

## Vision Pulse Train Outputs Motion Control Made Easy



The increasing drive for product quality requires more accurate and consistent movement from the components of modern-day machines. To move accurately and quickly requires the use of a servo or stepper motor, a device which needs to be told which direction to move in, at what speed and for precisely how far. The requirement to be able to alter these parameters easily for different products puts a strain on traditional PLC equipment which is not good at handling and processing large amounts of integer values.

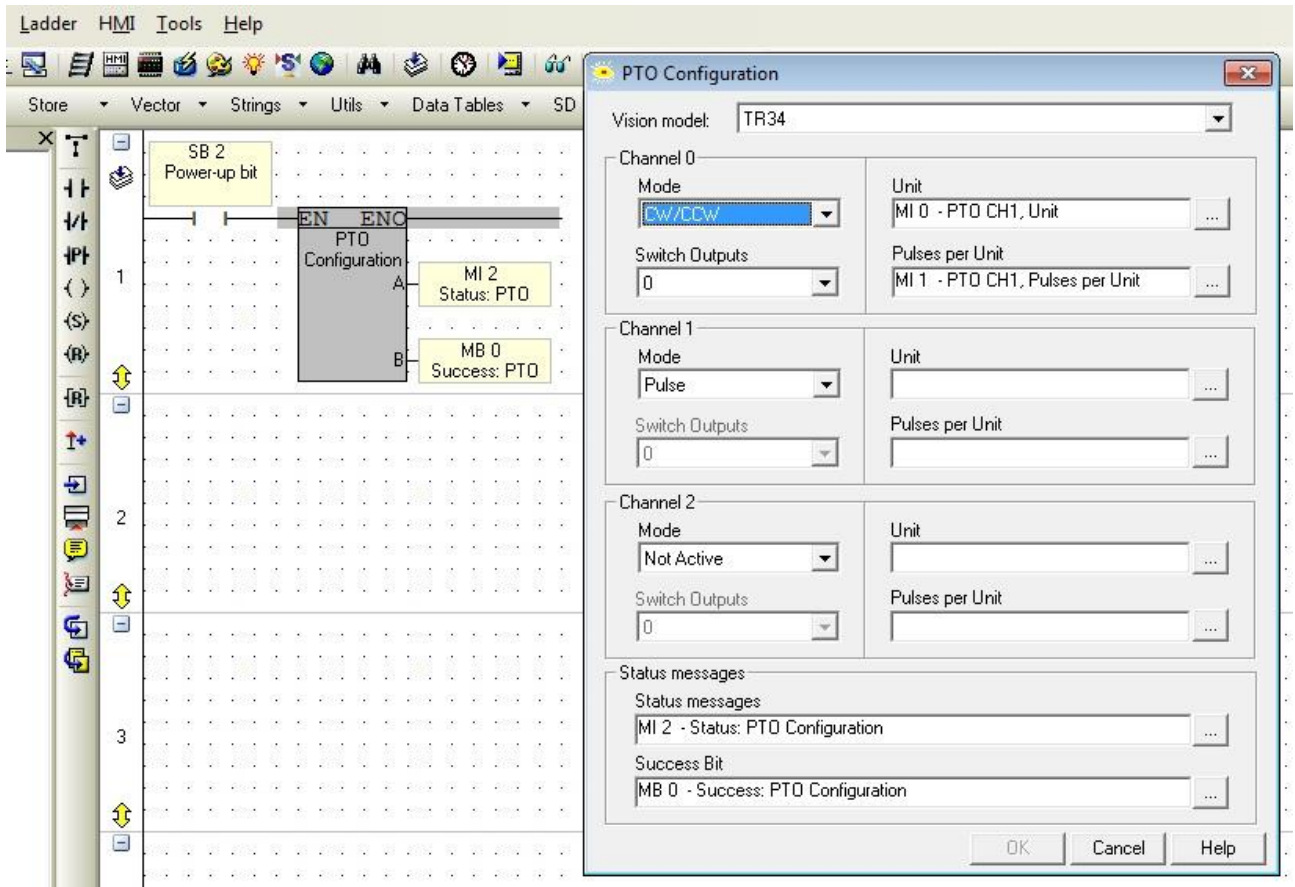
Unitronics engineers have worked hard to reduce the pain involved in motion control by producing a set of function blocks that allow you to configure movement profiles using drop down boxes and multiple-choice selection. The net result is a neat little box in the middle of your program that outputs a pulse train to your motor control card.

There are six elements to the pulse train output (PTO) function block set

- Configuration
- Set profile
- PTO Move
- Stop
- Set home
- Read status

Available only on certain Unitronics Vision® models (those with high speed transistor outputs!) the Configuration function block is shown below. This block defines the hardware system and converts pulses to engineering units, up to three channels may be used and there are three modes available

- Clockwise - Counter clockwise
- Pulse
- Pulse & direction



Having defined the physical system we now set up the move profile which consists of three stages, acceleration, steady speed and deceleration. The Set Profile function block allows entry of start speed, stop speed, acceleration and deceleration times together with a 'jerk factor'. There are six available jerk factors which specify whether the acceleration and deceleration profiles have straight line characteristics or use a smoother S Curve approach. The parameters in a profile may be fixed numerical values or internal registers if the value needs to change under program or recipe control. Unitronics Vision® OPLC's have internal data tables and can retrieve and save data onto an SD card which allows many different profiles to be accessed.

The screenshot shows two windows from a software interface. The left window is titled 'Acceleration Time (mS): PTO Set Profile' and contains a 'Direct' tab with a dropdown menu set to 'MI' and a value of '3'. Below this are 'Ok', 'Cancel', and 'Help' buttons. The right window is titled 'PTO Set Profile' and features a graph of Velocity vs. Time. The graph shows a trapezoidal profile with labels: (B) Start/Stop Velocity, (C) Maximum Velocity, (D) Acceleration time, (E) Deceleration time, and (F) Jerk Factor. Below the graph is a parameter table:

Params	#	Type	Add	Format	Description
IN	A	D#	0	DEC	Channel 0
	B	DW	0	DEC	Start/Stop Velocity: PTO Set Profile
	C	DW	1	DEC	Maximum Velocity: PTO Set Profile
	D	MI	3	DEC	Acceleration Time (mS): PTO Set Profile
	E	MI	4	DEC	Deceleration Time (mS): PTO Set Profile
OUT	F	MI	5	DEC	Jerk Factor: PTO Set Profile
	G	MI	6	DEC	Status: PTO Set Profile
	H	MB	1	DEC	Success: PTO Set Profile

The last part of defining a move is the actual move itself, using the PTO Move function block the user specifies the direction (a positive value for one direction, a negative value for the other direction), the speed and the target position. It is also possible to specify ABSOLUTE or RELATIVE movement, absolute movement being to a specific point and relative movement being another movement in the specified direction.

The screenshot shows two windows from a software interface. The left window is a ladder logic diagram with a 'PTO Move' function block. The right window is titled 'Mode: PTO Move' and has a 'Const' tab with a dropdown menu showing 'Movement Type: Relative', 'Movement Type: Absolute', and 'Movement Type: Relative'. Below this are 'Ok', 'Cancel', and 'Help' buttons. The bottom window is titled 'PTO Move' and contains a parameter table:

Params	Type	Add	Format	Description
IN	D#	0	DEC	Channel 0
	DW	2	DEC	Velocity: PTO Move
OUT	ML	0	DEC	Target Position: PTO Move
	MI	7	DEC	Status: PTO Move
	MB	2	DEC	Success: PTO Move

The last three elements of the function block set provide simple but convenient ways of implementing

<b>Stop</b>	Instructs the motor control card to either slow down and stop according to the current profile parameters, or to stop immediately following an emergency.
<b>Set home</b>	Send the workpiece to a predefined home position with one simple instruction.
<b>Read status</b>	Monitor where the workpiece is and how fast it is moving.

Motion control programs written in a modern PLC often take up vast areas of code clogging up the memory and distracting from the original objective of controlling the machine. Using a Unitronics function block not only makes the whole process simpler and easier to construct but it removes the clutter of incidental code leaving the control program nicely structured.