



DDS600

Direct Drive Translation Stage

User Guide



Original Instructions

Contents

Chapter 1	Introduction	1
Chapter 2	Safety	2
	2.1 <i>Safety Information</i>	2
	2.2 <i>General Warnings</i>	2
Chapter 3	Installation	3
	3.1 <i>Unpacking</i>	3
	3.2 <i>Environmental Conditions</i>	3
	3.3 <i>Mounting</i>	3
	3.3.1 Vertical Mounting	4
	3.3.2 General	4
	3.3.3 Cable Routing and Cable Extension	4
	3.3.4 Mounting the Stage to the Work Surface	5
	3.4 <i>Electrical Connections</i>	7
	3.5 <i>Dimensions</i>	8
Chapter 4	Operation	9
	4.1 <i>Getting Started</i>	9
	4.2 <i>General Operation</i>	10
	4.3 <i>Stopping the Stage</i>	13
	4.4 <i>Position Error Messages</i>	14
	4.5 <i>Maintenance</i>	14
	4.6 <i>Transportation</i>	15
	4.7 <i>Troubleshooting</i>	15
Chapter 5	Specification and Accessories	16
	5.1 <i>Specification</i>	16
	5.2 <i>Accessories List</i>	17
Appendices		
Appendix A	Using the Legacy APT Software	18
Appendix B	Regulatory	23
Appendix C	Thorlabs Worldwide Contacts	25

Chapter 1 Introduction

The Thorlabs' DDS600 low-profile, direct-drive stage provides 600 mm of travel with 100 nm minimum step size and a maximum speed of 400 mm/s. The stage is ideal for applications that require high speeds and high positioning accuracy, including automated alignment, surface inspection, mapping, and probing.

The innovative low-profile design with integrated brushless linear motors eliminates the external housings that create mechanical clash points and impede access to the moving platform. The direct-drive technology removes the need for a lead screw, eliminating backlash. Twin, precision-grooved linear bearings provide superior rigidity and linearity with excellent on-axis accuracy. This backlash-free operation coupled with high-resolution, closed-loop optical feedback ensures a minimal bidirectional repeatability of better than $\pm 0.25 \mu\text{m}$. Furthermore, the stage features an integrated cable management system, thereby eliminating the need for any user side cabling. Along with the Thorlabs BBD controller and the Thorlabs APT software interface, it forms a truly plug and play system.

Characterized by high-speed translation and high-positional accuracy, the DDS600 stage is well-suited for surface mapping and characterization applications where there is a need to move a camera or probe at constant velocity while simultaneously capturing data. Very precise, fine, positioning and control is easily achieved through the combination of the stable closed-loop control system and associated MJC001 joystick option.



Fig. 1.1 DDS600 Long Travel Stage

Chapter 2 Safety

2.1 Safety Information

For the continuing safety of the operators of this equipment, and the protection of the equipment itself, the operator should take note of the **Warnings, Cautions and Notes** throughout this handbook and, where visible, on the product itself.

The following safety symbols may be used throughout the handbook and on the equipment itself.

**Warning: Risk of Electrical Shock**

Given when there is a risk of injury from electrical shock.

**Warning**

Given when there is a risk of injury to users.

**Caution**

Given when there is a risk of damage to the product.

Note

Clarification of an instruction or additional information.

2.2 General Warnings

**Warning**

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. In particular, excessive moisture may impair operation.

Spillage of fluid, such as sample solutions, should be avoided. If spillage does occur, clean up immediately using absorbant tissue. Do not allow spilled fluid to enter the internal mechanism.

When bolting the stage to the work surface and when fixing a load to the top platform, high tightening torque of the attachment bolts can result in an increased resistive force on the moving platform. This in turn can lead to degraded performance and may require the PID parameters to be adjusted. As a general guide, 70 N.cm is a recommended nominal torque when tightening the attachment bolts.

Chapter 3 Installation

3.1 Unpacking

Note

During handling or shipping, the moving platform must be constrained to avoid damage to the bearings.

Retain the packing in which the unit was shipped, for use in future transportation.

Two handles are shipped with the unit to assist in handling. These handles should be fitted to the center hole at either end of the stage. The handles require a minimum of three turns to ensure safe load bearing of the product.

**Caution**

Once removed from its packaging, the stage can be easily damaged by mishandling. The unit should only be handled by its base, not by any attachments to the moving platform.

3.2 Environmental Conditions

**Warning**

Operation outside the following environmental limits may adversely affect operator safety.

Location	Indoor use only
Maximum altitude	2000 m
Temperature range	5°C to 40°C
Maximum Humidity	Less than 80% RH (non-condensing) at 31°C

To ensure reliable operation the unit should not be exposed to corrosive agents or excessive moisture, heat or dust.

If the unit has been stored at a low temperature or in an environment of high humidity, it must be allowed to reach ambient conditions before being powered up.

The unit must not be used in an explosive environment.

3.3 Mounting

**Warning**

The safety of any system incorporating this equipment is the responsibility of the person performing the installation.

3.3.1 Vertical Mounting



Warning

The stage is not suitable for mounting in a vertical (Z-axis) configuration.

3.3.2 General



Caution

The performance of the stage could be affected if the mounting surface is not flat to within 200 μ m. Care should be taken when bolting the stage to the worksurface, to ensure that the base does not warp, which could cause stiffness to be experienced in the bearing rails. Shims should be fitted as necessary.

When mounting the stage close to other equipment, ensure that the travel of the moving platform is not obstructed. If equipment mounted on the moving platform is driven against a solid object, damage to the internal mechanism could occur. The range of travel is 600 mm (23.62").

When considering the stage movement in the proximity of other objects or equipment, ensure that movement of cables connected to the moving carriage is not impeded.

When bolting the stage to the work surface and when fixing a load to the top platform, high tightening torque of the attachment bolts can result in an increased resistive force on the moving platform. This in turn can lead to degraded performance and may require the PID parameters to be adjusted.

As a general guide, 70 N.cm is a recommended nominal torque when tightening the attachment bolts.

Do not allow attachments to the moving platform (cables, tubing, electrical wiring) to induce drag forces, especially when the stage is changing direction. High drag forces can adversely affect phase initialization, homing, positioning accuracy and general reliability.

3.3.3 Cable Routing and Cable Extension



Caution

The D-Type shell of the motor connector houses an ID chip which could be damaged if the plug is opened. The encoder connector houses circuitry which could be easily damaged by static discharge. Under no circumstances should these plugs be opened or removed (e.g. to facilitate cable routing).

3.3.4 Mounting the Stage to the Work Surface

The DDS600 stage is mounted to the work surface by four M6 x 25 mm (1/4"-20 x 1") screws. The mounting holes are accessed from the top of the stage as shown below. Using a diagonal pattern, tighten all four mounting bolts.

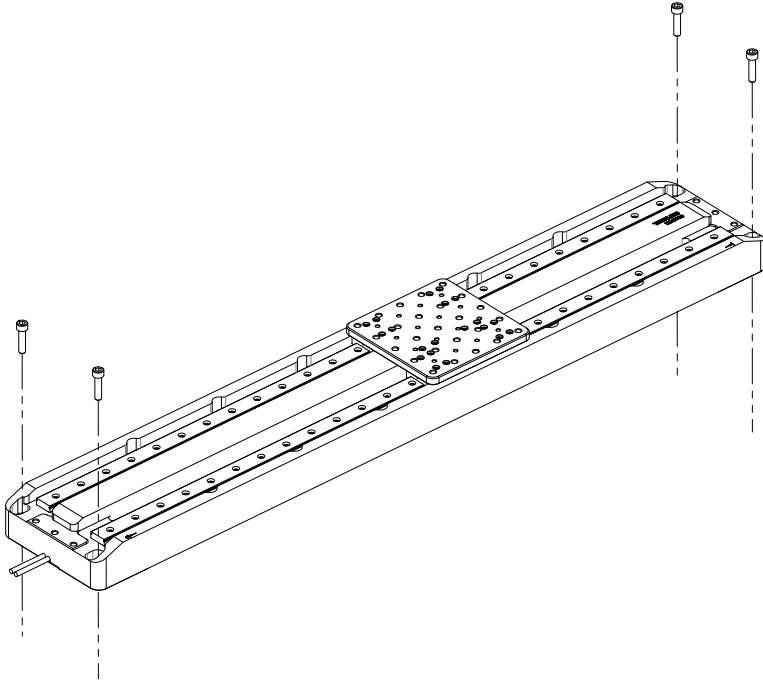


Fig. 3.1 Mounting



Caution

The performance of the stage could be affected if the mounting surface is not flat. Care should be taken when bolting the stage to the worksurface, to ensure that the base plate does not warp, which could cause stiffness to be experienced in the bearing rails. Shims should be fitted as necessary.

After mounting the stage to the work surface, if any increased resistance is experienced when moving the top platform, the likely cause is over tightening/torquing of the mounting bolts. As a general guide, 70 N.cm is a recommended nominal torque when tightening the attachment bolts.

Please contact tech support for more information.

The stage can also be mounted on its side, using two AP90RL(M) brackets - see Fig. 3.2. Using a diagonal pattern, tighten all four mounting bolts.

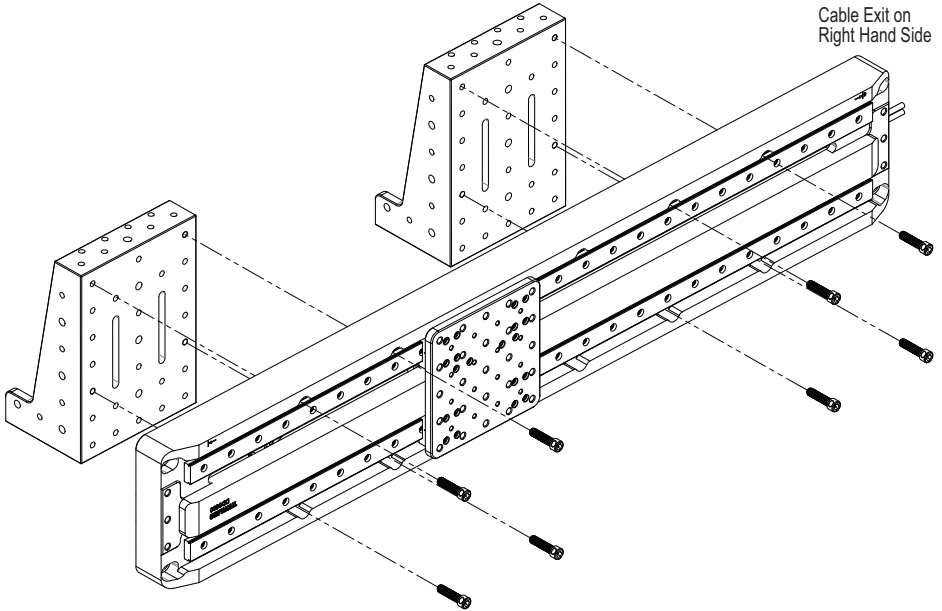


Fig. 3.2 Side mounting



Caution

When mounting the stage on its side, ensure that the cable exit is on the right hand side as shown above. Mounting with the cables in the LHS could cause damage to the internal cable management system.



Caution

Ensure that any devices and components attached to the moving platform are securely fastened. Incorrectly attached components could come loose when the stage is operated.

3.4 Electrical Connections

The stage must be driven by a Thorlabs BBD series controller. Connect the motor leads to the MOTOR DRIVE connectors, and the encoder feedback leads to the FEEDBACK connectors. Ensure that the motor drive and feedback leads for each motor are connected to the correct channel.

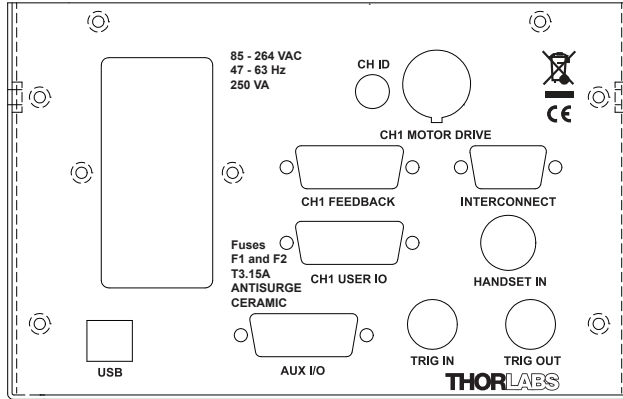
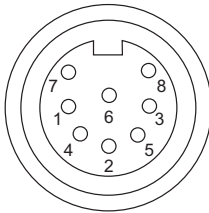


Fig. 3.3 Electrical connections

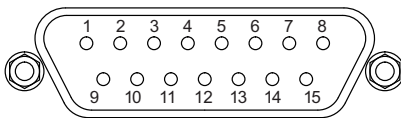
Pin out information for the motor drive and encoder feedback connectors on the motor flying leads is detailed below.

MOTOR DRIVE



1	Motor Phase V	5	Stage ID
2	GND	6	GND
3	Thermistor (not used)	7	Motor Phase W
4	Motor Phase U	8	Enable

ENCODER FEEDBACK



1		9	GND
2	GND	10	Limit Switch +
3		11	Limit Switch -
4	Enc Index -	12	Enc Index +
5	QB -	13	QB +
6	QA -	14	QA +
7	5 V	15	x
8	5 V		

Fig. 3.4 Motor Drive and Feedback Flying Lead Pin Out Details

3.5 Dimensions

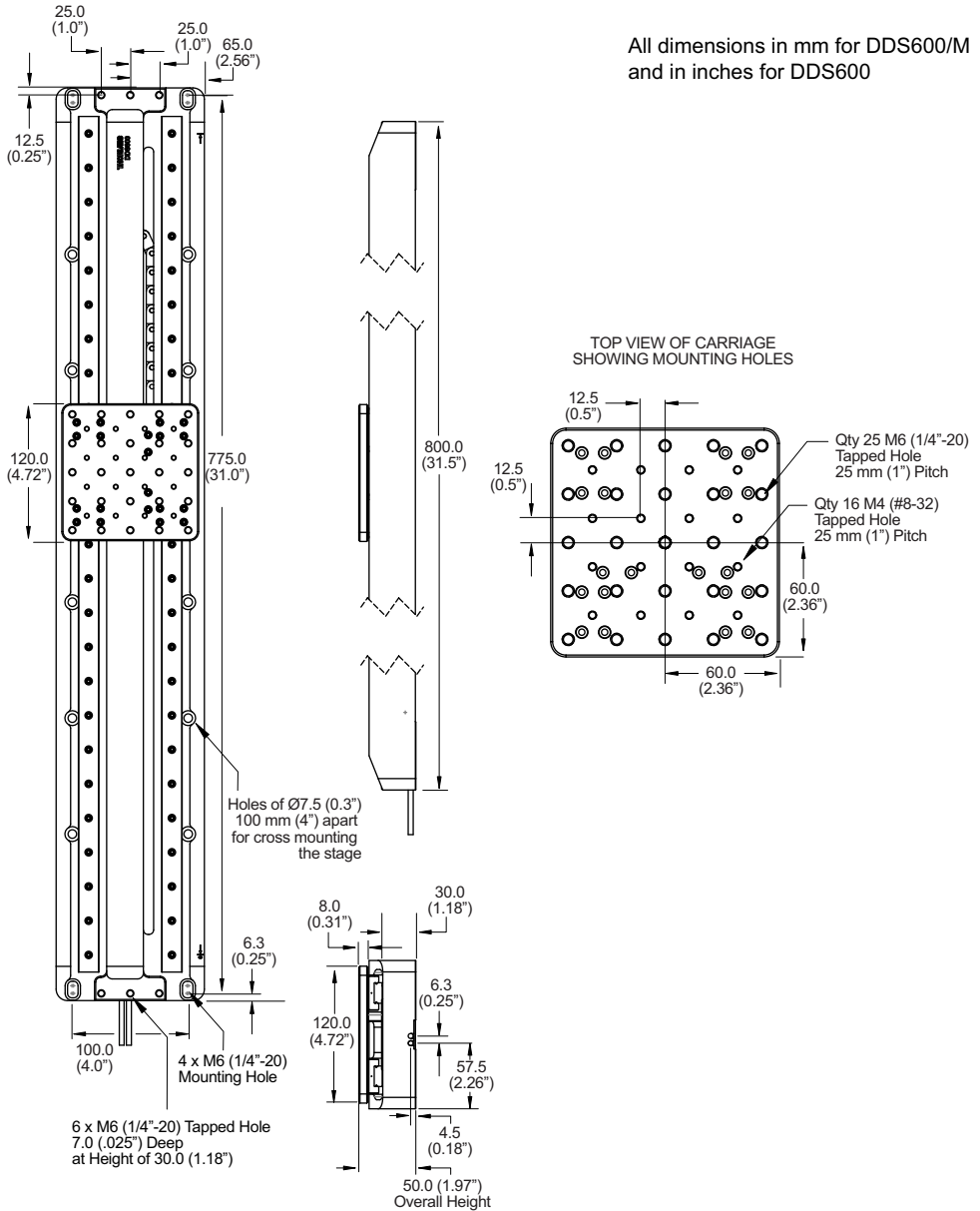


Fig. 3.5 Dimensions

Chapter 4 Operation

4.1 Getting Started

**Caution**

The DDS600 stage is designed to be driven by the Thorlabs BBD20x or RBD201 Brushless DC Motor Controllers.

The stages are connected to the controller via 2 flying leads, one terminated in D-type connector (FEEDBACK) and one terminated in a round 8-Pin DIN Connector (MOTOR DRIVE).

**Warning**

The motor controller must be switched OFF before the stages are plugged in or unplugged. Failure to switch the controller off may result in damage to either the controller, the stage, or both.

When running custom move sequences, or under fault conditions, the stage may move unexpectedly. Operators should take care when working inside the moving envelope of the stage.

For a complete tutorial on using the stage, see the manual supplied with the controller. Basic steps in controlling the stage are as follows:

- 1) Make electrical connections as detailed in Section 3.4.
- 2) Move the moving platform a few times over its full range of travel to overcome any storage resistance, then position the moving platform to be around its central position.

**Warning**

3-phase brushless DC motors are commutated electronically, i.e. the controller drives the coils with a precisely controlled waveform, that depends on the position of the motor coil housing. On power up, the position of the coil housing is not known. The controller establishes this by energising the coils and measuring the resulting movement. This is why on power up, the stage (motor) may make a slight buzzing noise and move slightly. Phase initialization can only take place if the motor can move unobstructed during this time. Before powering up the BBD controller at item (2), ensure that the stage movement is unobstructed.

- 3) Power up the controller and wait for 10 secs until the Channel Enable LEDs start flashing.
- 4) If a joystick control is being used, press and hold the 'High/Low' button for 2 seconds, then release to home the stage. When homing is complete, the green LED stops flashing.

- 5) If no joystick is being used, run the software utility and click the 'Home' button on each GUI panel. When homing is complete, the Channel Enable LEDs stop flashing.

Note

The stage design incorporates several reference markers on the encoder scale, which are used to calibrate the position counter.

The need for homing comes from the fact that on power up the motor (stage) is at a random position, so the value of the position counter is meaningless. Homing involves moving the motor to allow the encoder readhead to scan through encoder scale's reference markers in search of the reference marker designated for homing. The position counter is then reset, and the software will show an absolute value once the homing move sequence is completed.

- 6) The stage can now be moved using the joystick, GUI panel, or by setting commands to move each axis by relative and absolute amounts – see the handbook supplied with the BBD controller, and the helpfile supplied with the APT or Kinesis software for more information.

4.2 General Operation

The following sections contain a brief overview the stage using of the Kinesis software. For more detailed information see the manual for the associated controller (BBD20x or RBD201). For details using the legacy APT software please see Appendix A.

The stage is shipped already loaded with default parameter settings, which should give satisfactory performance in most cases. However, depending on the application, it may be necessary to adjust the PID loop parameter settings to fine tune the response. In the event that these settings need to be changed, the user can create a custom settings group - see the Kinesis Helpfile for more information.

- 1) If it is not already running, start the Kinesis software - Start/Programs/Thorlabs/Kinesis/Kinesis.The server reads in the stage and controller information on boot up and the GUI panel shown below is displayed..

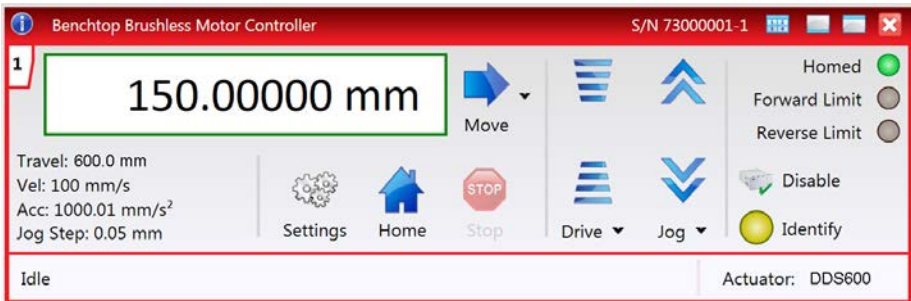


Fig. 4.1 Kinesis GUI screen

Note

The MOTOR DRIVE connectors for each channel/axis contain an EEPROM, which stores the factory default settings for the set up parameters. When the stage is connected, these settings are loaded into the controller on start up, and are tuned for loads up to the 3.0 kg (6.6 lb) maximum, at speeds up to 100 mm/s.

However, depending on the load being driven and the speed/duty cycle of the particular application, it may be necessary to further optimize the Position PID loop settings.

If problems are encountered (e.g. stability of the closed loop position control, lost motion or incomplete moves) the position loop PID parameters should be adjusted to tune the stage for the given application. Normally, only minor adjustment of the Proportional, Integral and Derivative parameters should be necessary, and some trial and error will be required before the ideal settings for a specific application are achieved. In cases where further adjustment of the control loop parameters is required, the following guidelines are provided in order to assist in the tuning process.

- 2) Click the Settings button on the GUI to display the Settings panel, then select the 'Advanced' tab.

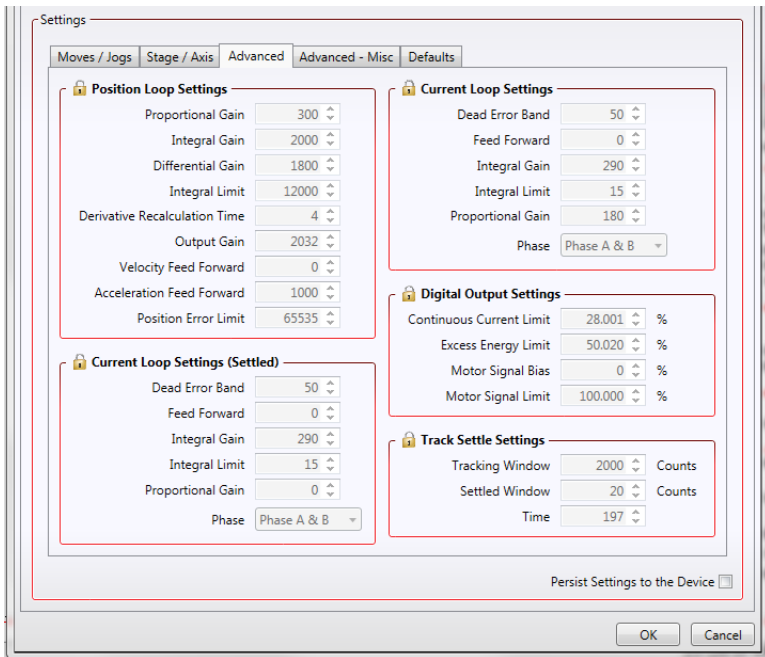


Fig. 4.2 Advanced Control Loop Settings

- 3) Create a Custom Settings Group (see the Kinesis helpfile for more information) and then adjust the PID settings to fine tune the control loop for your application.

Refer to the handbook supplied with the BBD201 control unit for more details on PID settings.



Caution

Default PID values have already been optimized and stored within the stage, and these are loaded into the controller on power up.

If problems are encountered (e.g. stability of the closed loop position control, lost motion or incomplete moves) the position PID parameters can be adjusted to tune the stage for the given application. Normally, only minor adjustment of the Proportional, Integral and Derivative parameters should be necessary, and some trial and error will be required before the ideal settings for a specific application are achieved.

See Fig. 4.3 below for guidelines on recommended PID values for a given load when the top plate resistive force profile is 2 to 5 N. If the force is outside this range, please contact Tech Support.

When extracting values from the graph, take note of the scale in the legend box. On the graph, the Integral limit values have been divided by '10' and the derivative time values have been multiplied by '100'.

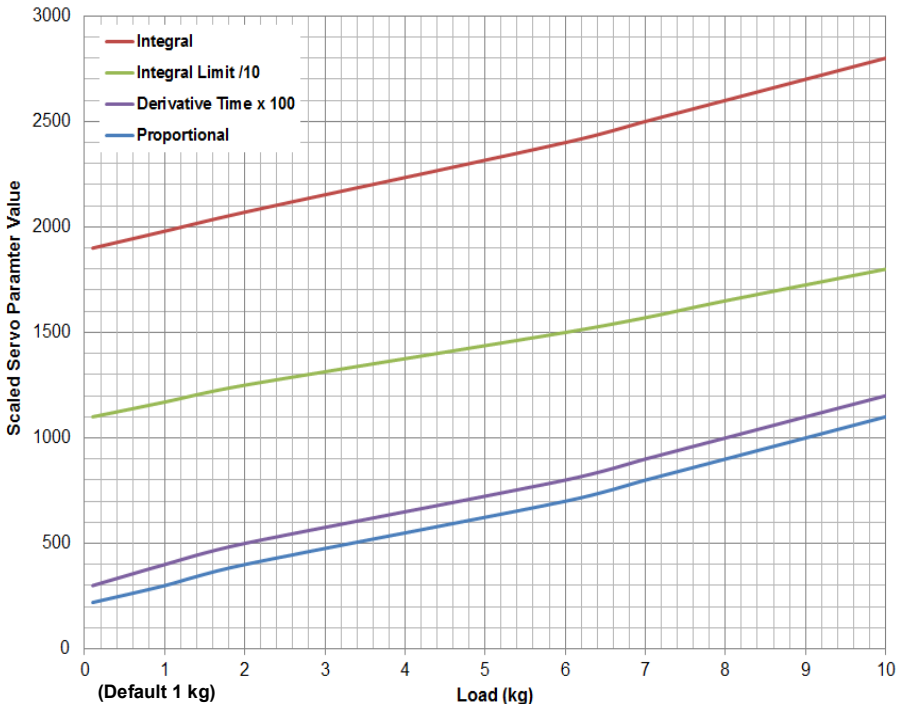


Fig. 4.3 Position Loop Settings v Load for a Top PLate Resistive Force Profile 2N to 5N

- 4) After the parameter changes have been performed, click the 'Persist Settings to Hardware' box, then click 'OK'. This will ensure that the same parameter settings will be loaded next time the unit is powered up - even in the absence of a PC.



Caution

If settings are persisted, then a stage is changed, further parameter adjustment may be required to achieve optimum performance with the new stage.

See the manual supplied with the controller unit for more information.

Note

For a given load, a deviation of typically $\pm 10\%$ from the values quoted in Fig. 4.3 may be necessary. To optimise parameters proceed as follows:

Stage struggles to reach final position - increase the values in 5% increments until satisfactory performance is achieved.

Stage overshoots or is unstable during move - reduce the values in 5% decrements until satisfactory performance is achieved.

Please see the handbook supplied with the controller, for more information on changing these settings

4.3 Stopping the Stage

The drive channel is enabled and disabled by clicking the 'Enable' button on the GUI panel or the front panel of the unit. The green indicator is lit when the drive channel is enabled. Disabling the channel removes the drive power and allows the stage/actuator to be positioned manually.

During operation, the stage can be stopped at any time by clicking the 'Stop' button on the GUI panel. Using this button does not remove power to the drive channel.



Fig. 4.4 Kinesis GUI screen

4.4 Position Error Messages.



Caution

The maximum velocity at which the encoder can operate is 400 mm/sec. Above this speed, encoder pulses may be lost and, as a result, the position readout becomes incorrect. This renders normal operation impossible because phase commutation of the motor is also based on the encoder reading.

When the stage is controlled by the BBD controller, the maximum velocity is limited to safe values. However, if the output is disabled (with the controller connected and monitoring the position) and the stage is moved manually at high speeds (i.e. above 400 mm/sec), it is possible to exceed this limit. If the BBD controller is subsequently used again to move the stage, the incorrect encoder reading will cause incorrect operation, often resulting in sudden uncontrolled moves. It is therefore important not to move the stage excessively quickly when it is moved manually.

The BBD controller has fault monitoring to detect the loss of encoder pulses. If this fault occurs, an error message will be generated and the controller must be powered down and re-started so that correct phasing and commutation can be established.

If this fault occurs when the stage is being controlled via the MJC001 joystick, in the absence of a PC, the red LED on the joystick console is lit, and all operation is suspended until the controller is shut down and rebooted.

4.5 Maintenance

Repetitive movement over long periods can result in build up of lubricant which can cause uneven motion. Periodically, the stage should be powered down and the top platform moved from one end of travel to the other several times to redistribute the bearing lubricant.

The product is maintenance free up to 5 million cycles. If any problems occur, the user should contact the local Thorlabs tech support for more information. After 5 million cycles, a replacement of the internal flexible cable, and a relubrication of the bearing carriers is recommended. Contact your local Thorlabs tech support for more information.



Warning

Prolong and repeated contact of the lubricant used on the linear rail bearing may cause skin irritation. Gloves should be worn when such contact is likely.



Caution

The coating on the bearing rails is easily damaged/removed by solvents (e.g. paint thinners) or similar aggressive substances. Do not allow such substances to contact the bearing rail.

4.6 Transportation



Caution

When packing the unit for shipping, use the original packing. If this is not available, use a strong box and surround the unit with at least 100 mm of shock absorbent material.

In particular, the moving platform must be constrained to avoid damage during shipping.

4.7 Troubleshooting

If an unexpected obstruction to the stage motion is encountered, the control system interface software disables the current to the associated drive channel, which may or may not result in the channel being disabled. After the obstruction to be removed, the associated channel of the controller should first be disabled to clear any fault codes, then re-enabled.

In the event of a breakdown, or malfunction of the product please contact Thorlabs Tech Support. Contact details are contained in Chapter C.

Chapter 5 Specification and Accessories

5.1 Specification

Parameter	Value
Travel Range	600 mm (23.6")
Max Speed	400 mm/s
Acceleration ¹	10,000 mm/s ²
Bidirectional Repeatability	±0.25 µm
Backlash ²	N/A
Min Incremental Movement	100 nm
Horizontal Load Capacity ³	10 kg (22.0 lb)
Absolute On-Axis Accuracy	±12.0 µm
Straightness/Flatness	±10.0µm
Pitch	±100 µRad
Yaw	±75 µRad
Continuous Motor Force	10.0 N
Peak Motor Force (2 sec)	20.0 N
Bearing Type	High Rigidity Recirculating Precision Linear Bearing
Limit Switches	Magnetic Sensor at Each End of Stage
Operating Temperature Range ⁴	5 to 40°C (41 to 104°F)
Motor Type	Brushless DC Linear Motor
Cable Length	2.2 m (7.2')
Dimensions (Mid Travel)	800 mm x 130 mm x 50 mm (31.5" x 5.12" x 1.97")
Weight (with cables)	9.1 kg (20.0 lb)

Notes

All measurements were undertaken at 400 mm/s and 5,000 mm/s² for the maximum travel of 600 mm.

The default tuning parameters can be changed to optimise settling times for a specific loads.

¹ The acceleration should be set according to the load, and is limited by the continuous motor force.

² The stage does not suffer from backlash because there is no leadscrew.

³ The controller default PID parameters are set for a 2 kg load and may require adjustment for higher loads. At higher loads the acceleration should be decreased. The acceleration is limited by the motor force.

⁴ For operation at temperatures outside normal room temperature, the PID parameters may require optimization



Caution

In applications requiring high speed/acceleration or high loads, some heating of the stage may occur and dimensional stability of the stage may be affected. This could result in less than optimal repeatability and accuracy. For cases where repeatability and accuracy are critical it is recommended that the stage temperature is allowed to reach a steady state before measurements are taken.

Alternatively the load, acceleration and duty cycle should be reduced from the maximum values. Some trial and error in setting these values may be necessary before the ideal settings are attained. Please contact your local Thorlabs tech support office for more details.

5.2 Accessories List

Thorlabs' MJC001 joystick console is designed for remote operation and enables intuitive, tactile, manual positioning of a stage. This highly reliable, Hall effect joystick features XY control, a speed adjustment for fast or high precision movement, and a high-quality, anodized aluminum casing.

An adapter plate, DDSA04 (/M) is available to raise the moving platform height to 62.5 mm for compatibility with our series of 3-axis positioning stages.

Product Name	Part Number
MJC001	2-Axis Joystick Console
DDSA04 (/M)	Adapter Plate for 62.5 mm Deck Height
HA0293T	Handbook

Appendix A Using the Legacy APT Software

A.1 General Operation

- 1) The stage is shipped already loaded with default parameter settings, which should give satisfactory performance in most cases. However, depending on the application, it may be necessary to adjust the PID loop parameter settings to fine tune the response - see the following pages for more information.
- 2) If it is not already running, start the APTUser utility - Start/Programs/Thorlabs/APT User/APT User
The APT server reads in the stage and controller information on boot up and the GUI panel shown below is displayed..

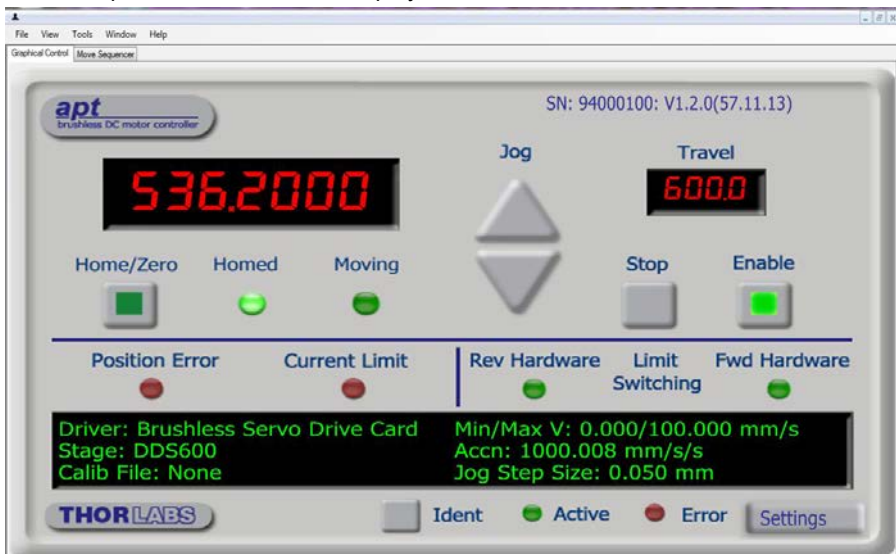


Fig. A.1 APTUser GUI screen

Note

The MOTOR DRIVE connectors for each channel/axis contain an EEPROM, which stores the factory default settings for the set up parameters. When the stage is connected, these settings are loaded into the controller on start up, and are tuned for loads up to the 3.0 kg (6.6 lb) maximum, at speeds up to 100 mm/s.

However, depending on the load being driven and the speed/duty cycle of the particular application, it may be necessary to further optimize the Position PID loop settings.

If problems are encountered (e.g. stability of the closed loop position control, lost motion or incomplete moves) the position loop PID parameters should be adjusted to tune the stage for the given application. Normally, only minor adjustment of the Proportional, Integral and Derivative parameters should be necessary, and some trial and error will be required before the ideal settings for a specific application are achieved. In cases where further adjustment of the control loop parameters is required, the following guidelines are provided in order to assist in the tuning process.

- 3) Click the Settings button on the GUI to display the Settings panel, then select the 'Advanced' tab.

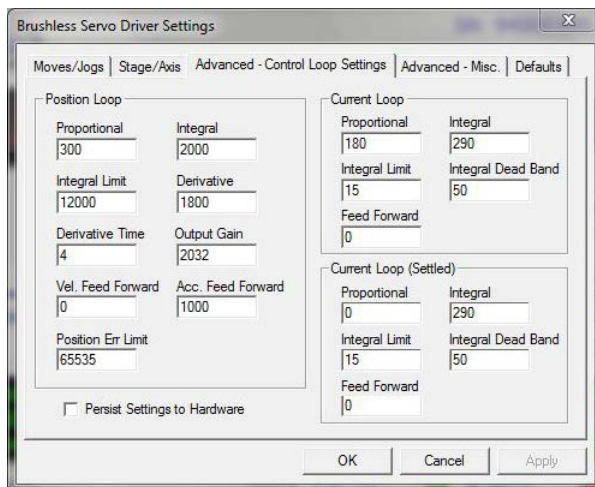


Fig. A.2 Advanced Control Loop Settings

- 4) Adjust the PID settings to fine tune the control loop for your application. Refer to the handbook supplied with the BBD201 control unit for more information.



Caution

Default PID values have already been optimized and stored within the stage, and these are loaded into the controller on power up.

If problems are encountered (e.g. stability of the closed loop position control, lost motion or incomplete moves) the position PID parameters can be adjusted to tune the stage for the given application. Normally, only minor adjustment of the Proportional, Integral and Derivative parameters should be necessary, and some trial and error will be required before the ideal settings for a specific application are achieved.

See Fig. 4.3 below for guidelines on recommended PID values for a given load when the top plate resistive force profile is 2 to 5 N. If the force is outside this range, please contact Tech Support.

When extracting values from the graph, take note of the scale in the legend box. On the graph, the Integral limit values have been divided by '10' and the derivative time values have been multiplied by '100'.

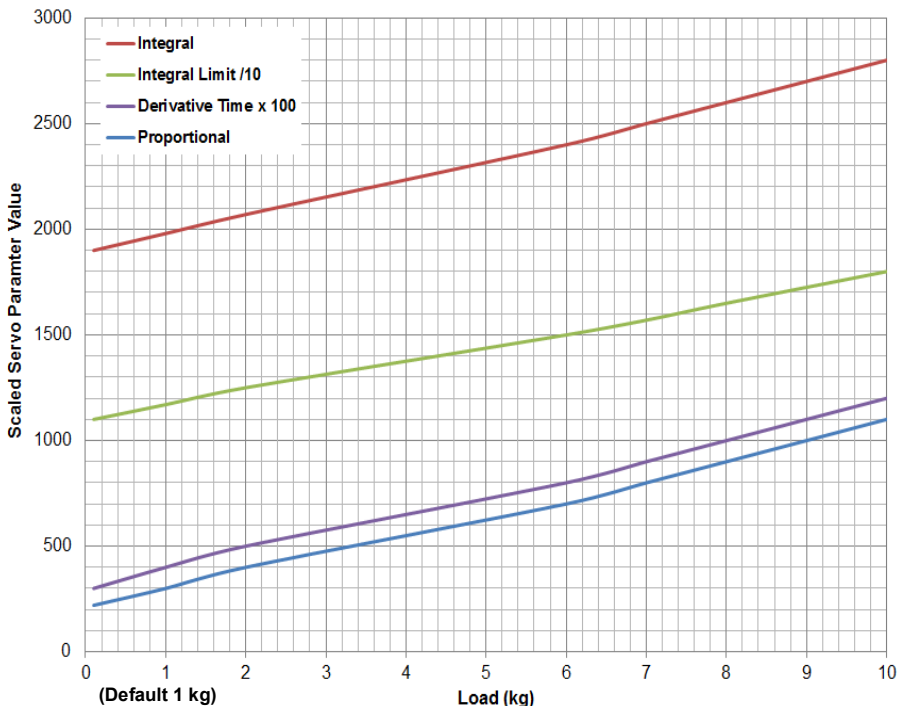


Fig. A.3 Position Loop Settings v Load for a Top PLate Resistive Force Profile 2N to 5N

- 5) After the parameter changes have been performed, click the 'Persist Settings to Hardware' box, then click 'OK'. This will ensure that the same parameter settings will be loaded next time the unit is powered up - even in the absence of a PC.



Caution

If settings are persisted, then a stage is changed, further parameter adjustment may be required to achieve optimum performance with the new stage.

See the manual supplied with the controller unit for more information.

Note

For a given load, a deviation of typically $\pm 10\%$ from the values quoted in Fig. 4.3 may be necessary. To optimise parameters proceed as follows:

Stage struggles to reach final position - increase the values in 5% increments until satisfactory performance is achieved.

Stage overshoots or is unstable during move - reduce the values in 5% decrements until satisfactory performance is achieved.

Please see the handbook supplied with the controller, for more information on changing these settings

A.2 Stopping the Stage

The drive channel is enabled and disabled by clicking the 'Enable' button on the GUI panel. The green indicator in the button center is lit when the drive channel is enabled. Disabling the channel removes the drive power.

During operation, the stage can be stopped at any time by clicking the 'Stop' button on the GUI panel. Using this button does not remove power to the drive channel. .



Fig. A.4 APTUser GUI screen

A.3 Position Error Messages.



Caution

The maximum velocity at which the encoder can operate is approximately 400 mm/sec. Above this speed, encoder pulses may be lost and, as a result, the position readout becomes incorrect. This renders normal operation impossible because phase commutation of the motor is also based on the encoder reading.

When the stage is controlled by the BBD10x controller, the maximum velocity is limited to safe values. However, if the output is disabled (with the controller connected and monitoring the position) and the stage is moved manually at high speeds, it is possible to exceed this limit. If the BBD10x controller is subsequently used again to move the stage, the incorrect encoder reading will cause incorrect operation, often resulting in sudden uncontrolled moves. It is therefore important not to move the stage excessively quickly when it is moved manually.

The BBD controller has fault monitoring to detect the loss of encoder pulses. If this fault occurs, an error message will be generated and the controller must be powered down and re-started so that correct phasing and commutation can be established.

If this fault occurs when the stage is being controlled via the MJC001 joystick, in the absence of a PC, the red LED on the joystick console is lit, and all operation is suspended until the controller is shut down and rebooted.

Appendix B Regulatory




B.1 Declarations Of Conformity

B.1.1 For Customers in Europe
See Section B.2.

B.1.2 For Customers In The USA

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by the company could void the user's authority to operate the equipment.

B.2 CE Declaration

	THORLABS www.thorlabs.com	
EU Declaration of Conformity <i>in accordance with EN ISO 17050-1:2010</i>		
We:	Thorlabs Ltd.	
Of:	1 St. Thomas Place, Ely, CB7 4EX, United Kingdom	
<i>in accordance with the following Directive(s):</i>		
2006/42/EC	Machinery Directive (MD)	
2004/108/EC	Electromagnetic Compatibility (EMC) Directive	
2011/65/EU	Restriction of Use of Certain Hazardous Substances (RoHS)	
 <i>hereby declare that:</i>		
Model:	DDS600 Series	
Equipment:	600mm Linear Stage with Controller (Imperial or Metric)	
 <i>is in conformity with the applicable requirements of the following documents:</i>		
EN ISO 12100	Safety of Machinery. General Principles for Design. Risk Assessment and Risk Reduction	2010
EN 61326-1	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements	2013
 <i>and which, issued under the sole responsibility of Thorlabs, is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, for the reason stated below:</i>		
does not contain substances in excess of the maximum concentration values tolerated by weight in homogenous materials as listed in Annex II of the Directive		
 <i>I hereby declare that the equipment named has been designed to comply with the relevant sections of the above referenced specifications, and complies with all applicable Essential Requirements of the Directives.</i>		
Signed:		On: 20 August 2013
Name:	Keith Dhese	
Position:	General Manager	
		<small>EDC - DDS600 Series -2013-08-20</small>

Appendix C Thorlabs Worldwide Contacts

For technical support or sales inquiries, please visit us at www.thorlabs.com/contact for our most up-to-date contact information.



USA, Canada, and South America

Thorlabs, Inc.
sales@thorlabs.com
techsupport@thorlabs.com

UK and Ireland

Thorlabs Ltd.
sales.uk@thorlabs.com
techsupport.uk@thorlabs.com

Europe

Thorlabs GmbH
europe@thorlabs.com

Scandinavia

Thorlabs Sweden AB
scandinavia@thorlabs.com

France

Thorlabs SAS
sales.fr@thorlabs.com

Brazil

Thorlabs Vendas de Fotônicos Ltda.
brasil@thorlabs.com

Japan

Thorlabs Japan, Inc.
sales@thorlabs.jp

China

Thorlabs China
chinasales@thorlabs.com

Thorlabs verifies our compliance with the WEEE (Waste Electrical and Electronic Equipment) directive of the European Community and the corresponding national laws. Accordingly, all end users in the EC may return "end of life" Annex I category electrical and electronic equipment sold after August 13, 2005 to Thorlabs, without incurring disposal charges. Eligible units are marked with the crossed out "wheelie bin" logo (see right), were sold to and are currently owned by a company or institute within the EC, and are not disassembled or contaminated. Contact Thorlabs for more information. Waste treatment is your own responsibility. "End of life" units must be returned to Thorlabs or handed to a company specializing in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.



UNLEASHED



THORLABS
www.thorlabs.com
