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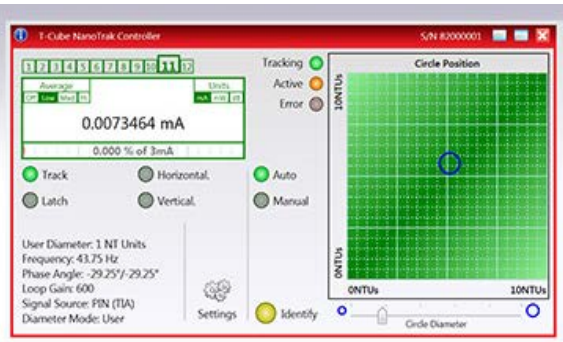
THORLABS

TNA001/IR - MAR 26, 2019

Item # TNA001/IR was discontinued on March 26, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

- **Maintain Long-Term Fiber Alignment**
- **Two Outputs for Controlling Piezo Drivers**
- **Visible Detector (300 - 1000 nm) Available Separately**



Includes Kinesis Software Interface

TNA001/IR
Power Supply
Sold Separately

Included Connectors

IR (InGaAs) FC/PC
Fiber Input

SMB Connector for
External Detectors

OVERVIEW

Features

- Compact Footprint: 60 mm x 60 mm x 47 mm
- Tracking Feature Maintains Optimum Throughput
- Two Piezo Actuator Output Channels Provide Closed-Loop Feedback
- Control Using Top Panel or PC Software
- IR (InGaAs) Detector and SMB Current Inputs Supplied
- USB Plug and Play Connectivity
- Full Kinesis® or APT™ Software Control Suite (See *Motion Control Software* Tab for Details)
- Visible (Si) Detector and Range of PSU Options Available Separately
- Multi-Axis Expansion Using USB Controller Hibs (Sold Separately)

Click to Enlarge
Top View of the TNA001/IR T-Cube Controller

Click to Enlarge
Back View of the TNA001/IR T-Cube Controller (See the *Pin Diagrams* Tab for More Information)

The T-Cube™ Fiber Alignment Controller is designed to maximize the power throughput of a fiber-to-fiber or fiber-to-free-space system. Two output channels provide active feedback for piezo controllers based on the measured power gradient from an input power sensor. In combination with a pair of K-Cube™ Piezo Drivers and a multi-axis, piezo-driven stage, such as our 3-Axis NanoMax and 6-Axis Nanomax stages, the Fiber Alignment Controller creates a complete, compact auto-alignment system. The small footprint of this unit (60 mm x 60 mm x 47 mm) and the 1/4" (M6) clearance slot allow the T-Cube to be mounted directly to an optical table in close proximity to the system it controls. These units are shipped with a 900 - 1700 nm InGaAs detector (Item # NTA007) and a PIN diode SMB input for use with external detector heads. The *Application* tab provides details on how the gradient search operates.

Top panel controls allow for convenient plug-and-play operation, and the easy-to-read target display allows the user to monitor the alignment. The T-Cube can also be connected to a PC via USB and controlled through our Kinesis software package or our legacy APT software package. Advanced custom motion control applications and sequences are also possible using .NET controls compatible with C#, Visual Basic, LabVIEW™, or any .NET compatible languages. For more details on both software packages, please see the *Motion Control Software, Kinesis Tutorials*, and *APT Tutorials* tabs.

Applications

- Fiber-to-Fiber Active Alignment
- Fiber-to-Free-Space Active Alignment
- Fiber Characterization

Other NanoTrak™ Fiber Alignment Controllers
T-Cube™ 2-Channel Controller[a]
Benchtop 2-Channel Controller
Modular 2-Channel Rack System Module
Compact Motion Control Modules
K-Cube™ Controllers[b]
Brushed DC Servo Motor Controller
Brushless DC Servo Motor Controller
Stepper Motor Controller
Single-Channel Piezo Controller
Solenoid Controller
Single-Channel Strain Gauge Reader
PSD Auto Aligner

- Piezo Drivers (KPZ101) sold separately

- K-Cube and T-Cube modules are fully compatible with one another.

A 320 - 1000 nm Si detector (Item # NTA009) is available separately. These units are shipped without a power supply. However, single-channel or multi-channel power supply options are available below.

We also offer larger benchtop and rack-mounted Automated Fiber Alignment Controllers with integrated piezo controllers for applications that do not require compact or modular solutions. See the table to the upper right for all of our fiber alignment controllers.

Power Supply Options
The preferred power supply (multi-channel or hub-based) depends on the end user's application and whether you already own compatible power supplies. To that end and in keeping with Thorlabs' green initiative, we do not ship these units bundled with a power supply.

Multiple units can be connected to a single PC by using the KCH301 or KCH601 USB Controller Hubs, available below, for multi-axis motion control applications. The KCH301 allows up to three T- or K-Cube controllers to be used while the KCH601 allows up to six controllers to be used.

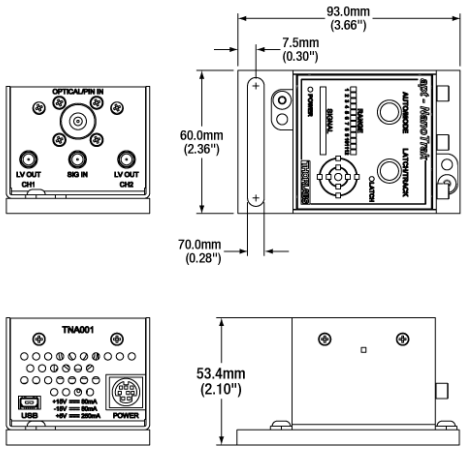
All power supply options compatible with the TNA001/IR Fiber Alignment Controller can be found below.

SPECS

Parameter	Value
Optical Power Measurement	
PIN Photodiode	FC/PC Fiber Input
Si or InGaAs Detector	30 nA to 10 mA Photocurrent
Optical Power Monitor	0 to 10 V (SMA)
Signal Phase Compensation	-180° to 180°
Gradient Search	
Output Voltage	0 to 10 V
Circle Scanning Frequency	7.5 to 87.5 Hz
Circle Position Range	<1% to >99% Max Piezo Extension
Circle Diameter Adjustment Modes	Automatic and Manual
Other Input/Output	
Feedback Signal In	0 to 10 V (SMA)
Dual Piezo Position Demand Outputs	0 to 10 V (SMA)
USB Port	USB Comms
Input Power Requirements	
Voltage	+15 V (200 mA), -15 V (100 mA), +5 V (400 mA)
General	
Housing Dimensions[a]	60 mm x 60 mm x 47 mm (2.4" x 2.4" x 1.8")
Weight	160 g (5.5 oz)

- Dimensions Do Not Include Mounting Plate

Suggested Components for Complete Fiber Alignment Setup	
Piezo Controllers	KPZ101
Compatible Translation Stages	3-Axis and 6-Axis Nanopositioners, NF15AP25, NFL5DP20, NFL5DP20S



Click to Enlarge
Mechanical Drawing of the TNA001/IR

APPLICATION

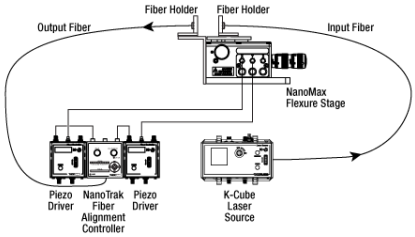
T-Cube™ NanoTrak Fiber Alignment Application

The T-Cube™ NanoTrak Fiber Alignment Controller can be used in conjunction with two of our KPZ101 Piezo Drivers and a MAX311D Flexure Stage to create a continuous active fiber alignment system. Light from our KLS1550 laser source is transmitted through the input fiber to the fiber end attached to the moving world of the stage. An output fiber is fixed to the stationary portion of the stage, and the light transmitted through the second fiber is fed into the power sensor on the NanoTrak controller.

The NanoTrak controller looks for the gradient in the power signal to determine the direction of peak power. This is achieved by scanning the stage in a circular path. As the input fiber is driven in a circle, the optical power coupling between the two fibers will fluctuate. The NanoTrak samples the power at multiple points around the test circle and then directs the piezos to move the stage in the direction of the highest signal. This process is continued until the highest power lies in the center of the circle and the power at every point on the circle is equal.

Continuous active alignment can be used to maintain alignment in a setup, or the gradient search can be halted for next step assembly or R&D operations. The

setup below can be used for fiber characterization and testing. If the output fiber is replaced with one of our Fiber Optic Couplers, the same setup may be used to maintain high power throughput to an entire fiber-based setup.



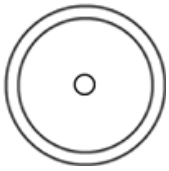
Click to Enlarge
Fiber-to-Fiber Auto-Alignment Setup Using a TNA001/IR NanoTrak to Control Two KPZ101 Piezo Drivers Connected to a MAX311D NanoMax Stage

Suggested Components	
Description	**Item #**
Fiber Alignment Controller	TNA001/IR
Piezoelectric Controllers	Two KPZ101 K-Cube Piezo Controllers[a]
NanoMax Flexure Stage (Choose One)	MAX312D (MAX312D/M) 3-Axis Stage, Open-Loop Piezos MAX311D (MAX311D/M) 3-Axis Stage, Closed-Loop Piezos MAX381 (MAX381/M) 3-Axis Stage, Closed-Loop Piezos[b]
Extension Platform	AMA009 (AMA009/M) Fixed Mounting Bracket
Fiber Holder (Two Required)	HFB001 SMA Fiber Holder for Multi-Axis Stages HFB004 FC/PC Fiber Holder for Multi-Axis Stages HFB005 FC/APC Fiber Holder for Multi-Axis Stages
Laser Source	KLS1550 K-Cube Laser Source
Fiber Patch Cables	Two Fiber Patch Cables Are Required

- One controller is required per independently controlled axis.
- These stages have stepper motors which require separate drivers.

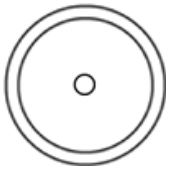
PIN DIAGRAMS

LV OUT CH1/2
SMA Female



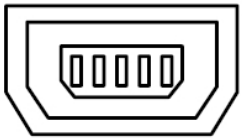
0 to +10 V. These outputs are connected to the EXT IN connectors on the associated Piezo Drivers. When the unit is used with a USB Controller Hub, these outputs can be connected to an oscilloscope to enable the drive signal of the piezo actuator to be monitored.

Sig In
SMA Female



Used to receive a signal of optical power from an external power meter; 0 to 10 V range, 1 MΩ input impedance.

Computer Connection
USB Mini-B*



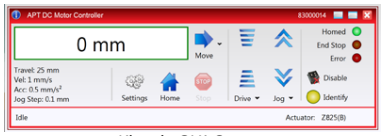
*USB type A to type Mini-B cable included.

MOTION CONTROL SOFTWARE

Thorlabs offers two platforms to drive our wide range of motion controllers: our Kinesis® software package or the legacy APT™ (Advanced Positioning Technology) software package. Either package can be used to control devices in the Kinesis family, which covers a wide range of motion controllers ranging from small, low-powered, single-channel drivers (such as the K-Cubes™ and T-Cubes™) to high-power, multi-channel, modular 19" rack nanopositioning systems (the APT Rack System).

The Kinesis Software features .NET controls which can be used by 3rd party developers working in the latest C#, Visual Basic, LabVIEW™, or any .NET compatible languages to create custom applications. Low-level DLL libraries are included for applications not expected to use the .NET framework. A Central Sequence Manager supports integration and synchronization of all Thorlabs motion control hardware.

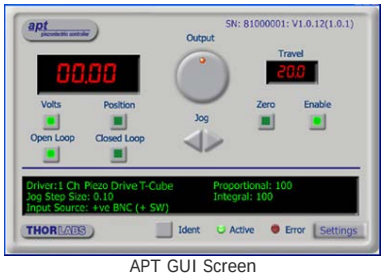
Our legacy APT System Software platform offers ActiveX-based controls which can be used by 3rd party developers working on C#, Visual Basic, LabVIEW™, or any Active-X compatible languages to create custom applications and includes a simulator mode to assist in developing custom applications without requiring hardware.



Kinesis GUI Screen

By providing these common software platforms, Thorlabs has ensured that users can easily mix and match any of the Kinesis and APT controllers in a single application, while only having to learn a single set of software tools. In this way, it is perfectly feasible to combine any of the controllers from single-axis to multi-axis systems and control all from a single, PC-based unified software interface.

The software packages allow two methods of usage: graphical user interface (GUI) utilities for direct interaction with and control of the controllers 'out of the box', and a set of programming interfaces that allow custom-integrated positioning and alignment solutions to be easily programmed in the development language of choice.



APT GUI Screen

A range of video tutorials is available to help explain our APT system software. These tutorials provide an overview of the software and the APT Config utility. Additionally, a tutorial video is available to explain how to select simulator mode within the software, which allows the user to experiment with the software without a controller connected. Please select the *APT Tutorials* tab above to view these videos, which are also available on the software CD included with the controllers.

Software

Kinesis Version 1.14.15

The Kinesis Software Package, which includes a GUI for control of Thorlabs' Kinesis and APT™ system controllers.

Also Available:

- Communications Protocol

KINESIS TUTORIALS

Software

APT Version 3.21.3

The APT Software Package, which includes a GUI for control of Thorlabs' APT™ and Kinesis system controllers.

Also Available:

- Communications Protocol

Thorlabs' Kinesis® software features new .NET controls which can be used by third-party developers working in the latest C#, Visual Basic, LabVIEW™, or any .NET compatible languages to create custom applications.

C#

This programming language is designed to allow multiple programming paradigms, or languages, to be used, thus allowing for complex problems to be solved in an easy or efficient manner. It encompasses typing, imperative, declarative, functional, generic, object-oriented, and component-oriented programming. By providing functionality with this common software platform, Thorlabs has ensured that users can easily mix and match any of the Kinesis controllers in a single application, while only having to learn a single set of software tools. In this way, it is perfectly feasible to combine any of the controllers from the low-powered, single-axis to the high-powered, multi-axis systems and control all from a single, PC-based unified software interface.

The Kinesis System Software allows two methods of usage: graphical user interface (GUI) utilities for direct interaction and control of the controllers 'out of the box', and a set of programming interfaces that allow custom-integrated positioning and alignment solutions to be easily programmed in the development language of choice.

For a collection of example projects that can be compiled and run to demonstrate the different ways in which developers can build on the Kinesis motion control libraries, click on the links below. Please note that a separate integrated development environment (IDE) (e.g., Microsoft Visual Studio) will be required to execute the Quick Start examples. The C# example projects can be executed using the included .NET controls in the Kinesis software package (see the Kinesis Software tab for details).

C#

Click Here for the Kinesis with C# Quick Start Guide
Click Here for C# Example Projects
Click Here for Quick Start Device Control Examples

C#

LabVIEW

LabVIEW can be used to communicate with any Kinesis- or APT-based controller via .NET controls. In LabVIEW, you build a user interface, known as a front panel, with a set of tools and objects and then add code using graphical representations of functions to control the front panel objects. The LabVIEW tutorial, provided below, provides some information on using the .NET controls to create control GUIs for Kinesis- and APT-driven devices within LabVIEW. It includes an overview with basic information about using controllers in LabVIEW and explains the setup procedure that needs to be completed before using a LabVIEW GUI to operate a device.

APT TUTORIALS

These videos illustrate some of the basics of using the APT System Software from both a non-programming and a programming point of view. There are videos that illustrate usage of the supplied APT utilities that allow immediate control of the APT controllers out of the box. There are also a number of videos that explain the basics of programming custom software applications using Visual Basic, LabView and Visual C++. Watch the videos now to see what we mean.

To further assist programmers, a guide to programming the APT software in LabView is also available.

T-Cube™ NanoTrak Fiber Alignment Controller

The T-Cube™ NanoTrak Fiber Alignment Controller optimizes the coupling power when aligning fiber and free space devices. The output signal is fed to a pair of piezo driver K-cubes to position the input and output devices for maximum throughput. It is shipped with a 900 - 1700 nm InGaAs detector and a PIN current adapter for use with external detector heads. A 320 - 1000 nm Si detector (Item # NTA009) is available separately (see below).

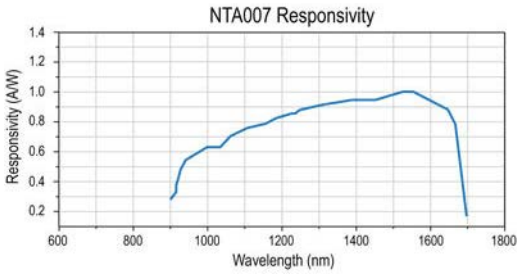
Power supply options for the TNA001/IR are sold separately below.

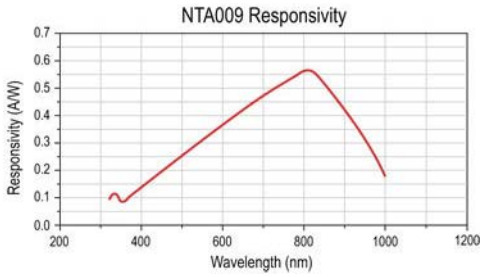
Part Number	Description	Price	Availability
TNA001/IR	NanoTrak Fiber Alignment Controller (Power Supply Not Included)	$1,488.35	Lead Time

NanoTrak Detector Heads

These infrared (NTA007) and visible (NTA009) wavelength detector heads are compatible with the benchtop (BNT001/IR), T-Cube™ (TNA001/IR), and rack-mounted (MNA601/IR) NanoTrak controllers.

Item #	Wavelength Range	Active Area	Fiber Input	Dark Current	Junction Capacitance
NTA009	320 - 1000 nm	Ø 0.8 mm	FC/PC	0.01 nA (Typ.) @ 10 V	3.00 pF(Typ.) @ 10 V
NTA007	900 - 1700 nm	Ø 0.12 mm	FC/PC	0.05 nA (Typ.) @ 5 V	2.0 pF (Typ.) @ 5 V





Part Number	Description	Price	Availability
NTA009	APT NanoTrak Visible Light (Si) Detector Head, 320 - 1000 nm	$326.74	Today
NTA007	APT NanoTrak IR (InGaAs) Detector Head, 900 - 1700 nm	$314.13	Today

Compatible Power Supplies

- ±15 V/5 V Power Supply
  - TPS002: For up to Two K-Cubes™ or T-Cubes™
- USB Controller Hubs Provide Power and Communications
  - KCH301: For up to Three K-Cubes or T-Cubes
  - KCH601: For up to Six K-Cubes or T-Cubes
  - KAP101: Adapter Plate for Connecting 60 mm Wide T-Cubes to KCH Series Hubs
  - KAP102: Adapter Plate for Connecting 120 mm Wide T-Cubes to KCH Series Hubs

Click to Enlarge

The TPS002 supplies power for up to two K-Cubes or T-Cubes. The cubes still need to be connected to a computer individually via a USB cable.

The KCH301 and KCH601 USB Controller Hubs each consist of two parts: the hub, which can support up to three (KCH301) or six (KCH601) K-Cubes or T-Cubes, and a power supply that plugs into a standard wall outlet. The hub draws a maximum current of 10 A; please verify that the cubes being used do not require a total current of more than 10 A. In addition, the hub provides USB connectivity to any docked K-Cube or T-Cube through a single USB connection.

A KAP101 or KAP102 Adapter Plate (sold separately) is required for each T-Cube to operate on the KCH301 or KCH601 controller hub. The KAP101 is designed to adapt 60 mm wide T-Cubes to the hubs, while the KAP102 is designed to adapt 120 mm wide T-Cubes to the hubs.

For more information on the USB Controller Hubs, see the full web presentation.

Please note that our KPS101 Power Supply is not compatible with the controller on this page since it does not offer reversible polarity.

Part Number	Description	Price	Availability
TPS002	±15 V/5 V Power Supply Unit for up to Two KPZ101, TNA001/IR, KPA101, KSG101, or TLD001 Modules	$113.46	Today
KCH301	USB Controller Hub and Power Supply for Three K-Cubes or T-Cubes	$509.54	Today
KCH601	USB Controller Hub and Power Supply for Six K-Cubes or T-Cubes	$616.70	Today
KAP101	Adapter Plate for KCH Series Hubs and 60 mm Wide T-Cubes	$59.10	Today
KAP102	Adapter Plate for KCH Series Hubs and 120 mm Wide T-Cubes	$64.35	Today


apt - NanoTrak
AUTO / MODE
LATCH / TRACK
LATCH
RANGE
1 2 3 4 5 6 7 8 9 10 11 12
SIGNAL
POWER
THORLABS
TNA001
S/N 82850138
2014
+15V 30mA
-15V 30mA
+5V 200mA
POWER
USB


Not to Scale