Acceleration Calculator Users Guide

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Introduction

The Acceleration Calculator utility was written to allow users to easily calculate the distance and time required to transition from one velocity to a second at a specific acceleration. Despite the name the Acceleration Calculator utility only calculates the requirements of time and distance from the acceleration when there is a change in velocity.

When using a coordinate measuring machine it is normal to set move and touch speeds to values that are appropriate for the measurement application. The acceleration is rarely considered since this is not obvious when observing the machine. When measuring touch points on the machine it is critical that the acceleration at the moment of probe contact is zero otherwise you are introducing machine errors from stresses on the frame.

When it is necessary to use a very small prehit distance for touch points or the CMM has poor performance settings it is a good idea to know the minimum distance required for the machine to reach the desired touch speed.

Overview

The Acceleration Calculator Utility is a single window with inputs for the initial velocity, final velocity, and acceleration. The output shows the transition time and distance. The time and distance fields are read-only and calculated from the velocity and acceleration fields.
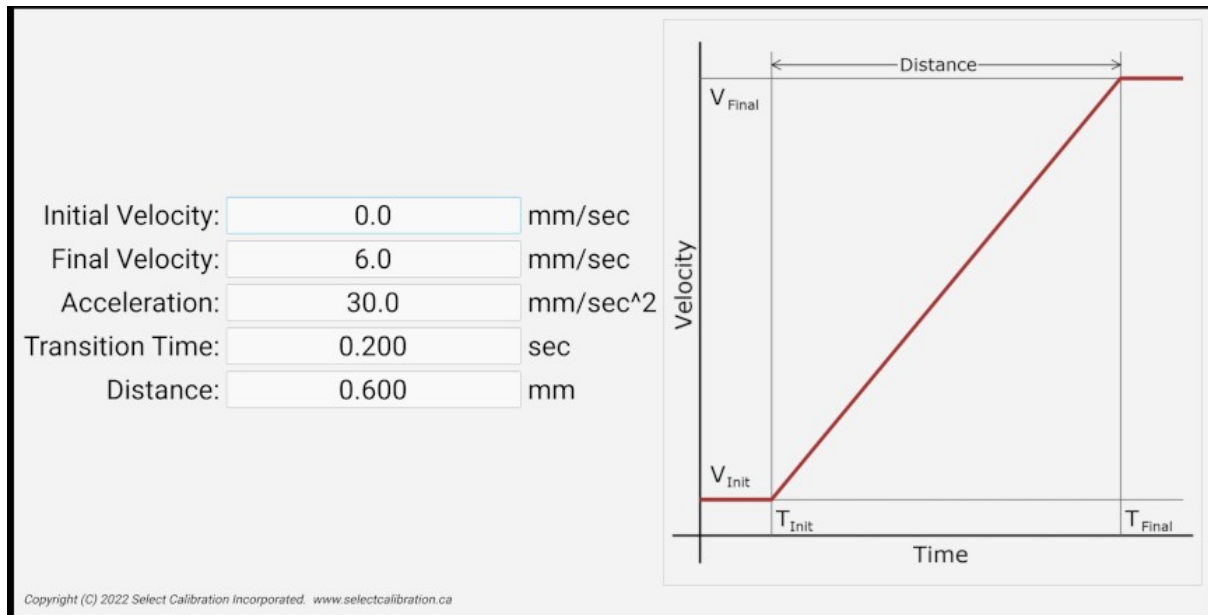

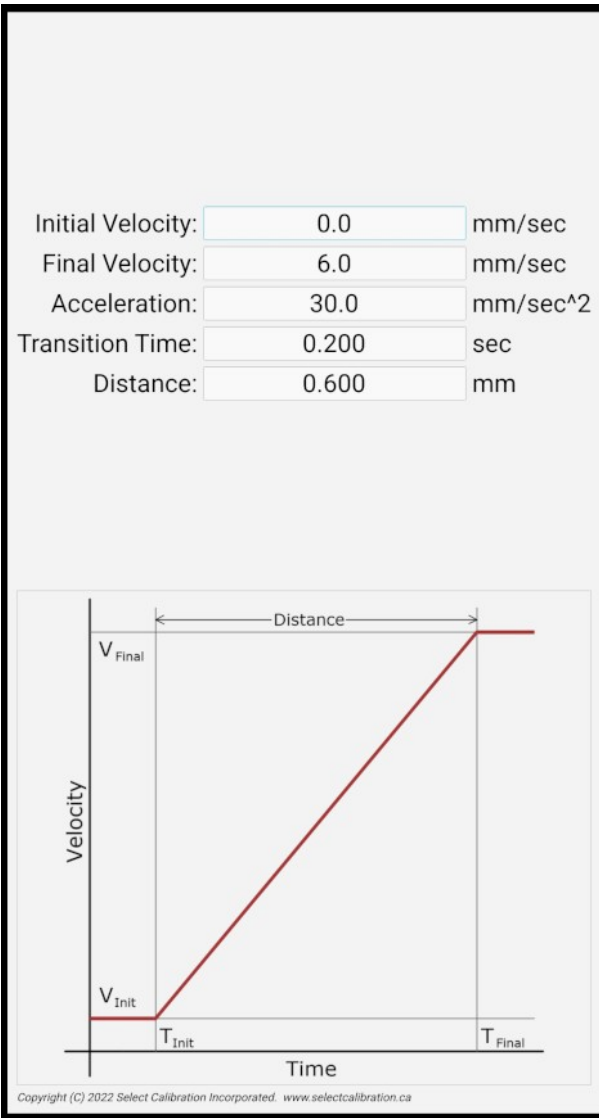*Figure 1: Acceleration Calculator in wide mode.*

Figure 2: Acceleration Calculator in tall mode.

Calculations

The formulas to calculate the time and distance are below:

$$Time = \frac{Velocity_{Change}}{Acceleration}$$

$$Distance = \frac{acceleration * time^2}{2}$$

Where:

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Time: the amount of time to transition from the first to second velocity
Distance: the distance required to transition from the first to second velocity.
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No CMM's has perfect servo control characteristics so often there is a small amount of overshoot and oscillation in the velocity until it has stabilized. This amount of instability depends on the machine. The practical time and distance for touch points should take this into account.

Revision History

Date	Version	Changes
Jun 15, 2022	1.0	New Program