



# **Three Axis Controller Application User Guide**

14/08/2024

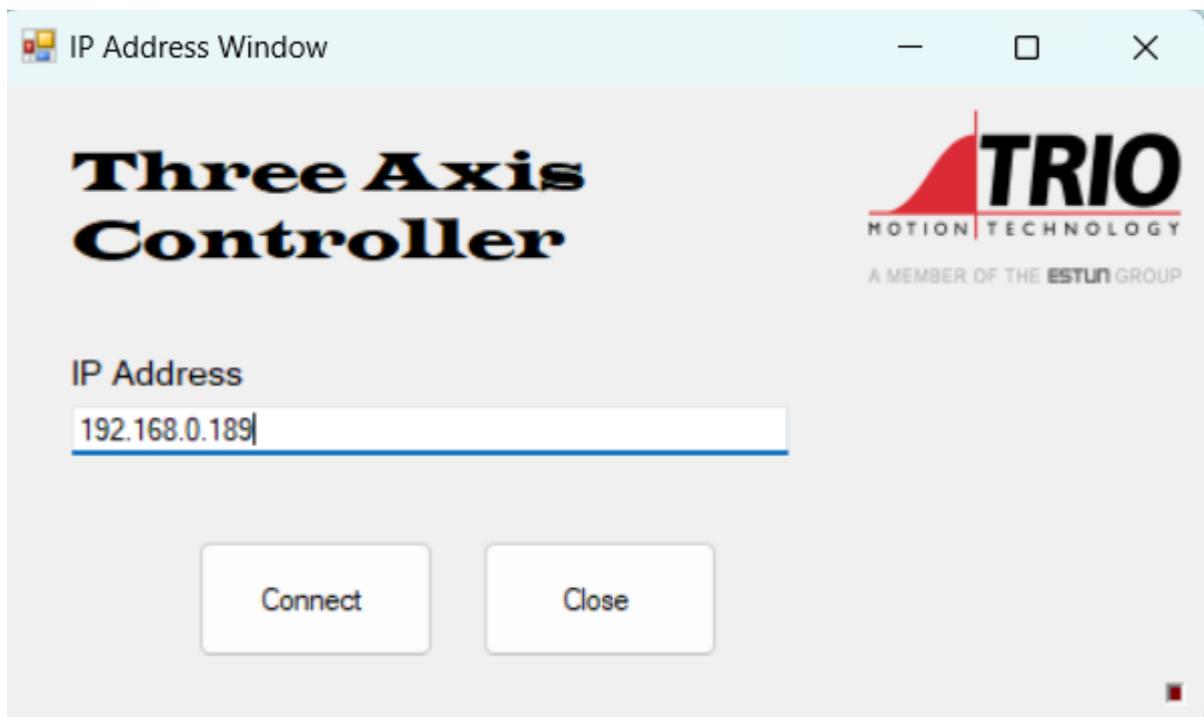
## Dependencies

- Visual Studio 2022
- Trio\_UnifiedApi version 1

## Introduction

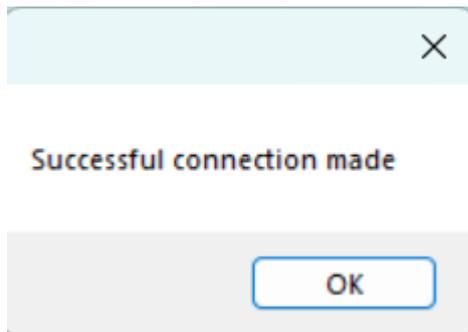
This application has been developed using Windows Forms and utilises the Trio\_UnifiedAPI to connect to a three axes controller. The application offers the user several functionalities. This document outlines each and provides a comprehensive guide for a user to follow.

## Initial Window

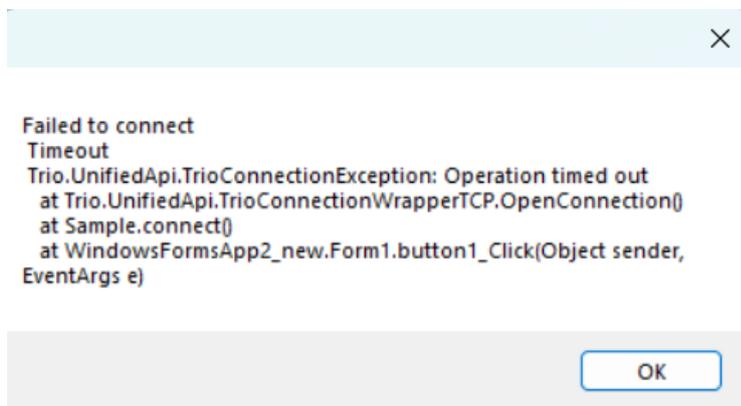


The program will begin with a user prompt for the controller's IP address. The 'Connect' button will use this IP address along with the Trio unified API and attempt to connect to a controller. Please allow some time for this to execute.

A message box will pop up, indicating whether a successful connection has been made or not. A successful connection will display the following.



A failed attempt will instead display the following.

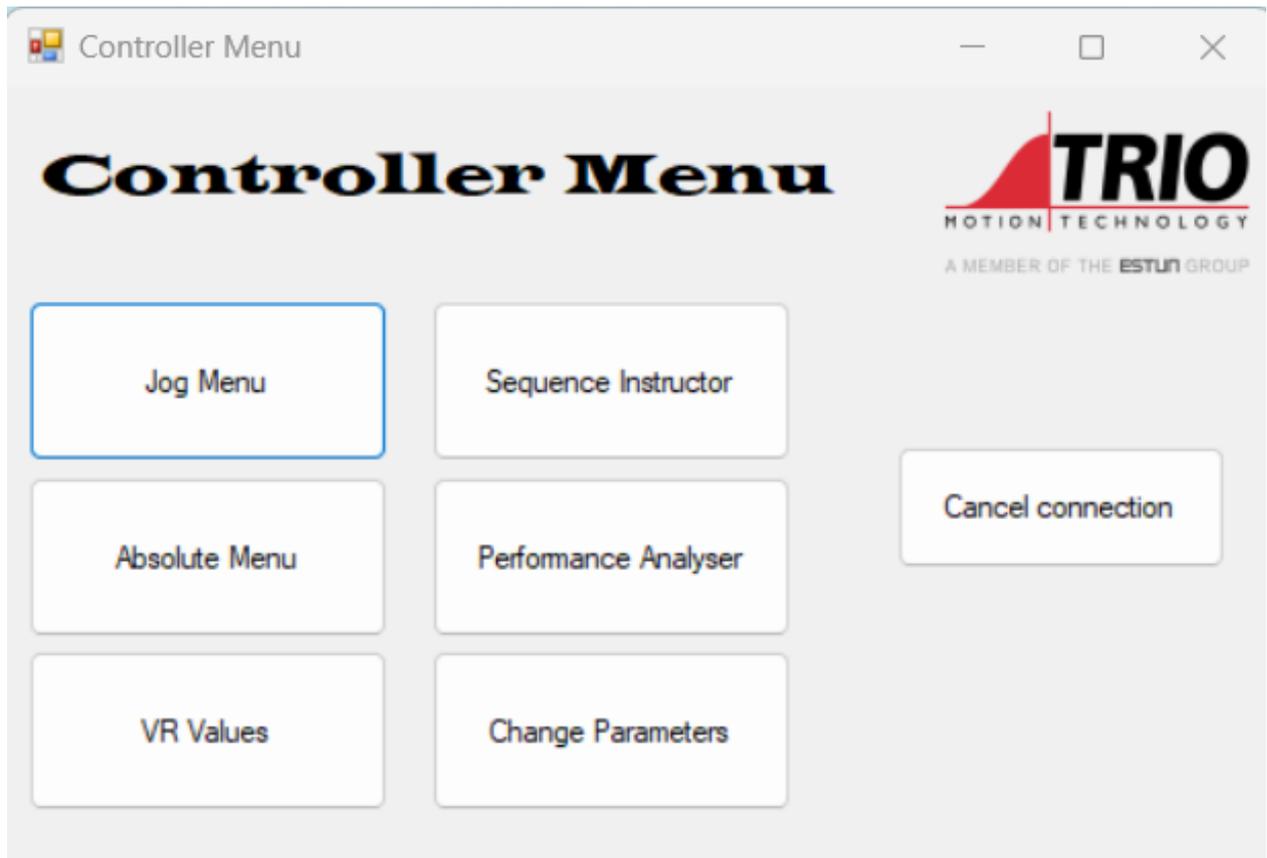


Further, the red picture box in the bottom right corner of the window will turn green, indicating a successful connection.

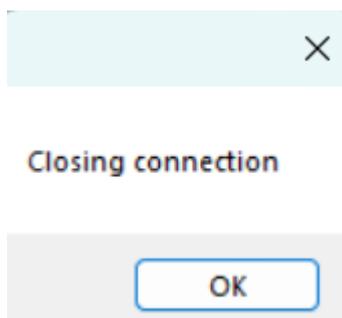
The 'Close' button on this window gives the user the option to close the current window. Since this is the only window open, this will close the application.

## Controller Menu

Once a successful connection to a controller has been made, the user will be taken to a separate window – the controller menu.



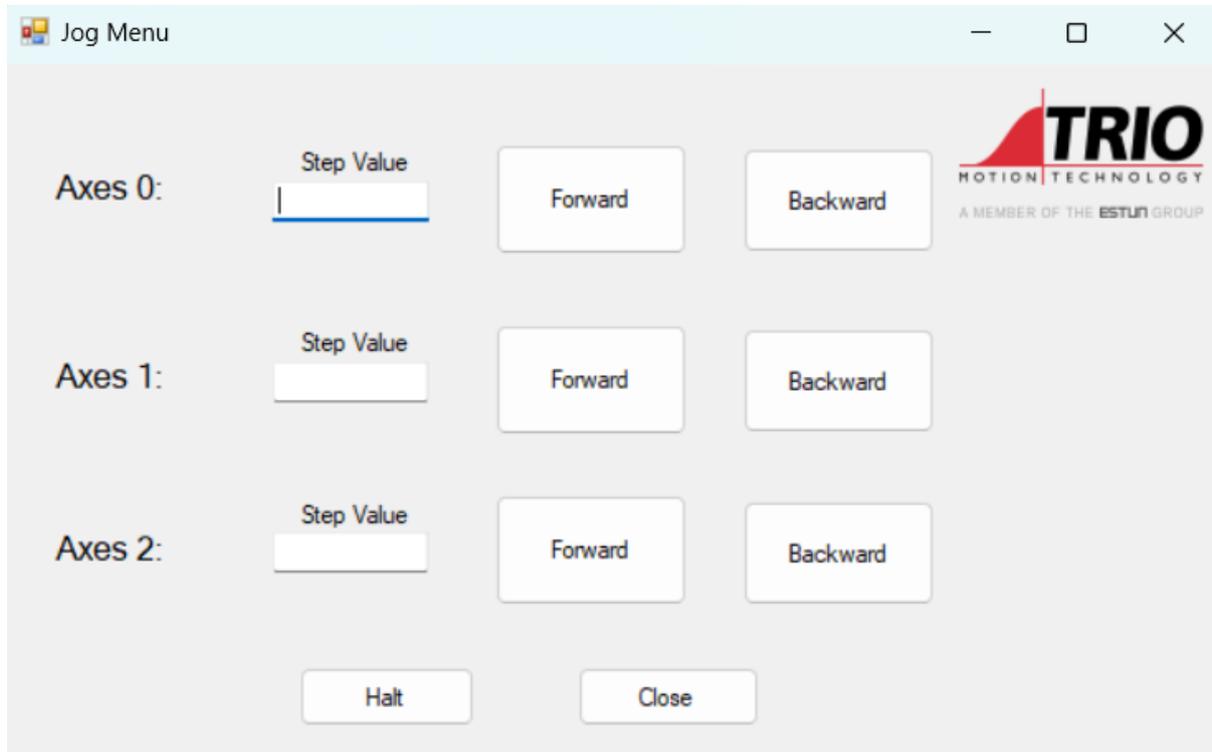
From here, the user is provided with six options, which will navigate them to separate windows with unique functionalities. There is also a 'Cancel connection' button which will terminate the connection between the application and the controller. If the user clicks this, they will be presented with the following message box.



Upon clicking 'Ok', the Controller Menu window will be closed, and the user will then be taken back to the initial window, where they can either reconnect to the controller, connect to a different controller, or close the program.

## Jog Menu

By selecting 'Jog Menu' from the Controller Menu, the user will be presented with the following window.



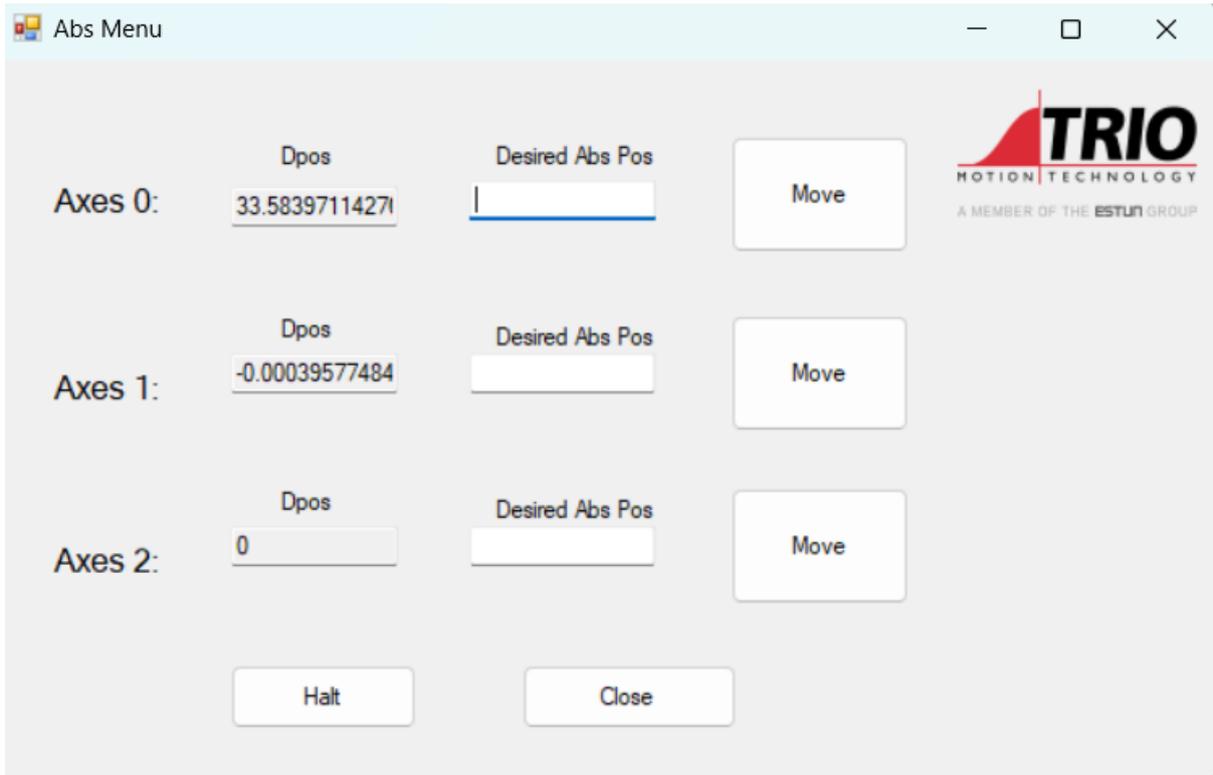
The user can select a step value for each axis and proceed to jog the respective axis either forward or backward, using the 'Forward' and 'Backward' buttons on the axis' respective row.

The 'Halt' button will bring all axes to a rapid stop.

The 'Close' button will close this window, and the user will be navigated back to the Controller Menu.

## Absolute Menu

By selecting 'Absolute Menu' from the Controller Menu, the user will be presented with the following window.

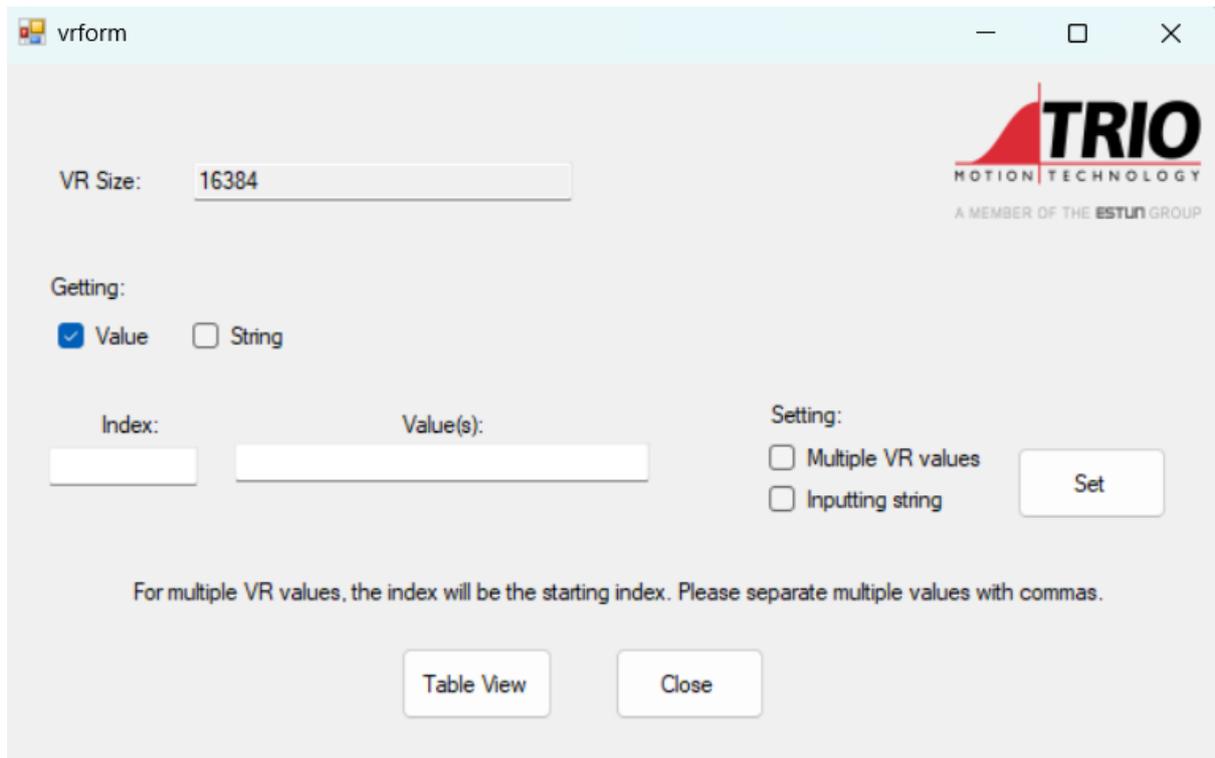


For each of the three axes, the user can set a desired absolute position, and the 'Move' button will execute this. The current absolute position of the axes will update live-time in the 'Dpos' field.

Once again, the 'Halt' button will bring all axes to a rapid stop, and the 'Close' button will close this window, bringing the user back to the Controller Menu.

## VR Values

If the user selects the 'VR Values' button from the Controller Menu, they will be presented with the following window.



The first, read-only field denotes the VR size of the controller.

The user can proceed to type a VR index of interest, in the 'Index' field. If they attempt to type an index that exceeds the VR size, or they type an index that isn't an unsigned integer, an error message will pop up alerting the user. As they type a valid index, the value stored at that location will be displayed in the 'Value(s)' field. They can alternatively retrieve a string at that location, by checking the 'String' checkbox instead of the default 'Value' checkbox. The program will read a string stored from the inputted index onwards, until a terminating character is read, or once the index exceeds the VR size.

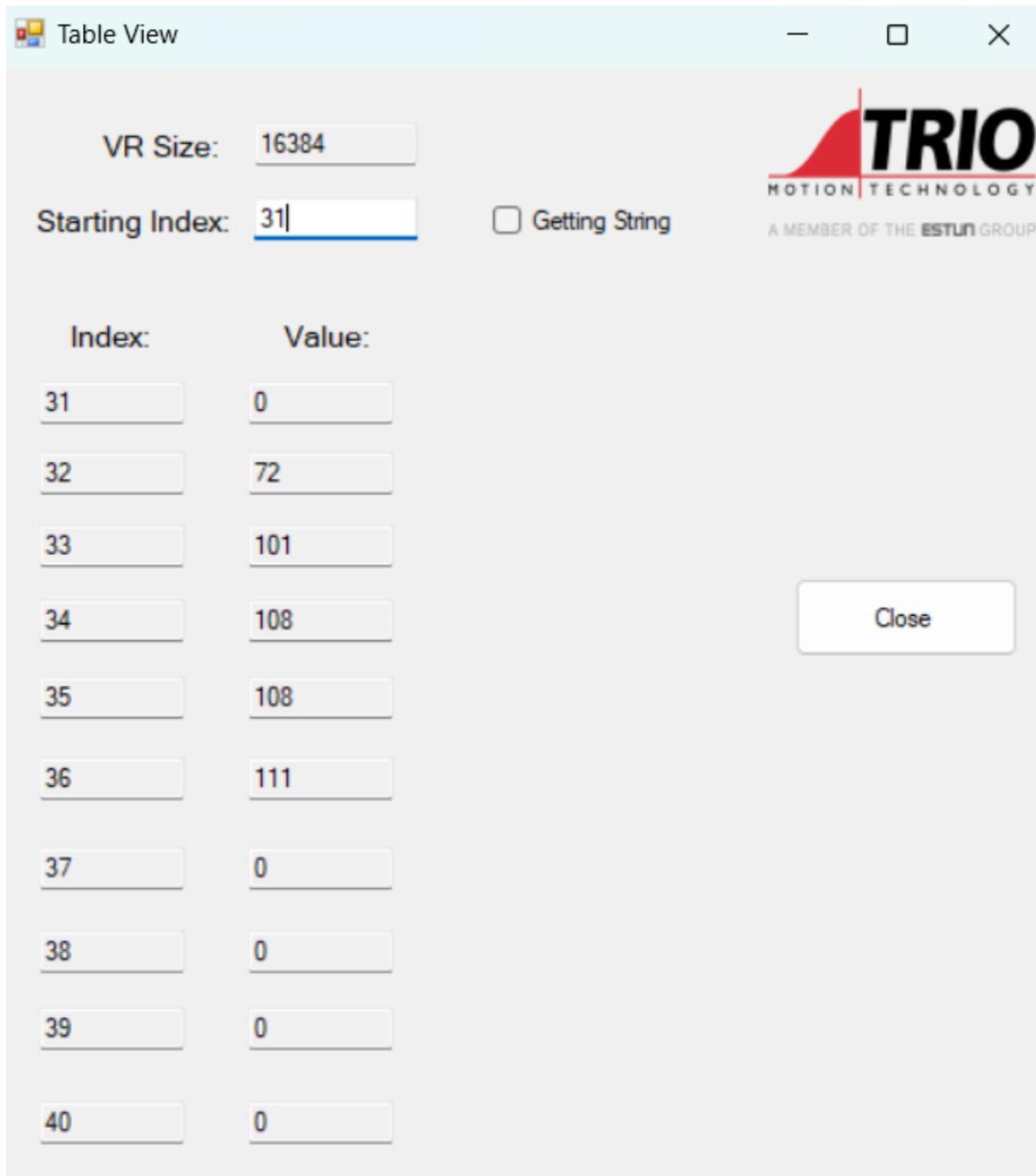
If the user wants to set a single VR value, they can type their desired new value in the 'Value(s)' field after the index has been inputted and click the 'Set' button. An error message will be displayed if the user attempts to set the VR value to anything other than a double data type. If the VR value is updated successfully, a pop-up message will inform the user.

If the user would like to set multiple VR values, they must check the 'Multiple VR values' checkbox, and input multiple VR values into the 'Value(s)' field, separating each with a comma. The 'Set' button will then set the VR values from the selected index onwards.

If the user would like to input a string, they must select the 'Inputting string' checkbox. Note that this will automatically select the 'Multiple VR values' checkbox, since multiple VR values are being set. The user can then type a string into the 'Value(s)' field, and once

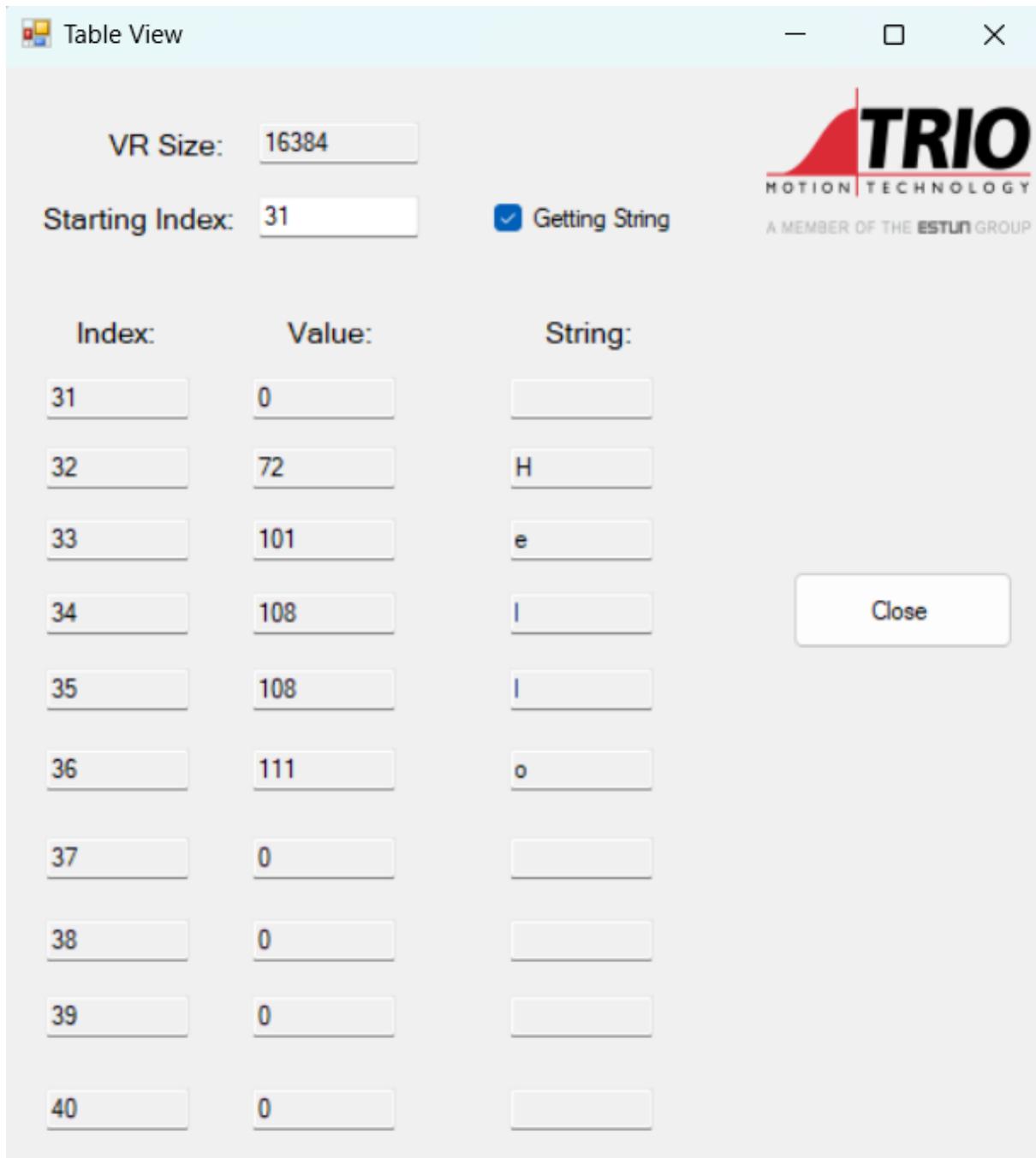
the user clicks the 'Set' button, a success message will pop up if the VR values are updated successfully. Each character will be stored from the selected index (declared in the 'Index' field) onwards.

If the user selects the 'Table View' button, they will be presented with the following window.



The user can type an index in the 'Starting Index' field, and this Table View window will display the next 10 indexes, and their corresponding VR values. If the user selects the

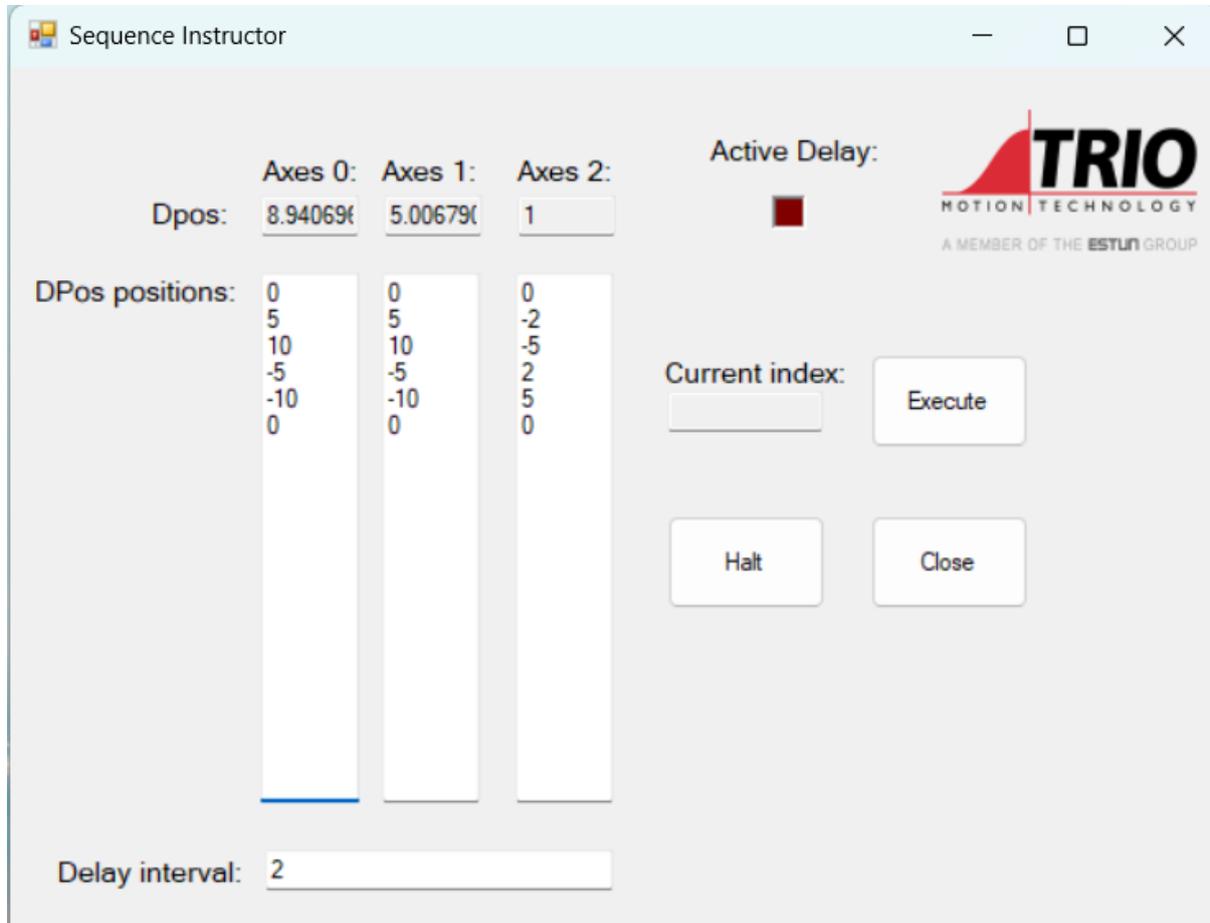
'Getting String' checkbox, they can read any strings that may be stored under the selected VR indexes. An example of this can be seen below.



Note that the user can close either the Table View window, or the VR Value window by clicking the window's corresponding 'Close' button.

# Sequence Instructor

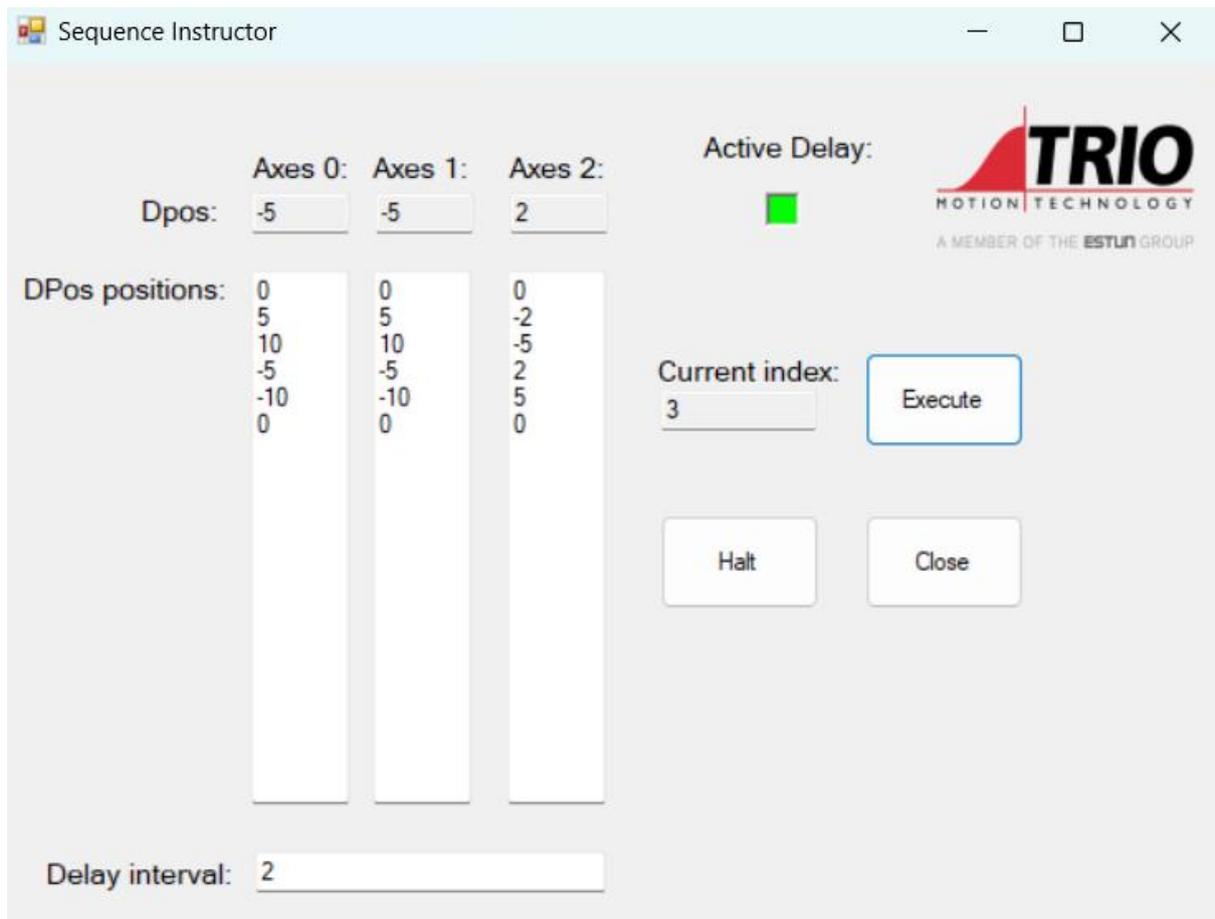
If the user clicks the 'Sequence Instructor' button, they will be taken to the following window.



For each of the three axes, the user will define a set of absolute positions for each of the axes to move to. This is denoted by the three 'DPos positions' fields, and each column corresponds to its respective axis. The idea is that the program will move down each row sequentially, reading the next desired position for each axis. Between rows, once all axes have stopped moving, there will be a delay before commencing onto the next row of desired axes positions. The length of this delay is denoted by the 'Delay interval' field, where the user can input their desired delay length (in seconds).

If the user defines more desired positions in one column than the other, they will be presented with an error message, after clicking the 'Execute' button. If they define a data type somewhere that's not a double data type, the program will alert them, informing them which row and column their error lies.

If the user has defined an equal number of desired positions in each column, and they are all of type double, the 'Execute' button will successfully begin the sequence instructor.



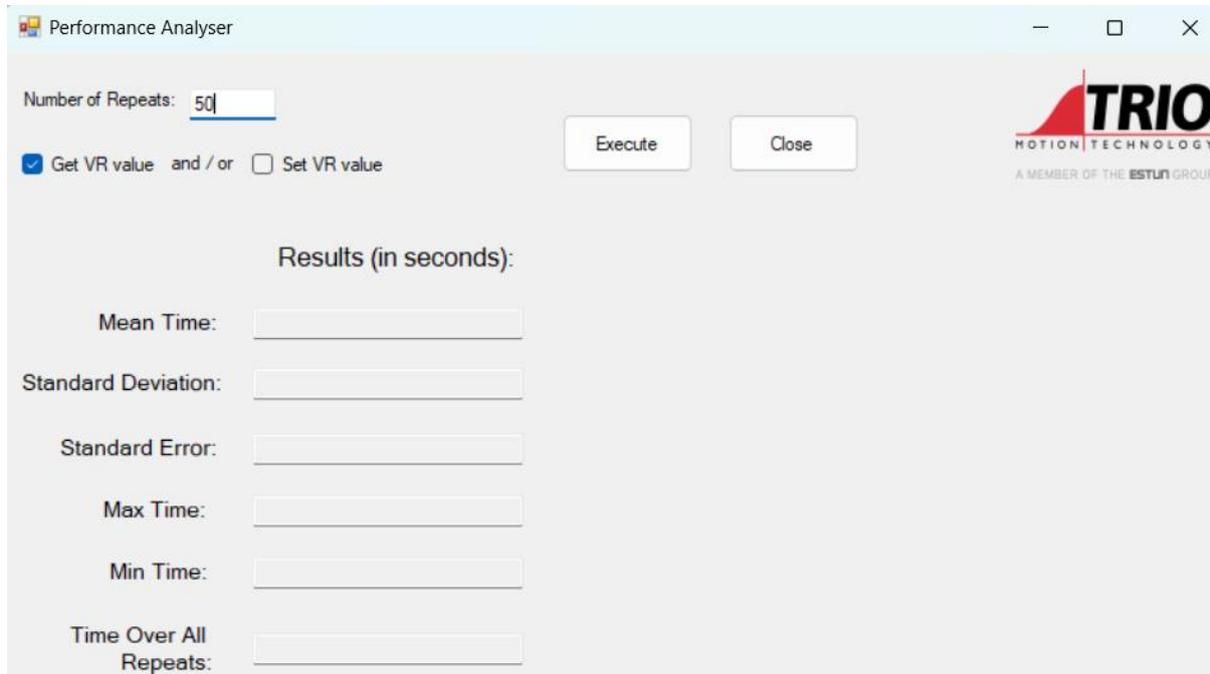
The above figure shows a snapshot of the sequence instructor whilst it's running. The 'Current index' field is a read-only field and tells the user which row the program is currently on (zero-indexed). The current absolute positions of each axis are updated live-time in the 'Dpos' fields towards the top of the window. The user is also informed when an active delay is taking place – the picture box towards the top of the window turns from red to green. It'll turn back to red once the delay is finished, and the program will move to the next instruction (or end if that was the final instruction).

The 'Halt' button will terminate the sequence instructor program and bring all axes to a rapid stop.

The 'Close' button will close the current window and will take the user back to the Controller Menu.

# Performance Analyser

If the user clicks the 'Performance Analyser' button, they will be taken to the following window.



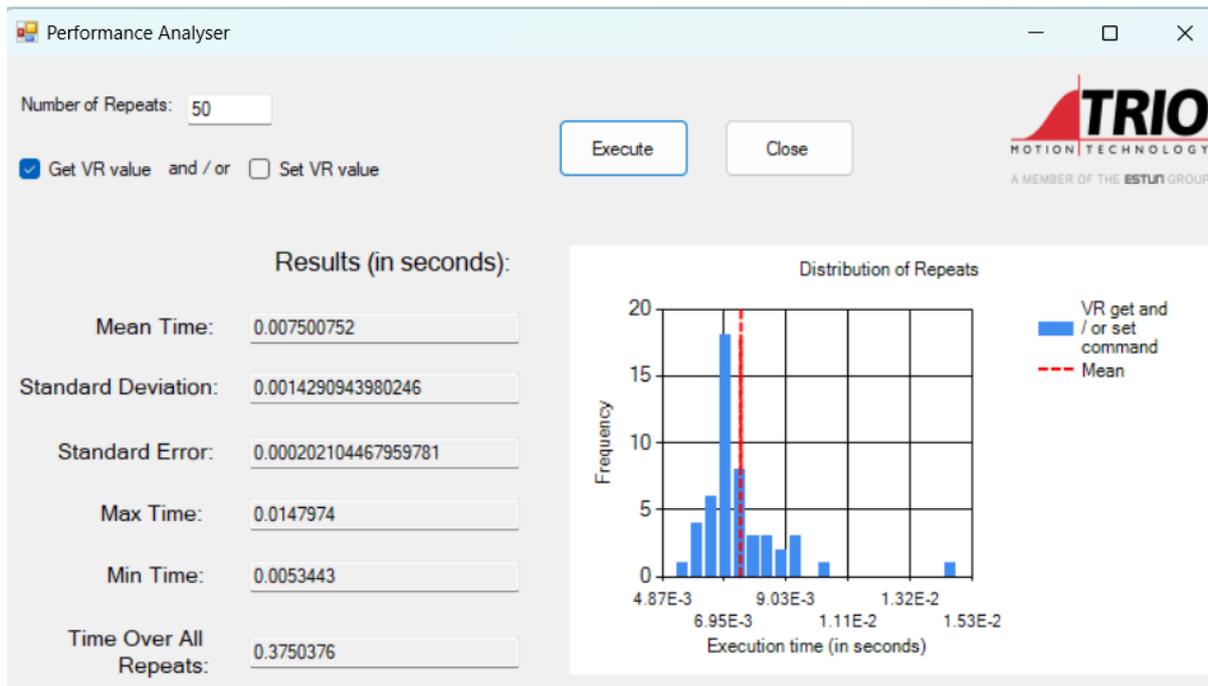
The screenshot shows a software window titled "Performance Analyser". At the top left, there is a text input field labeled "Number of Repeats:" containing the value "50". Below this, there are two checkboxes: "Get VR value" (checked) and "Set VR value" (unchecked), with the text "and / or" between them. To the right of these checkboxes are two buttons: "Execute" and "Close". In the top right corner, there is a logo for "TRIO MOTION TECHNOLOGY" with the tagline "A MEMBER OF THE ESTUN GROUP". Below the input fields and buttons, the text "Results (in seconds):" is centered. Underneath, there are six rows, each with a label and an empty text input field: "Mean Time:", "Standard Deviation:", "Standard Error:", "Max Time:", "Min Time:", and "Time Over All Repeats:".

The purpose of this window is to allow the user to measure the performance of their controller. They can either retrieve stored VR values, set VR values, or do both, and run this over a user-defined number of repeats. From there, they can analyse statistical metrics.

Note that if the user desires to set VR values, they will not be storing any new VR values once this performance analyser has been run.

Also note that if the user requests a number of repeats that exceeds the VR size, the performance analyser won't be able to execute this, and a warning message will reflect this.

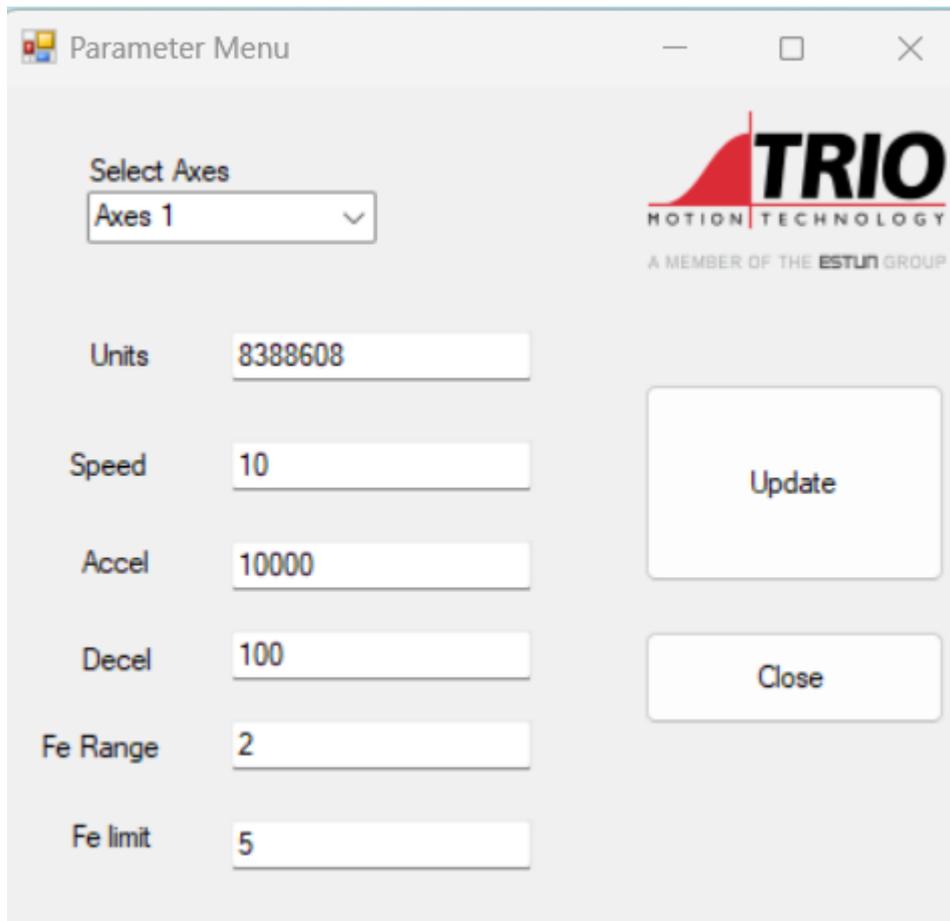
Once the 'Execute' button has been clicked, and the performance analyser has been executed, a distribution of repeats will also be displayed within the window. An example of this can be seen below.



The user can return to the Controller Menu by clicking the 'Close' button, which will close the performance analyser window.

## Change Parameters

If the user selects the 'Change Parameters' button, they will be taken to the following window.



From the drop-down menu, they can select one of the three axes. This will load in all parameters associated with that axis into the fields below. The user can then define new values for each field and click the 'Update' value. If some fields contain invalid inputs (incorrect data types), these fields won't be updated, whilst the others will, and an error message will be displayed to the user to reflect this.

The 'Close' button will close this window and take the user back to the Controller Menu.