THORLABS

# ODL220(/M), ODL300(/M), ODL600(/M) Optical Delay Lines

## User Guide

# Table of Contents

# Chapter 1 Warning Symbol Definitions

Below is a list of warning symbols you may encounter in this manual or on your device.

| Symbol | Description |
|---|---|
|  | Direct Current |
|  | Alternating Current |
|  | Both Direct and Alternating Current |
|  | Earth Ground Terminal |
|  | Protective Conductor Terminal |
|  | Frame or Chassis Terminal |
|  | Equipotentiality |
|  | On (Supply) |
|  | Off (Supply) |
|  | In Position of a Bi-Stable Push Control |
|  | Out Position of a Bi-Stable Push Control |
|  | Caution: Risk of Electric Shock |
|  | Caution: Hot Surface |
|  | Caution: Risk of Danger |
|  | Warning: Laser Radiation |
|  | Caution: Spinning Blades May Cause Harm |

# Chapter 2 Safety

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly.

**WARNING**

**This unit must not be operated in explosive environments.**

**CAUTION**

**Only apply a small clamping force when tightening the screws that hold the right-angle prism mirror.**

**WARNING**

**When aligning laser beams on this system, remember to wear appropriate laser safety glasses.**

# Chapter 3 Introduction

Thorlabs' ODL220(/M), ODL300(/M), and ODL600(/M) Free-Space Optical Delay Line Kits incorporate a long-travel, low-profile direct drive stage, benchtop controller, and optics for tuning the optical delay. Optical delays up to 4000 ps (ODL600) and repeatable delay shifts down to 0.67 femtoseconds are achievable. The high accuracy and long-term stability of the stage make this system a suitable choice for pump-probe spectroscopy, THz spectroscopy, interferometry, and related applications. For accommodating different input beam heights, Thorlabs offers the RS99 Periscope Assembly (sold separately), which can accept a maximum beam height of approx. 4.6" (114 mm) with the included Ø1" Pillar Post. By using additional Ø1" Posts, the input beam height that can be accommodated is easily increased to any height.

The stage's V-block contains features two kinematic mirror mounts and positions for two ring-actuated irises for alignment. Two Ø1" ultrafast-enhanced silver mirrors (UM10-AG) as well as a 1" knife-edge right-angle prism with a protected silver coating (MRAK25-P01) are included. The knife-edge prism is mounted on one end of the translation stage. These mirrors provide high reflectance and minimal group delay, making them well suited for use with femtosecond pulsed lasers.

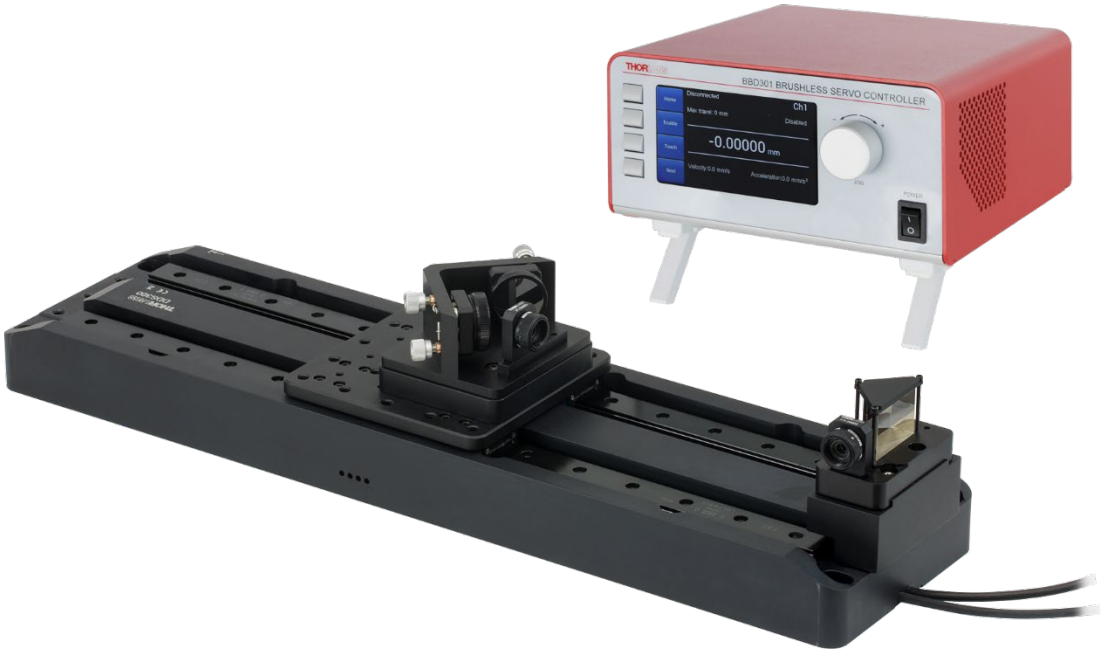



***Figure 1 Assembled ODL300 Optical Delay Line Kit***

# Chapter 4 Setup and Alignment

**WARNING**

**Infrared laser beams are particularly dangerous because they cannot be seen. Always wear appropriate laser safety glasses (not included) when working with laser beams.**

Each kit includes a direct drive translation stage, a V-block with two built-in kinematic adjusters, two MH25 Mirror Holders for attaching mirrors to the V-block, two SM05D5D Ring-Actuated Irises, two removable FT-SM05 Mounting Bases for attaching the irises to the V-block, two Ø1" UM10-AG Ultrafast Mirrors, an MRAK25-P01 Protected-Silver-Coated, Knife-Edge Right-Angle Prism, a platform riser, a fixed riser plate and prism mirror mount, and a BBD301 Benchtop Controller for the translation stage. Figure 2, below, shows an assembled ODL300 kit and beam path after the system has been aligned.

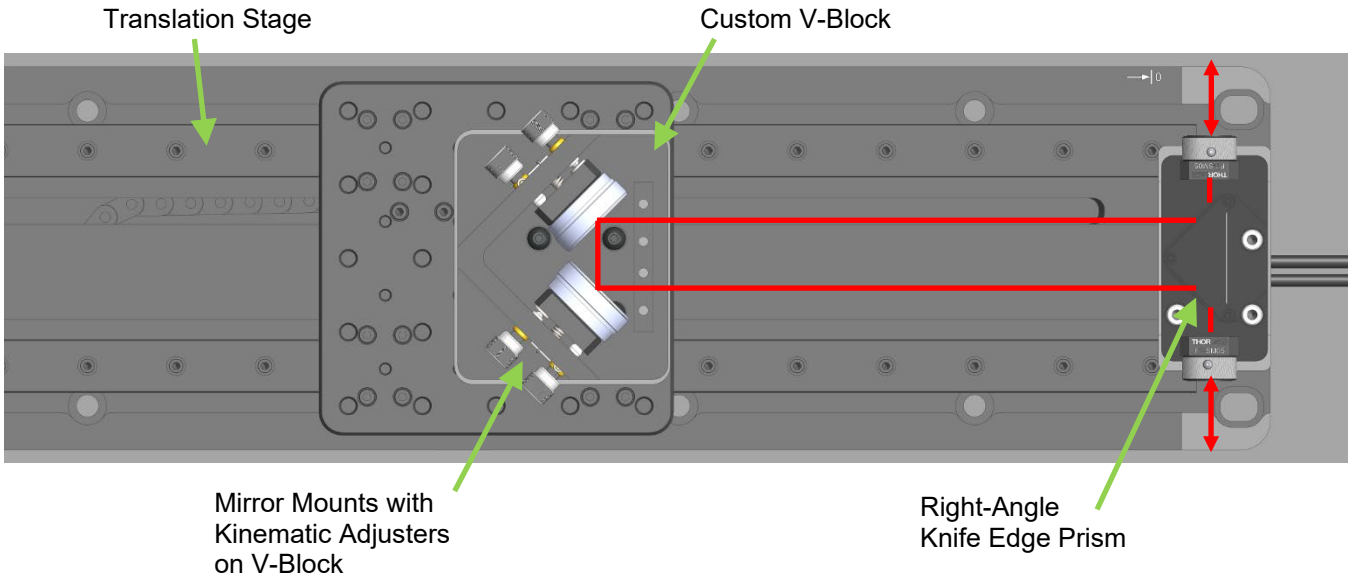



***Figure 2 Schematic of an Optical Delay Line Kit***

## 4.1. Optical Assembly

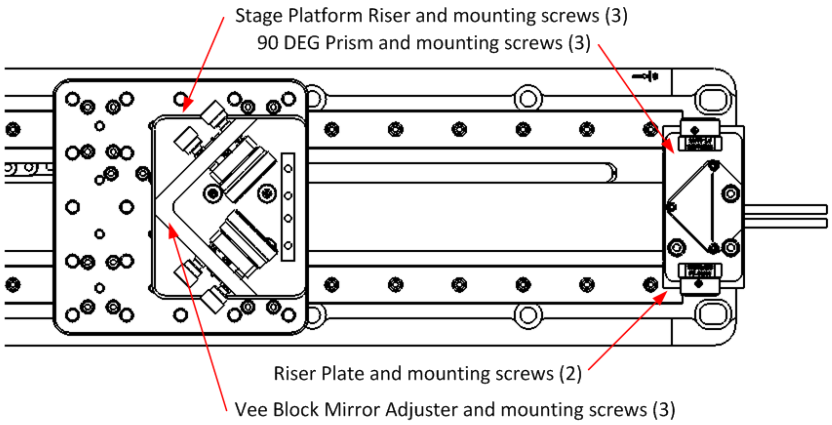



***Figure 3 Component Locations***

### 4.1.1. Delay Stage, Part 1: V-Block

1. Mount the platform riser plate onto the movable stage platform with the three included 1/4"-20 (M6) cap screws.
2. Mount the V-block to the platform riser plate. It fastens down using three 8-32 button head cap screws, which are provided (BH8A025). In order to center the V-block on the stage, the open end of the “V” should point towards the 90 degree prism. Place the three screws in the mounting holes and move the V-Block in order to align the holes, then tighten the screws.
3. Mount two Ø1" mirrors into the MH25 mirror holders by inserting the bottom of the mirror into the externally threaded side of the adapter, then tightening the knurled ring around the bottom piece. (To remove the mirror later, a SPW901 adjustable spanner wrench, sold separately, may be necessary to provide torque.)
4. Thread the mounted mirrors into the kinematic mounts on the V-block.

### 4.1.2. Delay Stage, Part 2: Prism Mount

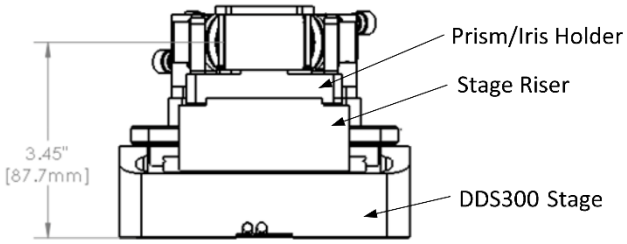



***Figure 4 Mounting the Stage Riser and Knife-Edge Prism***

1. Mount the stage riser to the side of the translation stage. It attaches using two of the included 1/4"-20 (M6) cap screws.
2. Install the knife-edge right-angle prism into its holder. The two legs of the right-angle prism are gently pressed against the edges of the specially designed holder, and the top plate of the holder is gently tightened against the prism by three locking screws with a 5/64" hex head.

### 4.1.3. Final Assembly

1. At this point, the translation stage may be secured to the optical table or breadboard using 1/4"-20 (M6) cap screws secured using the slots in the ends of the stage.
2. Thread the two SM05D5D irises into the FT-SM05 bases. The irises are externally SM05 (0.535"-40) threaded for compatibility with the FT-SM05 bases, which are internally SM05 threaded. The irises may be located either on the prism holder or on the V-block, as needed for alignment.
3. Using the irises and the V-block's built-in kinematic mirror mounts, ensure that both passes of the beam along the stage's translation axis are parallel to the stage translation and each other over the entire range of travel.
    a. The V-block is machined to position the mirrors at close to their optimal positions. Only small adjustments should be necessary.
    b. To facilitate quick alignment, the power to the translation stage should be off. This allows the stage to freely move. Under software control the stage may also be released for this purpose.
    c. To align the first pass, move the translating plate as close as possible to the prism, and tweak the adjusters of the top mirror to center the beam on the first iris. Then move the translating plate as far as possible from the prism and tweak the adjusters of the bottom mirror to center the beam on the first iris.
    d. To align the second pass, move the translating plate as far as possible from the prism, and tweak the adjusters on the first mirror of the V-block to center the beam on the second iris. Then move the translating plate as close as possible to the prism, tweak the adjusters on the second mirror of the V-block to center the beam on the second iris.
    e. If the stage alignment is correct, and the beam spot is observed on a screen after the second reflection from the right-angle prism, the spot will not move as the stage is translated.
4. Connect the stage and power supply to the BBD301 controller then use the included USB cable to connect the BBD301 to your PC.

## 4.2. Optical Delay Offsets

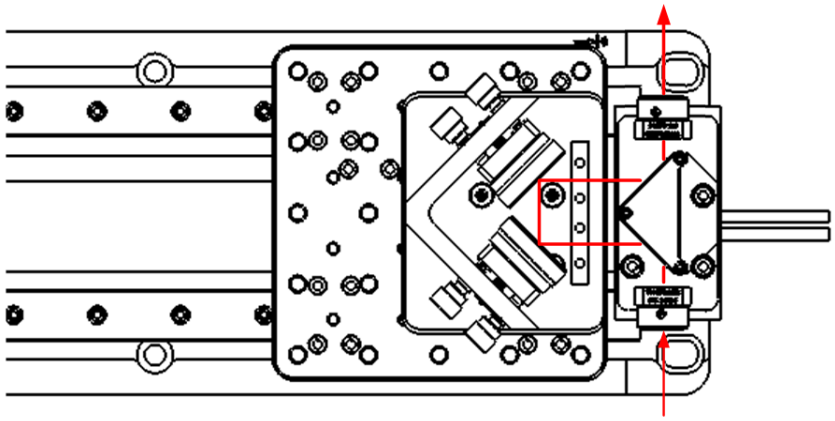


***Figure 5 Minimum Optical Delay Path***

When the stage is at zero position there is an inherent minimum optical delay in the system. This delay is a fixed distance. The delays listed below need to be taken into account when calculating the overall delay.

a. ODL220(/M) Inherent Delay @ 0 mm Position: 152 mm or 507 ps.

b. ODL300(/M) Inherent Delay @ 0 mm Position: 182 mm or 607 ps.

c. ODL600(/M) Inherent Delay @ 0 mm Position: 182 mm or 607 ps.

## 4.3. Beam Entrance Height

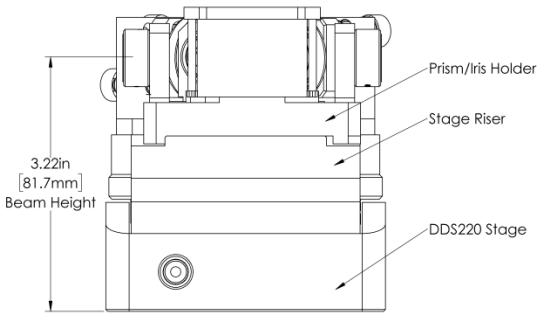



***Figure 6 DDS220(/M) Beam Entrance Height***

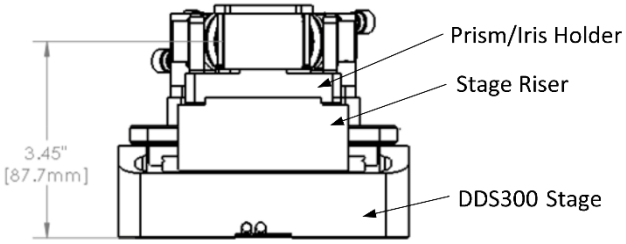



***Figure 7 DDS300(/M) Beam Entrance Height***

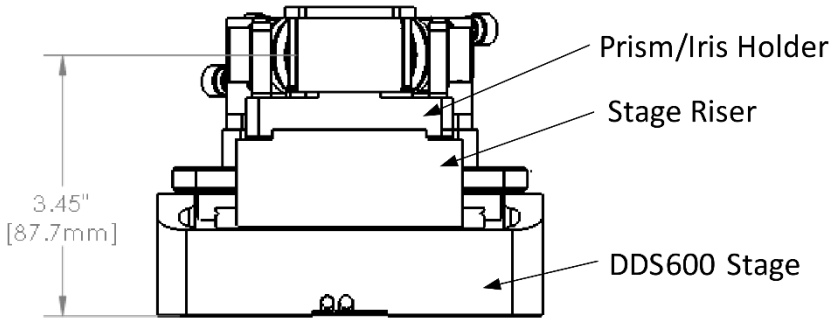



***Figure 8 DDS600(/M) Beam Entrance Height***

# Chapter 5 Software Control

The optical delay line may be controlled using the Kinesis™ software package, which includes graphical user interface utilities for direct interaction and provides out-of-the-box control of the stage. Kinesis also provides a set of programming interfaces that allow custom integrated positioning and alignment solutions to be easily programmed in the development language of your choice.

Using Kinesis, you can read the current stage position; control the stage position, speed, and acceleration; and execute scan sequences. With this software, it is possible to precisely choose the optical delay you wish to add or subtract from your beam path. For interferometry or pump-probe experiments, the option to scan the stage continuously or in discrete steps with each step's position being held for a specific time period is available. Refer to the following guide for more detailed information on the use of the Kinesis software: **BBD301, BBD302, & BBD303 Brushless DC Motor Controllers Kinesis User Guide**.

The Kinesis software may be downloaded directly from our website (**http://www.thorlabs.com**/) by choosing Services > Software Downloads > Motion Controllers > Kinesis Overview.

## 5.1. Software Operation

The Kinesis software suite includes a graphical user interface. The following provides a brief tutorial of the operation of the stage using the GUI controls, as well as an introduction to parameters that can be configured through the GUI. This chapter assumes that the stage, controller, and computer are connected and powered up as described in Section 3.5 of the **BBD301, BBD302, & BBD303 Brushless DC Motor Controllers Kinesis User Guide**, and that the software is already installed. The DDS220 Direct Drive Translation stage was used to demonstrate operation.

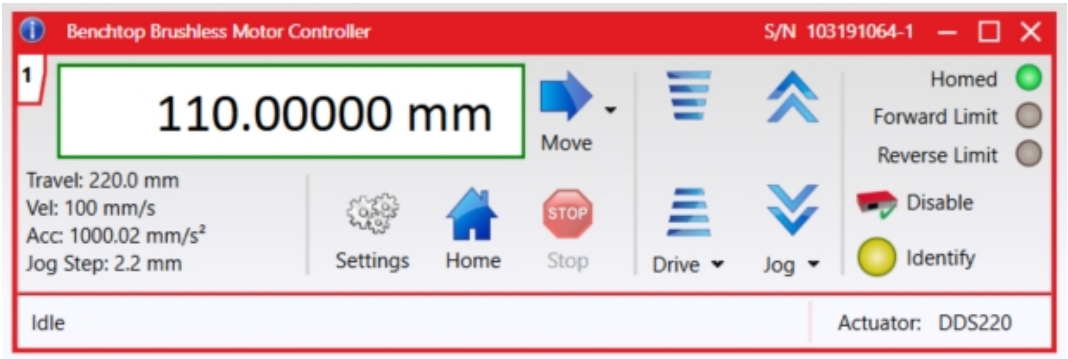



***Figure 9 Kinesis Software Operational Panel***

Thorlabs' Kinesis Software Main Panel consists of all operations required for the delay line. Optical delay in the stage is double pass and provides the following range:

- ODL220(/M) Travel/Delay Range: 0 to 220 mm or 0 ps to 1470 ps
- ODL300(/M) Travel/Delay Range: 0 to 300 mm or 0 ps to 2000 ps
- ODL600(/M) Travel/Delay Range: 0 to 600 mm or 0 ps to 4000 ps

### 5.1.1. Settings Panel

When the 'Settings' button on the GUI panel is clicked, the 'Settings' window is displayed. This panel allows motor operation parameters such as move/jog velocities, and stage/axis information to be modified. Note that each of these settings also can be read and updated using the Kinesis API. Chapter 7 of the **BBD301, BBD302, & BBD303 Brushless DC Motor Controllers Kinesis User Guide**, provides more information about the Kinesis API, including a table that associates Kinesis API commands with the Kinesis GUI functionality.

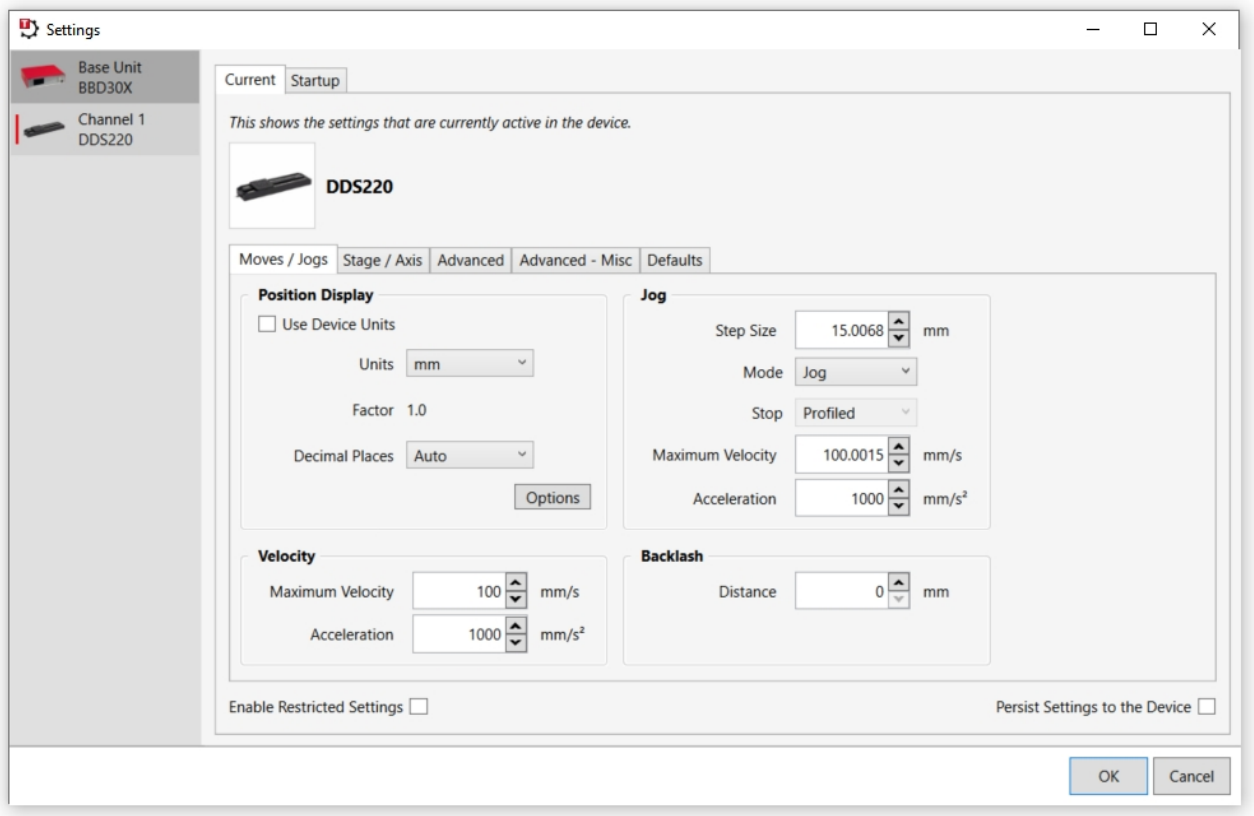



***Figure 10 Settings Panel (Move/Jog)***

- **Velocity** – These variables may also be changed to the stage: velocity and acceleration. During a scan, high speed steps may produce a ringing motion at stop that can be removed by slowing down the acceleration and velocity.

- **Jog** – Sets the distance the stage will move in either direction when the jog arrows are invoked by a mouse click.

- **Position Display** – All motion distances may be addressed in millimeters or picoseconds. The user can change the Position Display units as described in the next section.

- **Backlash** – All motion distances may be addressed in millimeters or picoseconds. The user can change the Position Display units as described in the next section.

### 5.1.2. Position Display Parameters

By default, the GUI will display position in mm. If required, the units can be changed so that the display shows other positional units (cm, µm, or in.). Refer to section 6.4 of the **BBD301, BBD302, & BBD303 Brushless DC Motor Controllers Kinesis User Guide** for a more detailed description. The follow will describe how to setup a custom unit to display the positioning in picoseconds.

Custom units can be added to the drop-down "Units" menu. To do this, click the "Options" button to open the "Configure Custom Units" window. Enter the name of the custom unit in the "Unit Name" field and adjust the factor to the value necessary to convert from millimeters to the new custom unit. Then click add. When finished click OK. The new custom unit can now be selected from the Units drop-down menu. window.

Enter ps for the new units, and a factor of 6.67 for conversion from millimeters to picoseconds, then click Add.

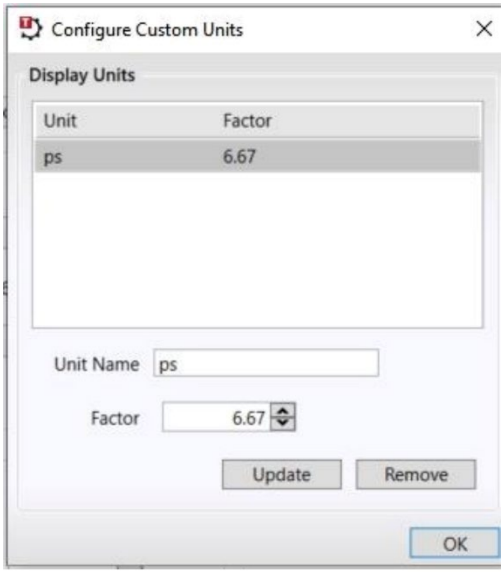



***Figure 11 Configure Custom Units***

## 5.2. Control Functions

Using Kinesis, the ODL has 3 options to promote a move over any part of the stage.

a. **Direct ODL Control** is a graphical user interface utility for direct interaction and provides out-of-the-box control of the stage.

b. **External Triggered Scan** promotes a scan after a 5V trigger is invoked at the BNC connector on the rear panel of the BBD301 Controller.

c. **Internal Triggered Sequence** promotes a scan after the Run Sequence is invoked. Scans from Ref 1 to Ref 2 by Delay Dwell time and Scan Step Size. Upon completion of the scan a 5V CMOS pulse is generated at USER IO connector (Pin 3) on the BBD301 Controller. Refer to the BBD301 manual for connector identification.

When the Software/Controller/stage is powered on, it is required that the stage is homed to determine absolute zero.

### 5.2.1. Direct ODL Control

The display shows continuously the stage position in the units selected above.

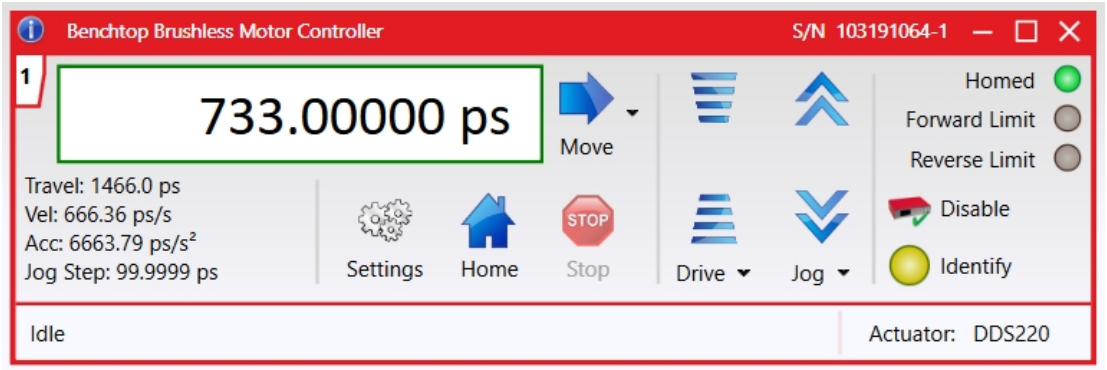



***Figure 12 DS220 Homed***

- **Move** - Opens the move settings window. Enter the target position and make any desired modifications to velocity and acceleration parameters. To move to the specified position, click the blue arrow to the right of the position entry field. The current values of the Move function's velocity and acceleration parameters are also shown below the left corner of the Position window.

- **Home** – Involves moving the motor to a known reference marker and resetting the position counter to the associated absolute value.

- **Jog** – Allows the user to enable a jog move. The jog move step size is set by the user on the Settings panel.

- **Drive –** Used to increment or decrement motor position. These eight controls are arranged as a bar graph. The controls in the top and bottom groupings increment and decrement the stage position, respectively. Clicking each bar in a group moves the stage at a different velocity, the speed of which is related to the length of the bar. To change any of the four velocity settings, click the button labeled with "Drive" and a down arrow. Note that the velocities can be entered in any order. However, they will be automatically reordered from largest to smallest before being assigned to the controls

- **Stage Disable/Enable** – Once the stage is energized it is locked in position. One can enable or disable the stage so one can move the stage by hand to some arbitrary position. Once the stage is energized it is locked in position. One can enable or disable the stage so one can move the stage by hand to some arbitrary position.

### 5.2.2. External Triggered Scan

The ODL controller can be configured so that it responds to the Trigger In signal, provided via the BNC port, by homing the stage, moving the stage by a relative amount, or moving the stage to a specified absolute position. The rising or falling edge of a Trigger In signal initiates the action. The rising edge refers to a transition from logic LOW to HIGH, and the falling edge refers to a transition from logic HIGH to LOW. Since a move already in progress will not be interrupted, the stage will not respond to an external Trigger In signal if in the process of executing a move.

Refer to the Triggering section of the **BBD301, BBD302, & BBD303 Brushless DC Motor Controllers Kinesis User Guide**.

The trigger settings can be used to configure multiple units in a master-slave setup, thereby allowing multiple channels of motion to be synchronized. Multiple moves can then be initiated via a single software or hardware trigger command.

Input triggers are coupled to the BBD30x controllers via a BNC connector on the rear panel of the unit. There is one BNC connector devoted to each channel supported by the controller. Note that on the BBD301, the I/O 1 port is used for Trigger In and the I/O 2 port is non-functional. The output trigger signal is provided via pin 13 (User Digital O/P 10+) on the 37-pin AUX I/O connector on the unit's rear panel.

### 5.2.3. Internal Triggered Sequence

The sequencer is useful for automating tasks on one or more devices. It allows the user to run a set of simple tasks on a device or to create a program of events to control several devices in a synchronized manner. An example of how a sequence is created and run is provided below.

This sequence will Home the stage, and then move the stage to zero. Once the stage is at zero position, an output trigger will be raised, and the stage then waits for a time set by the user. Once the wait time has expired, the stage will move relative to its current position by an amount set by the user. After each relative move an output trigger is raised and a user defined wait is invoked. This relative move is repeated by a number determined by the user.

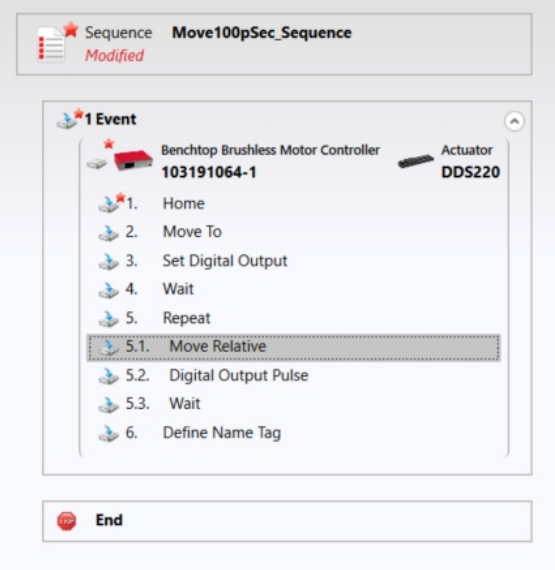



***Figure 13 Example Sequence***

### *Creating A Sequence*

Click the Sequence Manager button, on the right-hand side of the main Kinesis window. This opens the sequence manager task pane. Click the New option to create a new sequence.


***Figure 14 Create Sequence***

The new unedited sequence is displayed in a small window within the Sequence Manager task pane. This task pane can display multiple sequences for multiple devices at any one time allowing easy access and control for multiple devices and sequences.

To add devices and functions to a sequence click the **Edit** button in the new sequence window.

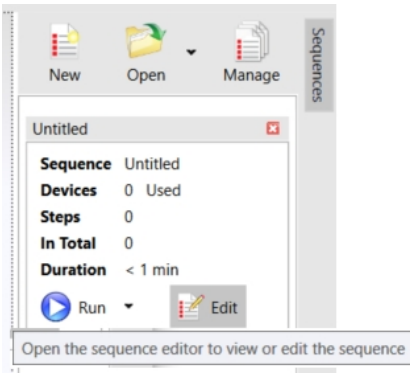



***Figure 15 Edit Sequence***

A larger Sequence Editor window will open, where devices and functions can be added to the sequence.

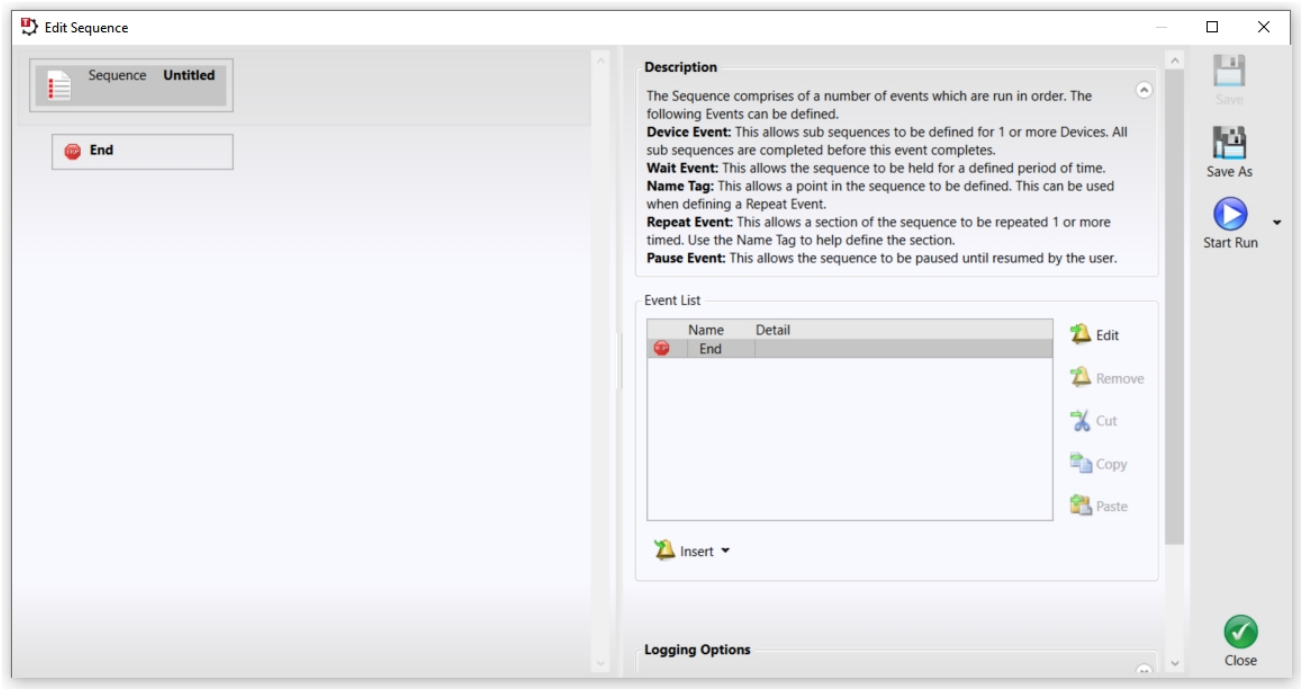



***Figure 16 Sequence Editor***

A sequence is comprised of several events which are run in order. To insert a currently connected device into the sequence event, click Insert over to the right, and from the subsequent drop-down list select Device Event, see below. This allows a sub sequence to be defined for 1 or more devices.

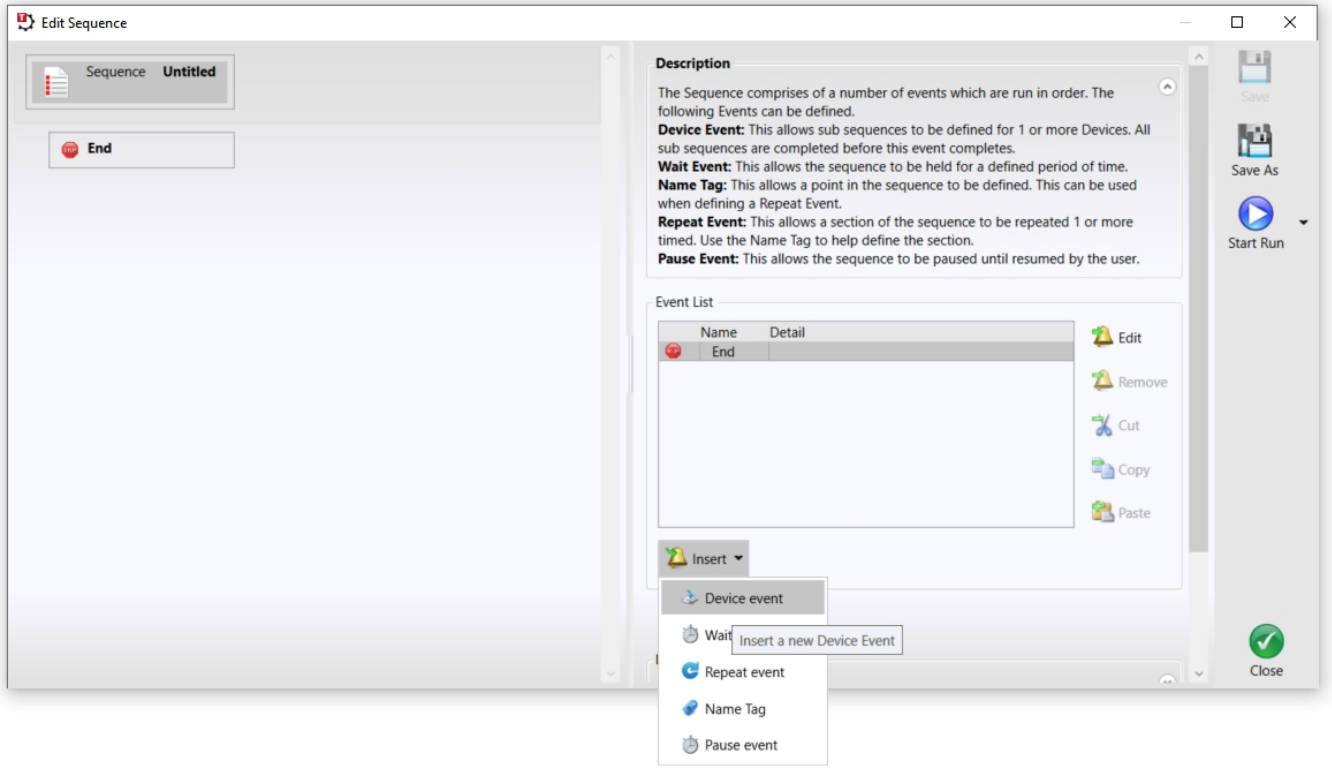



***Figure 17 Insert Device Event***

The device event will now be displayed on the left-hand side of the sequence window (1 Event below). Select the new event by clicking it. This will allow you to access devices to add to the sequence event.

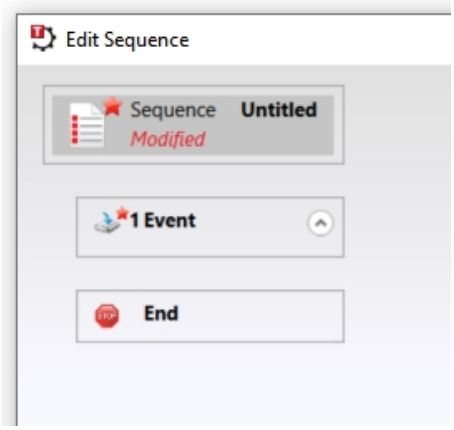



***Figure 18 Select Device Event***

To add a connected device to the new event, click **Add**. This will display all the currently connected and loaded devices. Select the device you would like to add to the sequence from the drop-down menu. Devices are named and identified by their unique serial number.


***Figure 19 Add Device Event***

Once the device is added select the device from the main sequence window on the left-hand side by clicking on it as shown below.

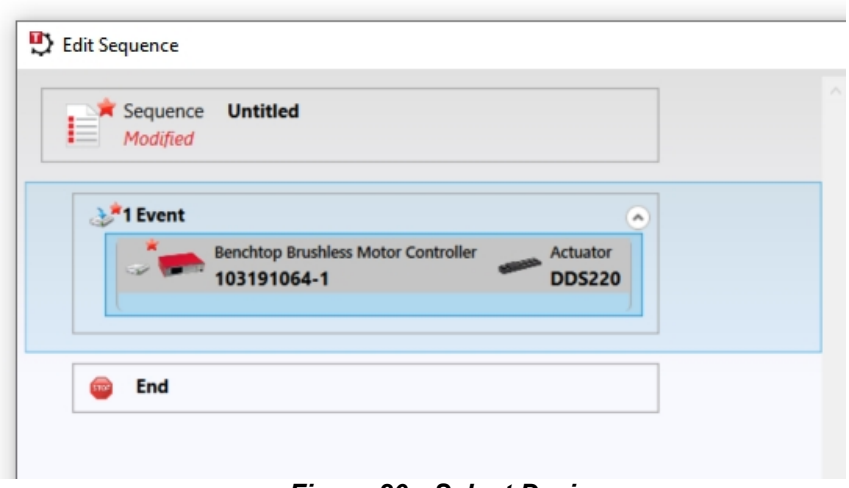



***Figure 20 Select Device***

The window displayed allows you to insert details and functions that you would like your device to perform during the sequence.

To home the motor as the first step in the sequence, click **Insert,** then select **Home** from the drop-down list. This will add a home command to the sequence.

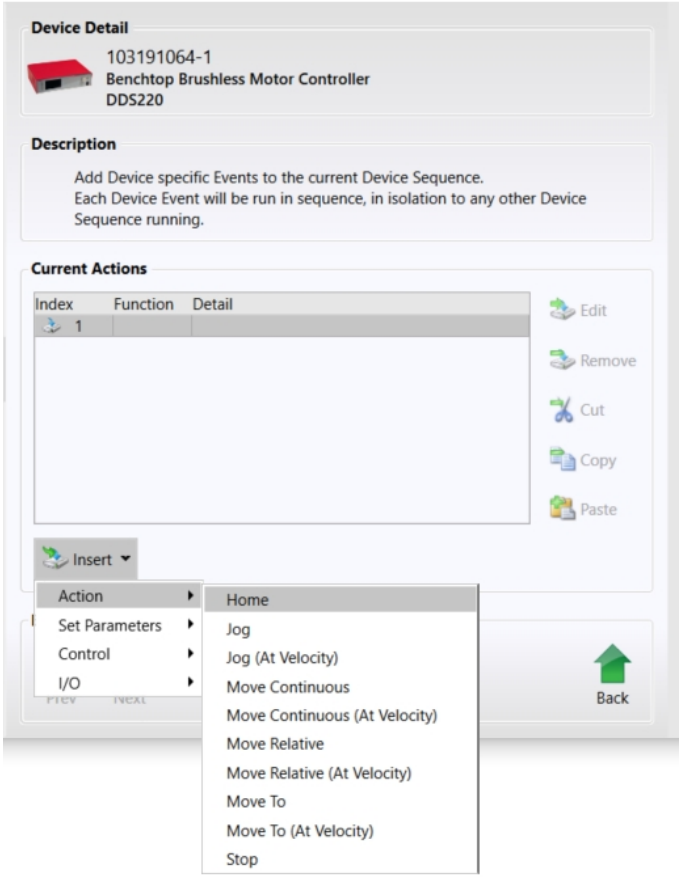



***Figure 21 Insert Home Command***

Once the device has homed a new function can be added after the Home step to move the device to a new set position.

To ensure that this move occurs after the Home step highlight the **Index 2** action in the **Current Actions** list; this will insert the next sequence step immediately before the End of the sequence. (All new sequence events are added immediately before the currently selected action.)

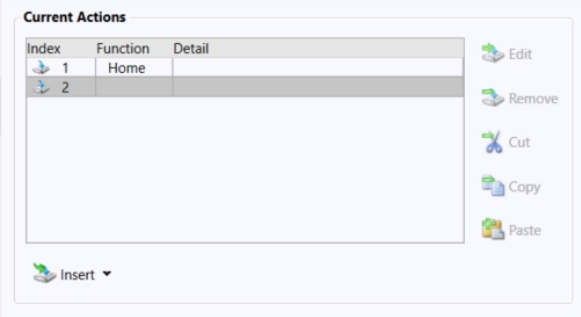



***Figure 22 Insert Next Command***

To add a simple move command to the sequence, click **Insert** then select the **MoveTo** function.

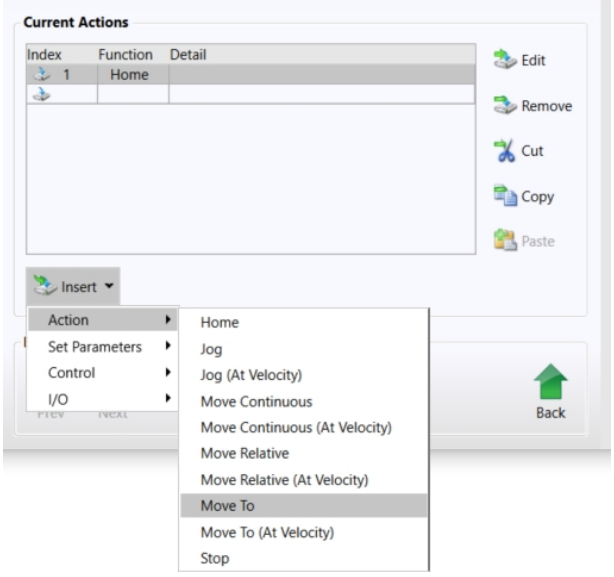



***Figure 23 Insert Move To Command***

To edit the parameters of the move double click on the **MoveTo** step in the **Current Actions** List. This will open a section that will allow the user to edit the position that the motor will move to, see below.

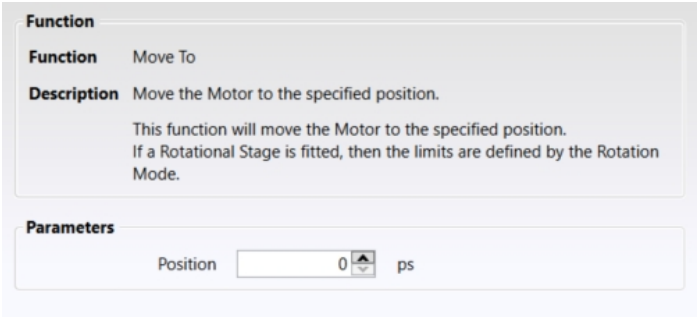



***Figure 24 Move To Parameters***

To add the next command to the sequence, click **Insert** then select the **I/O Set Digital Output** function.

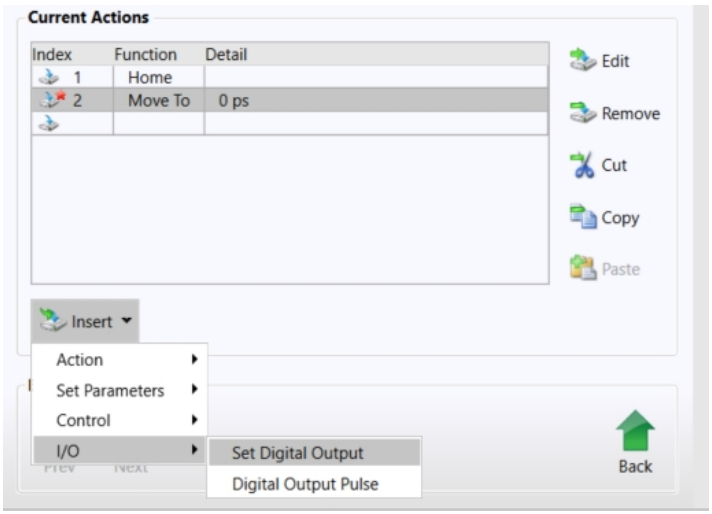



***Figure 25 Set Digital Output***

To edit the parameters of the set digital output click on the **Set Digital Output** step in the **Current Actions** List. This will open a section that will allow the user to edit the I/O Port State, see below.

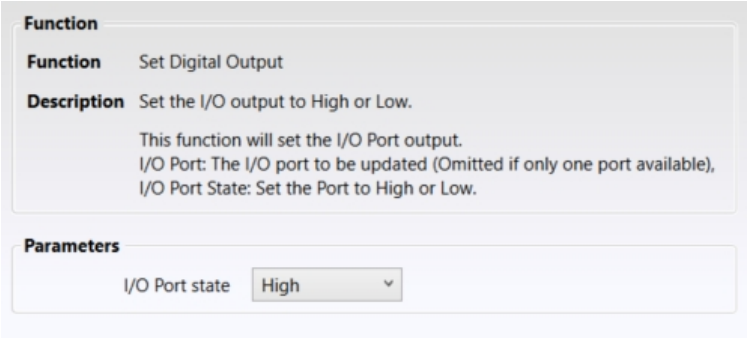



***Figure 26 Move To Parameters***

To add the next command to the sequence, click **Insert** then select the **Control Wait** function.

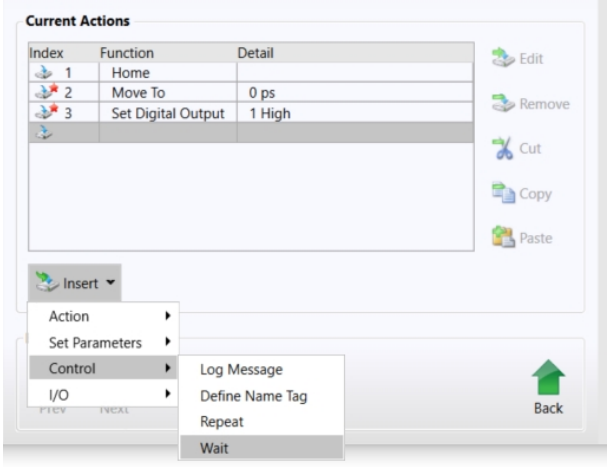



***Figure 27 Wait***

To edit the parameters of the wait click on the **Wait** step in the **Current Actions** List. This will open a section that will allow the user to edit the Wait State, see below.

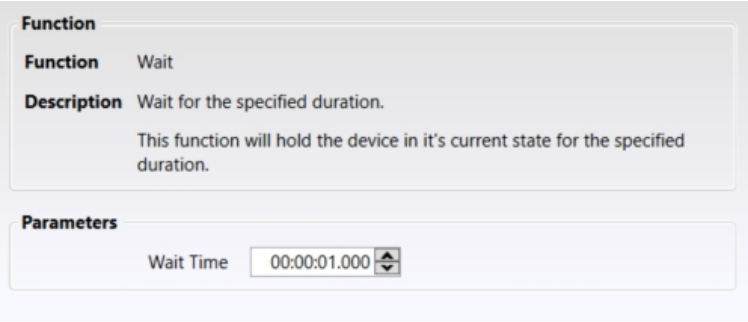



***Figure 28 Wait Parameters***

To add the next command to the sequence, click **Insert** then select the **Control Repeat** function.

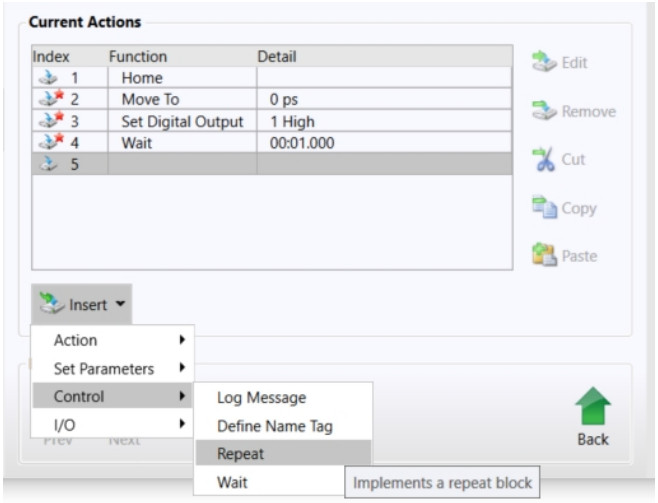



***Figure 29 Repeat***

To edit the parameters of the repeat click on the **Repeat** step in the **Current Actions** List. This will open a section that will allow the user to edit the Number of time to repeat the steps inserted after the repeat function until the end of the sequence, see below.

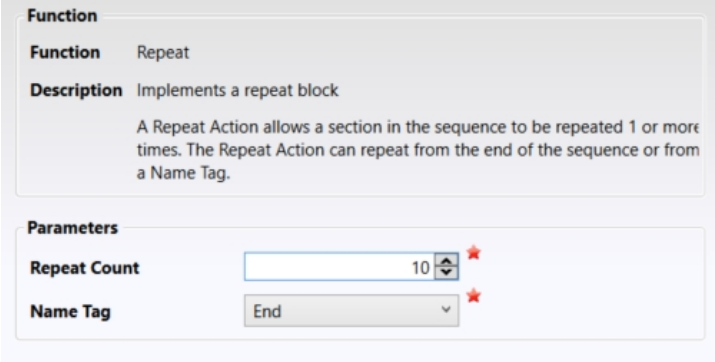



***Figure 30 Wait Parameters***

To add the next command to the sequence, click **Insert** then select the **Action Move Relative** function.

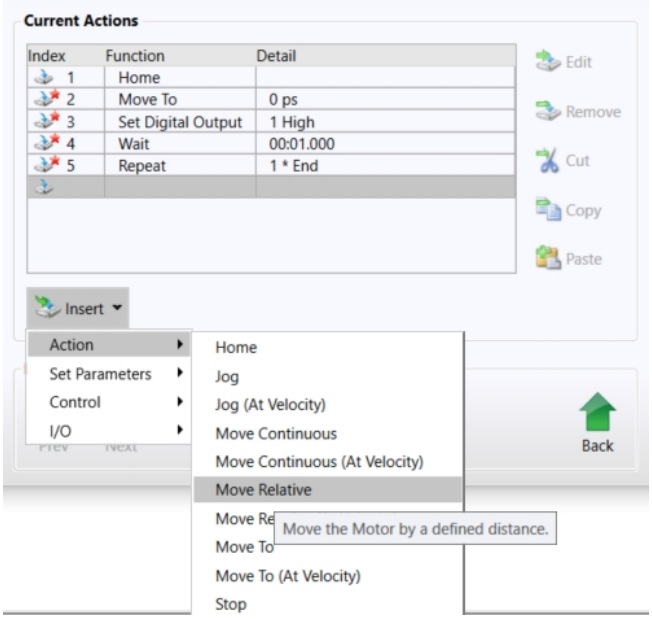



***Figure 31 Move Relative***

To edit the parameters of the move relative click on the **Move Relative** step in the **Current Actions** List. This will open a section that will allow the user to edit the Move distance parameter, see below.

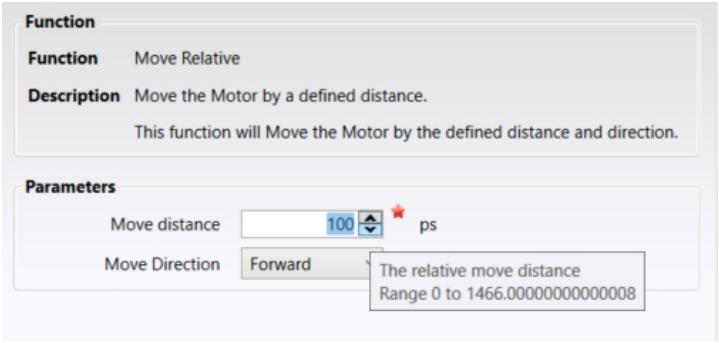



***Figure 32 Move Distance Parameter***

To finish the example sequence we will use the copy and paste feature of the sequence editor. Highlight the Index 3 “Set Digital Output” step and paste it into the sequence below the Index 5.1 “Move Relative” step. Repeat this for the Index 4 step “Wait” to complete the example sequence.

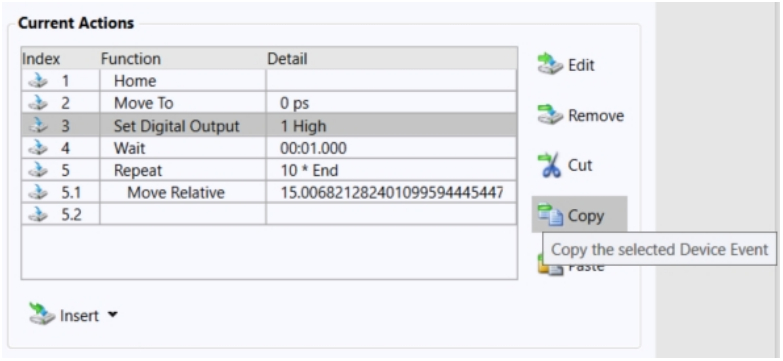



***Figure 33 Copy***

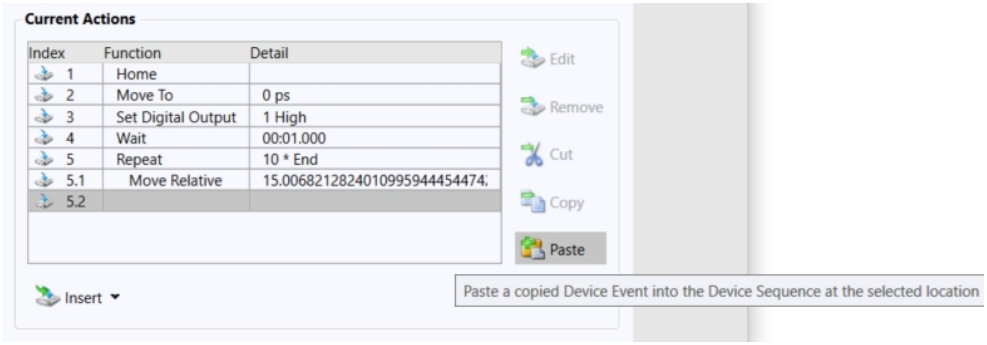



***Figure 34 Paste***

The sequence can now be saved, select the **Save As** button on the right of the Sequence editor window.

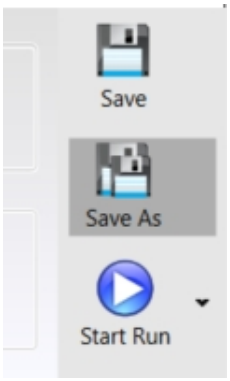



***Figure 35 Save As***

The sequence can now be saved with a suitable file name. The files are saved as .sequence files. Click **Save**. Once back on the main sequence editor window click **Close** to close the sequence editor window.

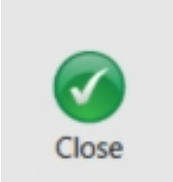



***Figure 36 Close Editor***

### *Running A Sequence*

To run the newly saved sequence, click the Run button in the sequence manager task pane. The system executes the sequence created previously.

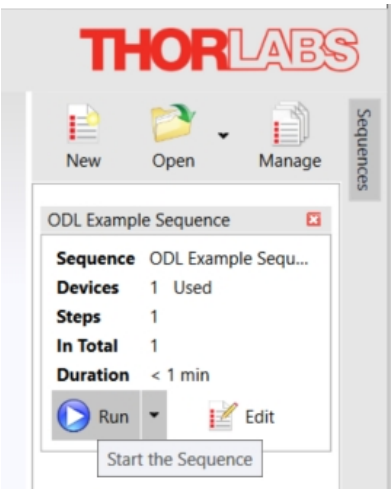



***Figure 37***

# Chapter 6 Specifications

## 6.1. Kit Contents

| Item # | ODL220(/M) | ODL300(/M) | ODL600(/M) |
|---|---|---|---|
| **Translation Stage** | DDS220(/M) Stage | DDS300(/M) Stage | DDS600(/M) Stage |
| **Controller** | BBD301 Benchtop Controller | | |
| **Optics** | UM10-AG Mirror (Qty. 2), MRAK25-P01 Knife-Edge Prism | | |
| **Optic Mounts** | Retroreflector V-Block, Knife-Edge Prism Mount | | |
| **Adapters** | Platform and Stage Risers for DDS220(/M) Stage | Platform and Stage Risers for DDS300(/M) Stage | Platform and Stage Risers for DDS600(/M) Stage |
| **Alignment Irises** | SM05D5D Lever-Actuated Iris (Qty. 2) | | |
| **Iris Mounts** | FT-SM05 FiberBench Optic Mount (Qty. 2) | | |

## 6.2. Optical Delay Line Specifications

| Item # | ODL220(/M) | ODL300(/M) | ODL600(/M) |
|---|---|---|---|
| **Maximum Optical Delay** | 1470 ps | 2000 ps | 4000 ps |
| **Inherent Delay @ 0 mm** | 507 ps | 607 ps | 607 ps |
| **Delay Sensitivity**[a] | 0.67 fs | 0.67 fs | 0.67 fs |
| **Output Beam Height** | 3.22" (81.7 mm) | 3.45" (87.7 mm) | 3.45" (87.7 mm) |

a. Based on the minimum repeatable incremental motion of the stage.

## 6.3. Key Translation Stage Specifications

| Item # | DDS220(/M) | DDS300(/M) | DDS600(/M) |
|---|---|---|---|
| **Travel Range** | 220 mm (8.6") | 300 mm (11.81") | 600 mm (23.6") |
| **Speed (Max)** | 300 mm/s | 400 mm/s | 400 mm/s |
| **Acceleration (Max)** | 5 000 mm/s$^2$ | 10 000 mm/s$^2$ | 10 000 mm/s$^2$ |
| **Bidirectional Repeatability** | ±0.25 µm | | |
| **Incremental Movement (Min)** | 0.1 µm | | |
| **Absolute On-Axis Accuracy** | ±2.0 µm | ±7.5 µm | ±12.0 µm |
| **Pitch**[b] | ±175 µrad | ±100 µrad | ±150 µrad |
| **Yaw**[b] | ±175 µrad | ±150 µrad | ±300 µrad |
| **Bearing Type** | Precision Linear Bearing | High Rigidity, Recirculating, Precision Linear Bearings | |
| **Motor Type** | Brushless DC Linear Motor | | |
| **Dimensions** | 370.0 mm x 90.0 mm x 44.0 mm (14.57" x 3.54" x 1.73") | 500 mm x 130 mm x 50 mm (19.69" x 5.12" x 1.97") | 800 mm x 130 mm x 50 mm (31.5" x 5.12" x 1.97") |
| **Weight** | 2.4 kg (5.3 lbs) | 5.9 kg (12.98 lbs) | 9.1 kg (20.0 lbs) |

a. Component specifications are subject to change. Please refer to our website for complete and up-to-date translation stage specifications.

b. Pitch and yaw are measured by moving the stage over its full travel range and taking an angular robust laser interferometry (RLI) measurement at 20 equidistant points along the travel. This is repeated 10 times and the maximum discrepancy between minimum and maximum value in the pitch and yaw directions is taken.

## 6.4. Key Controller Specifications

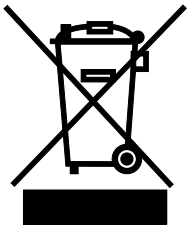
| Item # | BBD301 |
|---|---|
| **Control Algorithm** | 16-Bit Digital PID Servo Loop with Velocity and Acceleration Feedforward |
| **Velocity Profile** | Trapezoidal/S-Curve |
| **Position Feedback** | Incremental Encoder |
| **Encoder Bandwidth** | 2.5 MHz (10 M Counts/s) |
| **Input Power Requirements** | Power: 250 VA<br>Voltage: 100 to 240 V AC<br>Frequency: 47 to 63 Hz<br>Fuse: 3.15 A |
| **Dimensions** | 199.8 mm x 229.1 mm x 108.8 mm<br>(7.87" x 9.02" x 4.28") |

a. Refer to our website for complete controller specifications.

# Chapter 7 Regulatory

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return “end of life” units without incurring disposal charges.

- This offer is valid for Thorlabs electrical and electronic equipment:
- Sold after August 13, 2005
- Marked correspondingly with the crossed out “wheelie bin” logo (see right)
- Sold to a company or institute within the EC
- Currently owned by a company or institute within the EC
- Still complete, not disassembled and not contaminated



***Wheelie Bin Logo***

As the WEEE directive applies to self-contained operational electrical and electronic products, this end of life take back service does not refer to other Thorlabs products, such as:

- Pure OEM products, that means assemblies to be built into a unit by the user (e. g. OEM laser driver cards)
- Components
- Mechanics and optics
- Left over parts of units disassembled by the user (PCB’s, housings etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

***Waste Treatment is Your Own Responsibility***

If you do not return an “end of life” unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.

***Ecological Background***

It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of life products will thereby avoid negative impacts on the environment.

# Chapter 8 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.

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