameter.




Block Diagram: With one fiber fixed and the other mounted on a piezo-actuated stage capable of moving the fiber perpendicular to its endface, the NanoTrak™ controls the position of the moving fiber.

The NanoTrak's auto-alignment circuit controls the position of the fiber as it optimizes the efficiency of the butt-coupling.

In many applications, a planar waveguide or other device replaces one of the fibers; however, the basic principles remain the same.

# Benchtop NanoTrak™ Controller (Page 2 of 2)

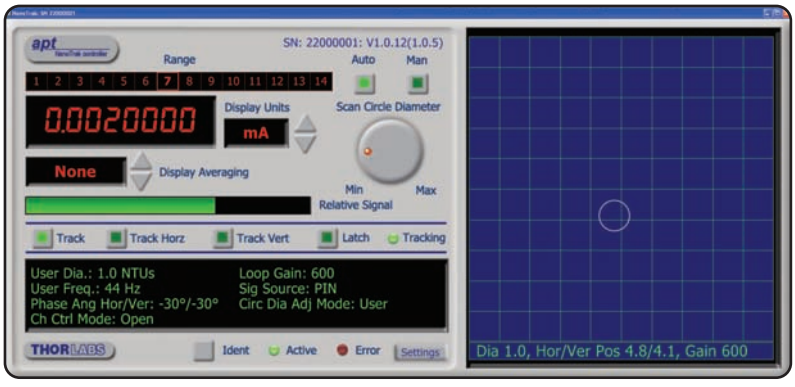
A few other important parameters are also worth covering in this brief summary of the NanoTrak™ system. The electromechanical phase lags associated with any moving device under piezoelectric control can be compensated by using phase correction parameters. A wide range of feedback signal (coupled power) noise levels can be accommodated by altering the input amplifier gain and filtering parameters. There are many more settings and adjustments that can be made to fully optimize operation of the unit.

All such settings and parameters are also accessible through the ActiveX® programmable interfaces for automated alignment sequences. See pages 654 – 656 for a full description of the apt™ system software.

## Specifications

- **Optical Power Measurement**
  - **PIN Photodiode:** 1 nA to 10 mA Photocurrent
  - **InGaAs Detector:** FC/PC Fiber Input
  - **Optical Power Monitor (BNC):** Multiple Ranges
  - **Signal Phase Compensation:** -180° to 180°
- **NanoTraking**
  - **Circle Scanning Frequency:** 1 – 300 Hz
  - **Circle Diameter Adjustment Modes:** Automatic and Manual
- **Piezoelectric Input/Output**
  - **Two Output Connectors (SMC Male):**
    - **Voltage Output:** 0 – 75 VDC/Channel
    - **Voltage Stability:** 100 ppm Over 24 Hours
    - **Noise:** <3 $mV_{RMS}$
    - **Output Current:** 500 mA/Channel
  - **Output Monitors (BNC):** 0 – 10 VDC
  - **Analog Inputs (BNC):** 0 – 10 VDC (Used in Piezo Amp Mode)
  - **Strain Gauge Position Feedback:** (Two 9-Pin, Female D-Type)
- **Other Input/Output**
  - **Optical Power Monitor (BNC):** 0 – 10 VDC
  - **User Control (37-Pin, D-Type)** – Isolated Digital I/O
  - **Trigger In/Out (BNC):** 0 – 10 VDC
  - **USB Port**
- **Power Requirements**
  - **Voltage:** 85 – 264 VAC
  - **Frequency:** 47 – 63 Hz
  - **Power:** 200 W
  - **Fuse:** 3 A
- **General**
  - **Dimensions (W x D x H):** Standard 9.67" x 13.0" x 5.1" (245 mm x 300 mm x 130 mm)

The apt™ NanoTrak™ controller is supplied with a full suite of software support tools. Once the software and associated USB drivers are installed, the aptUser utility provides a full-featured, intuitive graphical instrument panel, allowing full control and visualization of the NanoTrak™ operation. Additionally, ActiveX® components are included to speed user developed routines in the users programming environment of choice (e.g., LabVIEW™, Visual Basic, or C++).




The InGaAs Detector (800-1800 nm) that comes with the BNT001/IR is packaged just like the NTA009 Si detector shown to the right. For applications in the 320 – 1000 nm wavelength range simply unplug the InGaAs detector and plug in the NTA009.

| SENSOR | WAVELENGTH RANGE | DESCRIPTION | RISE TIME | INPUT | NEP | DARK CURRENT |
|---|---|---|---|---|---|---|
| InGaAs | 800 – 1800 nm | Comes Standard with the BNT001/IR Nanotrak Contoller | 100 ps @ 12 V | FC/PC | 1.5 x $10^{-15}$ W/Hz | 0.5 nA @ -5 V |
| Si | 320 – 1000 nm | Item # NTA009 | 100 ps @ 12 V | FC/PC | 3.1 x $10^{-15}$ W/Hz | 0.5 nA @ 10 V |


**NTA009**
Si Detector for a BNT001 Controller

| ITEM # | $ | £ | € | RMB | DESCRIPTION |
|---|---|---|---|---|---|
| BNT001/IR | $ 6,760.00 | £ 4,867.20 | € 5.881,20 | ¥ 53,877.20 | apt™ NanoTrak™ Controller with InGaAs Detector |
| NTA009 | $ 295.00 | £ 212.40 | € 256,65 | ¥ 2,351.15 | Silicon Detector NanoTrak™ |