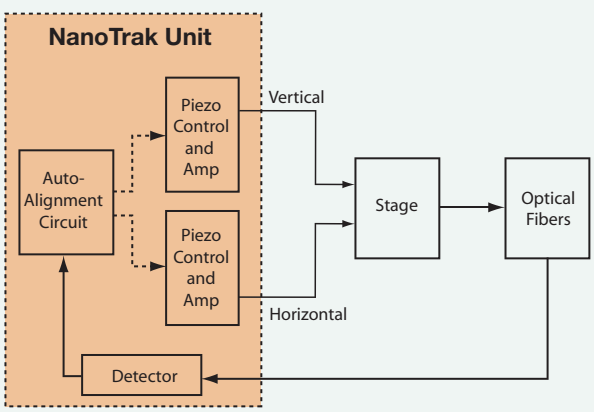
Modular Rack System NanoTrak™ Auto-Alignment Module (Page 1 of 2)

MNA601

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 (page 570), stepper motor controllers (page 560), 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.

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 or Si Detector or External Inputs (FC/PC for Optical and BNC Voltage for External Input)
- 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.

The modular NanoTrak™ plug-in is identical in functionality and associated user software to the benchtop NanoTrak™ system presented on page 568. The principles of operation are covered in detail in the NanoTrak™ tutorial (see page 583).

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 471 and 482, 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 (see our NanoMax™ stages on pages 471-472); two-channel motor control modules (page 570) 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.

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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 page 583). 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 580-582 for a full description of the apt™ system software.

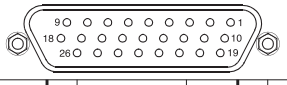
Extensive Software Support Tools

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.

Specifications

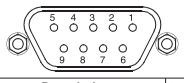
- **Optical Power Measurement:**
  - **PIN Photodiode:** 1 nA to 10 mA Photocurrent
  - **Si or InGaAs Detector:** FC/PC Fiber Input
  - **Ext. Power Meter Input (BNC):** Multiple Ranges
  - **Signal Phase Compensation:** -180° to 180°
- **NanoTraking:**
  - **Circle Scanning Frequency:** 1 - 300 Hz
  - **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 IP 1	19	10	DIG OP 1	19	19	Isolated Dig Ground	
2	DIG IP 2	19	11	DIG OP 2	19			
3	DIG IP 3	19	12	DIG OP 3	19	20	Ext Trigger I/P	22
4	DIG IP 4	19	13	DIG OP 4	19	21	Ext Trigger O/P	22
5	Channel 1 RS485		14	Channel 2 RS485		22	Ground	
6	Channel 1 RS485 NOT		15	Channel 2 RS485 NOT		23	5 V User O/P (Isolated)	
7	Not Used		16	Not Used		24	Not Used	
8	Ext input (+) Channel 2	25	17	Analog I/P	25	25	Ground	
						26	TIA Sig O/P	25
9	Ext input (+) Channel 1	25	18	Analog I/P	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

ITEM#	$	£	€	RMB	DESCRIPTION
MNA601/IR	$ 5,620.00	£ 3,896.00	€ 4,990,00	¥ 47,456.00	apt™ NanoTrak™ Controller Module with InGaAs Detector
MNA601/VIS	$ 5,620.00	£ 3,896.00	€ 4,990,00	¥ 47,456.00	apt™ NanoTrak™ Controller Module with Silicon Detector
NTA007	$ 295.00	£ 204.50	€ 262,00	¥ 2,491.00	InGaAs Detector for NanoTrak™
NTA009	$ 295.00	£ 204.50	€ 262,00	¥ 2,491.00	Silicon Detector NanoTrak™

High-Density, Rack-Based Motion Controllers

Modular versions of the apt™ stepper motor and piezo controllers are also available for use with the apt™ rack system. The module versions are functionally identical to the benchtop units but provide a more compact implementation for multi-channel applications such as fully automated control of our range of three-to-six axis stages.

See Pages 560 and 570