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Modular Rack System NanoTrak™ Auto-Alignment Module (Page 1 of 2)



MNA601/IR

See pages 624 - 625 for
information on the rack system

The modular NanoTrak™ auto-alignment controller combines an intelligent active-feedback alignment control system and a two-channel piezoelectric controller into a single plug-in unit. As part of the apt™ series, this auto-alignment unit represents the latest developments in automated optical alignment technologies. This system is a basic building block from which advanced alignment systems can be quickly

configured. It can be fully integrated into a rack mainframe system along with other plug-in modules (e.g., piezoelectric controllers (pages 644 - 645), stepper motor controllers (page 634), and this NanoTrak™ auto-alignment module). Although used primarily for aligning optical fibers and integrated optical devices, the NanoTrak™ is ideal for automating just about any labor-intensive alignment tasks.

The modular NanoTrak™ plug-in is identical in functionality and associated user software to the benchtop NanoTrak™ system presented on page 648. The principles of operation are covered in detail in the NanoTrak™ tutorial (see pages 647 - 649).

Auto-Alignment

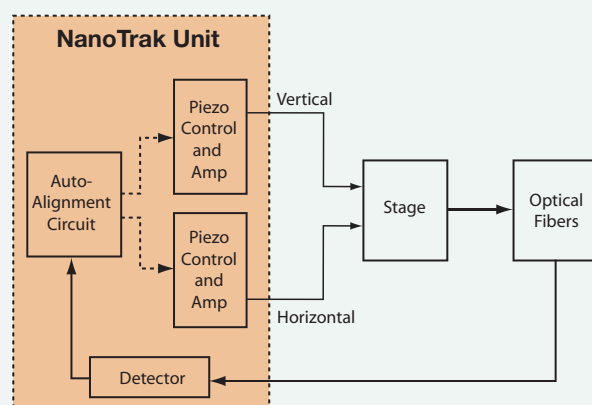
When combined with a positioning stage that has at least two piezoelectric actuators, the NanoTrak™ auto-alignment system is designed to optimize the coupling through an optical assembly. The NanoTrak™ module is compatible with a wide range of Thorlabs' piezo-actuated stages and assemblies (see our NanoMax™ stages on pages 547 and 568, respectively).

In a typical automated alignment setup, it is common to align for initial first-light detection using motor control and then allow the NanoTrak™ to take over and achieve optimal alignment via piezo actuation. Many of Thorlabs' piezo-actuated stages can also be motorized to support this initial alignment step; two-channel motor control modules (page 634) are available for use in the same rack mainframe as the NanoTrak™ module.

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. They are then directly applied to the piezoelectric actuators in order to achieve optimal alignment performance.

Features

- Tracking Feature Maintains Optimum Throughput Indefinitely
- Advanced Dark Search Algorithms for First-Light Detection with Motorized Fiber Launch
- Two Piezo Actuator Output Channels Provide Closed-Loop Feedback
- InGaAs Detector or External Inputs (FC/PC for Optical and BNC Voltage for External Input)
- 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 (Electronics and Mechanics)



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 fiber's position as it optimizes the coupling efficiency through the two fibers. In many applications, a planar waveguide or other device replaces one of the fibers; however, the basic principles remain the same.

Modular Rack System NanoTrak™ Auto-Alignment Module (Page 2 of 2)

Highly Adaptable Operation

There are an infinite variety of alignment scenarios, each with potentially different optical and physical characteristics such as half widths, coupled peak powers, misalignment power response, and mechanical phase lags.

To deal with this range of applications, the 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 (see the NanoTrak™ tutorial on pages 651 - 659). 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 a gain parameter.

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.

Extensive Software Support Tools

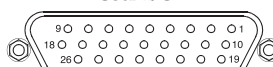
The apt™ software library contains a number of optional features, with many different graphical user interfaces, operational parameters, and programming functions. To assist in using the software, comprehensive, fully context-sensitive online help is provided.

The NTA009 is a Si Detector, designed for use in the visible spectral region, that can be used as a replacement of the InGaAs detector that comes with the BNT011/IR.

Specifications

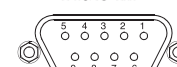
- **Optical Power Measurement:**
 - **PIN Photodiode:** 1 nA to 10 mA Photocurrent
 - **InGaAs Detector:** FC/PC Fiber Input
 - **Ext. Power Meter Input (BNC):** Multiple Ranges
 - **Signal Phase Compensation:** -180° to 180°
- **NanoTraking:**
 - **Circle Scanning Frequency:** 1 - 300 Hz
 - **Circle Diameter Adjustment Modes:** Automatic and Manual
- **Piezoelectric Input/Output:**
 - **Two Output Connectors (SMC male):**
 - **Voltage Output:** 0 - 75 VDC per Channel
 - **Voltage Stability:** 100 ppm over 24 Hours
 - **Noise:** <3 mV RMS
 - **Output Current:** 500 mA/Channel
 - **Two Output Monitors (BNC):** 0 - 10 VDC
 - **Position Feedback (9-Pin, D-Type Female):**
 - **Strain Gauge Feedback**
 - **Voltage Feedback:** 0 - 10 VDC
- **User I/O Port (26-Pin D-Type Female):**
 - **Optical Power Monitors:** 0 - 10 VDC
 - **Two Differential Analog Inputs:** 0 - 10 VDC
 - **Trigger Input/Output:** TTL
 - **Digital I/O Lines:** Opto-Isolated
- **General:**
 - **One Slot apt™ Rack**
 - **Dimensions (W x D x H):** 7.5" x 10.6" x 2.0" (190 mm x 270 mm x 50 mm)
 - **Weight:** 3.3 lbs (1.5 kg)

User I/O



Pin	Description	Return	Pin	Description	Return	Pin	Description	Return
1	DIG I/P 1	19	10	DIG O/P 1	19	19	Isolated Ground	
2	DIG I/P 2	19	11	DIG O/P 2	19	20	Ext Trigger I/P	22
3	DIG I/P 3	19	12	DIG O/P 3	19	21	Ext Trigger O/P	22
4	DIG I/P 4	19	13	DIG O/P 4	19	22	Ground	
5	Channel 1 RS485 (+)		14	Channel 2 RS485 (+)		23	5V User O/P (Isolated)	
6	Channel 1 RS485 NOT (-)		15	Channel 2 RS485 NOT (-)		24	Not Used	
7	Not Used	25	16	Not Used		25	Analog Ground	
8	Channel 2 10V O/P	25	17	External Analog I/P CH2 0 - 10V	25	26	Signal Power Out	25
9	Channel 1 10V O/P		18	External Analog I/P CH1 0 - 10V	25			

Piezo In



Pin	Description	Return
1	Wheatstone bridge excitation	4 or 6
2	+15 V	4 or 6
3	-15 V	4 or 6
4	Equipment ground	
5	Feedback signal in	4 or 6
6	Equipment ground	
7	Actuator ID signal	4 or 6
8	RS485 NOT (0-5 V)	9
9	RS485 (0-5 V)	8

The InGaAs Detector (800-1800 nm) that comes with the MNA601/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 MNA601/IR Nanotrak Contoller	100 ps @ 12 V	FC/PC	1.5×10^{-15} W/Hz	0.5 nA @ -5 V
Si	320 - 1000 nm	Item # NTA009	100 ps @ 12 V	FC/PC	3.1×10^{-15} W/Hz	0.5 nA @ 10 V



NTA009

Si Detector for a BNT001 Controller

ITEM #	\$	£	€	RMB	DESCRIPTION
MNA601/IR	\$ 5,620.00	£ 4,046.40	€ 4,889.40	¥ 44,791.40	apt™ NanoTrak™ Controller Module with InGaAs Detector
NTA009	\$ 295.00	£ 212.40	€ 256.65	¥ 2,351.15	Silicon Detector NanoTrak™