ADVANCED MOTION CONTROLS

Programmable Limit Switch (PLS) Examples

Introduction

ADVANCED Motion Controls® DigiFlex® Performance™ drives are configurable to support two independent programmable limit switch (PLS) outputs. These allow the drive to activate digital outputs that are position dependent. The pulse width and repeatability are configurable.

Requirements

The following requirements must be met before PLS can be used.

- A free digital output must be available to be assigned to the PLS function.
- A compatible position loop feedback device must be configured and connected. The position loop does not need to be closed.
- An absolute position must be defined. If using an incremental encoder to close the position loop, an absolute position can be set using homing or the Set Position function.

Configuration

DriveWare® 7 is the recommended configuration interface. It is also possible to configure using direct network commands. For more information on configuration using network commands, refer to the appropriate communication manual for the supported network type.
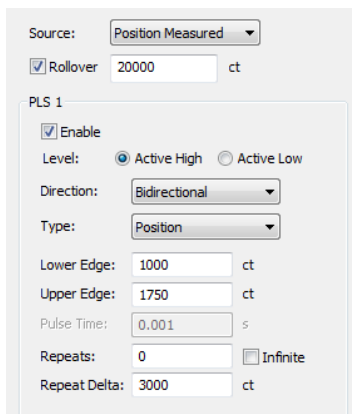

Figure 1 DriveWare PLS Interface

Examples

Triggered Behavior

Depending on the configured direction, a single position dependent pulse looks like the following.

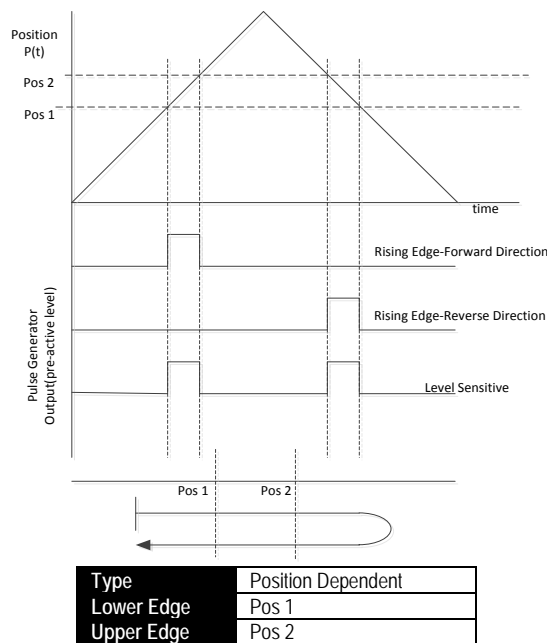| Type	Position Dependent
Lower Edge	Pos 1
Upper Edge	Pos 2

Figure 2 Pulse Width Based on Position

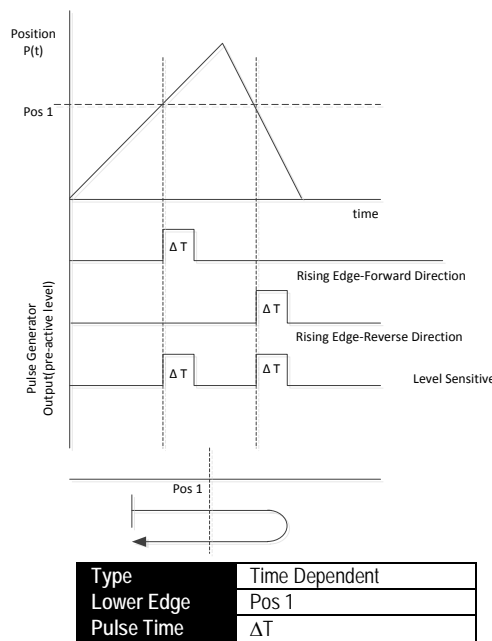The PLS can also be configured to activate for a certain time when triggered, as shown in Figure 3 below.

Type	Time Dependent
Lower Edge	Pos 1
Pulse Time	ΔT

Figure 3 Pulse Width Based on Time.

Lower Edge = Upper Edge = Pos1

Finite Repeat

To generate a finite repeating pulse train every N counts, set the Rollover count to N, and the operating mode to Rotary. Set the Lower and Upper Edge of the desired pulse to give the desired trigger characteristics. Set the Repeat count and the repeat delta to give the desired spacing between pulses and the number of segments to be repeated. The algorithm will repeat an integral number of pulses segments up to the repeat count. In Figure 4 below, a repeat count of 5 is specified, but only 3 complete segments fit, so the pulse will be repeated only twice for a total of 3 pulses.

Note: When specifying the repeat parameters, the following additional requirements must be met:
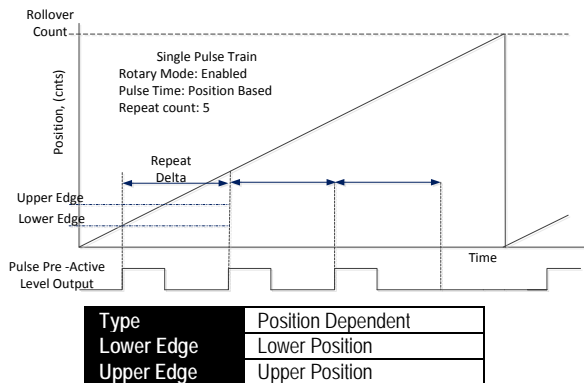
(Lower Edge + Repeat Delta) > Upper Edge

Type	Position Dependent
Lower Edge	Lower Position
Upper Edge	Upper Position

Figure 4 Finite Rep

Use Cases

Automated Greenhouse Watering

This example describes how an automated watering system could be configured for repetitive planter watering using a PLS output.

The water dispenser travels along the X-axis filling Row A of 6 planters, before moving along the Y-axis to Row B and traveling in the reverse X-axis direction while filling Row B planters.
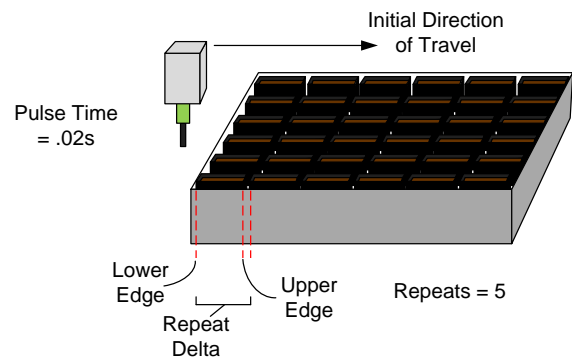

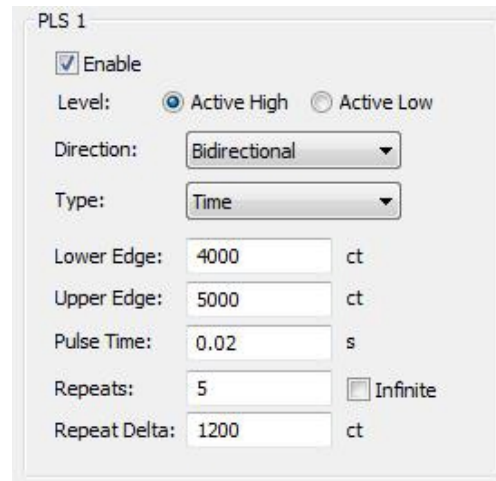**Figure 5 Automated Greenhouse Example**

Figure 6 DriveWare PLS settings

The PLS output controls the water dispensing, and should be set to trigger in both directions for a defined time period. The Pulse Time can be adjusted based on the speed at which the dispenser is moving and how long the desired amount of water will take to dispense into the planter. The Lower Edge is set to the position along the X-axis at which the first planter is encountered, and the Upper Edge is set to the position along the X-Axis of the opposite side of the planter. The Repeat Delta is the distance

from the start of one planter to the start of the next, and the number of repeats is set to 5 to account for all 6 planters in a Row.
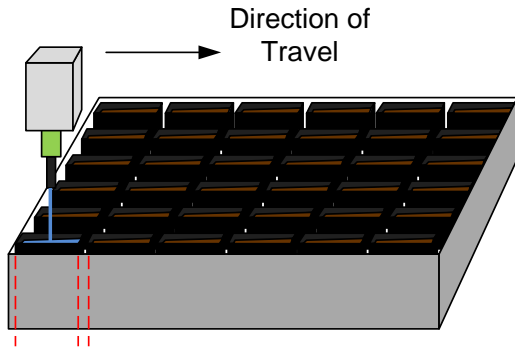

Figure 7 Start of Row A Motion

After Row A has been filled, the dispenser moves along the Y-Axis to Row B, then returns along the X-Axis to X = 0. In this direction, the Upper Edge of the last planter is what triggers the PLS output, and the repeat occurrences will continue along the Upper Edge of each planter.
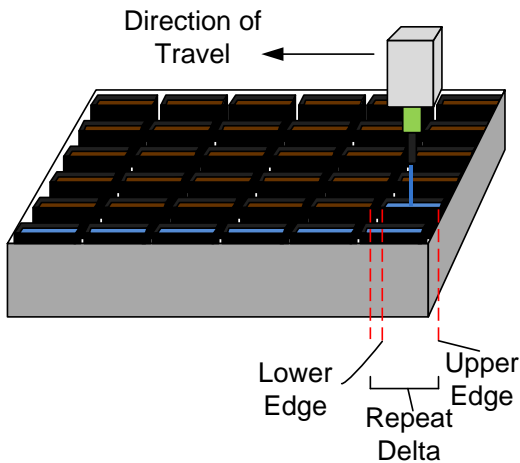

Figure 8 Start of Row B Motion

The oscilloscope capture from DriveWare in Figure 10 shows the PLS output triggering along motion in the positive direction.

Channel	Signal	Units / Div	Offset
1	Position Target	10 kct	0.0000 kct
2	Position Measured	10 kct	0.0000 kct
3	PLS Pulse 1 State	1	0.0000

Display
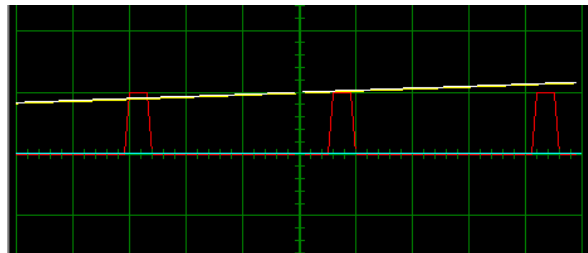Time/Div: 50 msec

Figure 9 DriveWare Scope Settings

Figure 10 DriveWare Scope – Positive Motion

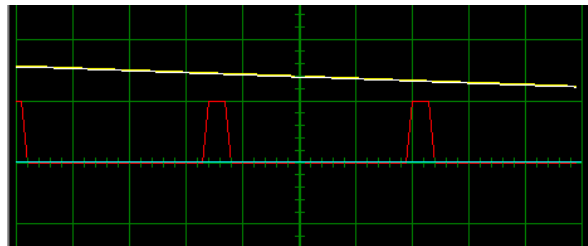The oscilloscope capture from DriveWare in Figure 11 shows the PLS output triggering along motion in the negative direction.

Figure 11 DriveWare Scope – Negative Motion