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TBD001 - March 15, 2016

Item # TBD001 was discontinued on March 15, 2016. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

T-CUBE BRUSHLESS DC SERVO CONTROLLER

- Drives Brushless DC Servo Motors Up to 2.5 W
- Seamless Operation with Thorlabs' DDSM Series Stages
- Control via Local Panel or USB Computer Connecton

TBD001
Power Supply
Sold Separately

Application Idea

DDSM100

TBD001
Shown with Baseplate
(Supplied) Fitted

OVERVIEW

Hide Overview

Features

- Compact Footprint: 60 mm x 60 mm x 47 mm (2.4" x 2.4" x 1.8")
- Differential Encoder Feedback (QEP Inputs) for Closed-Loop Positioning
- Auto-Configure Function when used with Thorlabs Brushless DC Stages/Actuators
- Power Supply Options Available Separately
- USB Plug-and-Play Enables Multi-Axis Expansion
- Easy-to-Use Manual Controls with Velocity Slider and Jog Buttons
- Full Software Control Suite Supplied
- Extensive ActiveX® Programming Interfaces
- Fully Software Integrated with Other APT™ Family Controllers

The TBD001 Brushless DC Motor T-Cube is ideal for fast (hundreds of mm/s), high-resolution (<100 nm) motion control applications. It offers accurate positioning in a wide range of applications, and when used along with our DDSM100 fast translation stage, delivers speeds of up to 500 mm/s. Designed using latest digital and analog techniques and with high-bandwidth high-power servo control circuitry, this new controller is capable of driving a range of rotary and linear brushless 3-phase DC motors of up to 2 A peak coil current.

Compact Motion Control Modules
K-Cube Controllers[a]
Brushed DC Servo Motor Controller
Stepper Motor Controller
Single-Channel Piezo Controller
T-Cube Controllers[a]
Brushless DC Servo Motor Controller
Single-Channel Strain Gauge Reader
Dual-Channel NanoTrak Auto-Aligner
Quadrant Detector
Solenoid Controller

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

Click to Enlarge
Back View of the TBD001 T-Cube (See the *Pin Diagrams* Tab for More Information)

Integrated into the APT family of products, the TBD001 offers Thorlabs' standard control and programming interface, allowing easy integration into the customer's own automated motion control applications. These units are cable of being reprogrammed in-field, allowing the option of upgrading the units with future firmware releases as soon as new programming interfaces (such as microscopy standard command sets) are added.

External triggering is accomplished using the "TRIG IN" and "TRIG OUT" SMA connectors on the front panel of the device. These connectors are controlled via the APT software and provide a 5 V logic level input/output that can be configured to support triggering from and to external devices.

The unit has a very small footprint, measuring just 60 mm x 60 mm x 47 mm (2.4" x 2.4" x 1.8"), and can be mounted directly to the optical table, close to the motorized system for added convenience when manually adjusting motor positions using the top panel controls. Table top operation also allows minimal drive cable lengths for easier cable management.

USB connectivity provides easy 'Plug-and-Play' PC-controlled operation. The TBD001 also includes the very user friendly APT™ software, which allows the user to quickly set up complex move sequences. For example, all relevant operating parameters are set automatically by the software when used with Thorlabs' stage and actuator products. Advanced custom motion control applications and sequences are also possible using the extensive ActiveX® programming environment described in more detail on the *Motion Control Software* and *APT Tutorials* tabs.

Power Supply Options

The preferred power supply depends on the 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. This avoids the cost and inconvenience of receiving an unwanted single-channel supply if a multi-cube system would be more appropriate. The power supply options compatible with the TBD001 Motor Controller are listed below.

SPECS

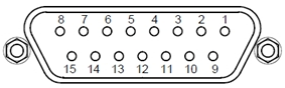
Specifications	
Motor Drive Connector (15 Way D-Type)	
Motor Phase Outputs	
Stage ID Input	
Forward, Reverse Limit Switch Inputs (+ Common Return)	
5 V Encoder Supply	
Front Panel Controls	
Velocity Potentiometer Slider	4-Speed Bidirectional Velocity Control
High/Low Button	Gain Response Adjustment of Velocity Pot
Enable Button	Channel Engage/Disengage
Motor Drive Current (Peak)	2 A (Continuous)
Pulse Width Modulation Frequency	40 kHz
Control Algorithm	16-Bit Digital PID Servo Loop with Velocity and Acceleration Feedforward
Position Feedback	Incremental Encoder
Encoder Feedback Bandwidth	2.5 MHz/ 10 MCounts/sec
Position Counter	32 Bit
Operating Modes	Position, Velocity
Velocity Profile	Trapezoidal/S-Curve
Input Power Requirements	
Voltage	14.5 - 15.5 V Regulated DC
Current	2 A (Peak)
General	
Housing Dimensions (W x D x H)	60 mm x 60 mm x 47 mm (2.4" x 2.4" x 1.8")
Weight	160 g (5.5 oz)

Hide Pin Diagrams

PIN DIAGRAMS

Motor Control Connector

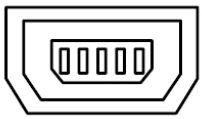
D-type Female



Pin	Description	Pin	Description
1	QA-	9	Ground
2	QA+	10	Motor Phase C
3	QB+	11	Motor Phase A
4	QB-	12	Motor Phase B
5	IX-	13	+5 V
6	IX+	14	Ground
7	LIM-	15	Stage ID
8	LIM+		

Computer Connection

USB Mini-B*

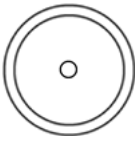


*USB type Mini-B to type A Included

External triggering is facilitated by the 'TRIG IN' and 'TRIG OUT' SMA connectors on the front panel of the unit as shown left and right. These connectors provide a 5 V logic level input and output that can be configured to support triggering from and to external devices.

TRIG IN

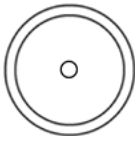
SMA Female



The TRIG IN input contains a pull up resistor to an internal +5 V supply, allowing it to be operated by passive devices (e.g., a switch or relay contact) as well as standard logic outputs. The protection circuit also allows the external signal to be in the ±10 V voltage range.

TRIG OUT

SMA Female



The TRIG OUT is the output of a standard 5 V CMOS logic gate in series with a 470 W resistor. The resistor provides protection against accidentally short circuiting to ground by limiting the current to ~10 mA maximum.

Hide Motion Control Software

MOTION CONTROL SOFTWARE

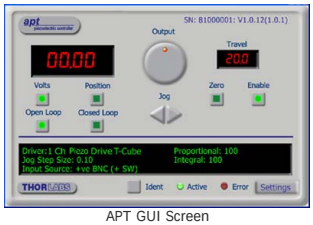
Thorlabs offers two platforms to drive our wide range of motion controllers: our legacy APT™ (Advanced Positioning Technology) software package or the new Kinesis software package. Either package can be used to control devices in the APT or Kinesis family, which covers a wide range of motion controllers 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).

Our legacy APT System Software platform is available by clicking on the link below. It features 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.

The Kinesis Software features new .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.

By providing these common software platforms, Thorlabs has ensured that users can easily mix and match any of the APT and 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.



APT GUI Screen

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.

A range of video tutorials are 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
APT Version 3.12.0

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

Also Available:

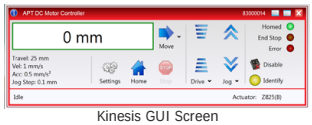
- Communications Protocol Software

Software
Kinesis Version 1.4.0

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

Also Available:

- Communications Protocol Software



Kinesis GUI Screen

Hide APT Tutorials

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.

Click here to view the video tutorial

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

Click here to view the LabView guide

Hide T-Cube Brushless DC Servo Controller

T-Cube Brushless DC Servo Controller

Power supplies sold separately; please see options below.

Part Number	Description	Price	Availability
TBD001	T-Cube Brushless DC Servo Driver (Power Supply Not Included)	$716.00	Lead Time

Hide Compatible Power Supplies

Compatible Power Supplies

- Power Supplies
  - KPS101: For One K-Cube or T-Cube
  - TPS008: For up to Eight 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 T-Cubes to KCH Series Hubs

Click to Enlarge
The KPS101 and TPS008 Power Supply Units


Click for Details
A location-specific adapter is shipped with the power supply unit based on your location. The adapters for the KPS101 are shown here.

The KPS101 can supply up to 2.4 A and power a single K-Cube or T-Cube, while the TPS008 can supply up to 8 A and can power up to eight K-Cubes or T-Cubes, or up to four TBD001 Brushless DC Servo Controllers. Both power supply units plug into a standard wall outlet and provide +15 VDC.

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 Adapter Plate is required to use a T-Cube with the KCH301 or KCH601. For more information on the USB Controller Hubs, see the full web presentation.

Part Number	Description	Price	Availability
KPS101	15 V, 2.4 A Power Supply Unit for One K-Cube or T-Cube	$25.71	Today
TPS008	15 V, 8 A Power Supply Unit for up to Eight K-Cubes or T-Cubes	$180.00	Today
KCH301	NEW! USB Controller Hub and Power Supply for Three K-Cubes or T-Cubes	$475.00	Today
KCH601	NEW! USB Controller Hub and Power Supply for Six K-Cubes or T-Cubes	$575.00	3-5 Days
KAP101	NEW! Adapter Plate for T-Cubes and KCH Series Hubs	$55.00	Today